WORLD RESOURCES INSTITUTE

CORPORATE GUIDE TO
GREEN POWER MARKETS

SUSTAINABLE ENTERPRISE PROGRAM

Corporate Greenhouse Gas Emissions Inventories: Accounting for the Climate Benefits of Green Power

INSTALLMENT 3

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I. Introduction

Many corporations are beginning to explore how to use green power as an approach for reducing the climate and air impacts of their businesses and for demonstrating corporate environmental leadership. Over the past two years, the World Resources Institute (WRI) has been working with ten large U.S. corporations in a unique partnership, the Green Power Market Development Group, which is dedicated to building corporate markets for green power. As WRI has observed, corporate energy and environmental managers recognize that power and heat from renewable resources such as solar, wind, geothermal, biomass, and landfill gas can provide many environmental benefits. For instance, relative to conventional fossil fuels, renewables reduce emissions of greenhouse gases such as carbon dioxide (CO_2), and reduce other significant pollutants that affect the environment and human health, such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and mercury (Hg). For many energy buyers, corporate energy and environmental goals can be achieved in unison by selecting green power.

In today's market and policy environment, many of the superior environmental attributes of green power have no monetary value. Moreover, many of the costs associated with conventional power sources (e.g., environmental, human health, and economic damages due to climate change) are not factored into conventional energy prices. Consequently, it is difficult for corporate energy managers to quantify and compare the environmental impacts and/or benefits of their power choices. Thus, many green power options appear more expensive than power generated from conventional fuels.

Policy frameworks that incorporate the full costs and benefits of energy sources are needed to address this market shortcoming. For instance, an emissions trading system for greenhouse gases could be an efficient and transparent mechanism for placing financial value on the positive attributes of green power and, consequently, for reducing the cost of green power. Allocating emission allowances or awarding credits to renewable energy generators could help overcome current market price barriers. National and state policymakers are beginning to explore these and other policy frameworks that could enable renewable markets to succeed and contribute to a clean energy future. For example, the United Kingdom has introduced an Emissions Trading Scheme that includes economic incentives for corporate use of green power.

This publication is the third installment of the *Corporate Guide to Green Power Markets* series which is based on WRI's experiences convening the Green Power Market Development Group (see www.thegreenpowergroup.org). This installment draws on the standards and guidelines recommended by the Greenhouse Gas Protocol Initiative—a multi-stakeholder partnership convened by WRI and the World Business Council for Sustainable Development (WBCSD). Earlier installments of the Corporate Guide can be found online at http://www.thegreenpowergroup.org/publications. The first installment provided an introduction to green power for corporate markets. The second discussed corporate opportunities for using landfill gas as a green energy source.

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Box 1 The Value of a Greenhouse Gas Emissions Inventory to IBM

IBM believes that voluntary and cost-effective strategies are available to reduce GHG emissions and that demonstrating such strategies is an important part of climate reduction efforts. IBM believes that voluntary initiatives provide an opportunity to demonstrate corporate and national leadership and to enhance long-term corporate competitiveness.

IBM's largest impact on climate change is indirect, through the release of CO_2 by the utilities that provide the electricity the company consumes. IBM also emits CO_2 from boilers operating at its sites and emits some PFCs during semiconductor manufacturing. As part of its climate strategy, the company is implementing energy efficiency measures and using green power (e.g., wind-generated electricity in Texas, landfill gas-generated electricity in the U.K.). Complementing these activities, IBM has developed and maintained a greenhouse gas emissions inventory since 1990 to meet several business objectives:

Monitor and manage overall and relative magnitudes of all corporate greenhouse gas emissions and reductions: By developing an inventory IBM knows that the CO_2 emissions from energy consumption (both electricity and fuel) by the company's worldwide facilities were 3.2 million tons in 2001. These emissions constituted approximately 90 percent of IBM's total annual reported GHG emissions. With an inventory, the company has been able to monitor and record more than 7 million tons of CO_2 emissions avoided through conserving a cumulative 11.3 billion kilowatt hours of electricity. The inventory also serves as the corporate record demonstrating that through its energy conservation activities IBM has reduced its global CO_2 emissions by nearly 31 percent relative to 1990 levels.

Track progress against GHG emissions targets set under voluntary programs: IBM has set voluntary GHG emission reduction targets and participates in climate programs such as the U.S. Voluntary Greenhouse Gas Emissions Report (since 1995), Climate Wise Partnership (since 1996), Energy Star Buildings Partnership (since 1999), the Green Power Market Development Group (since 2000), World Wildlife Fund's Climate Savers Program (since 2000), and the US EPA's Climate Leaders Initiative (since 2002). Targets include a commitment to achieve average annual CO_2 emissions reductions of 4 percent between 1998 and 2004 under the Climate Savers Program and between 2000 and 2005 under the Climate Leaders Initiative. Under the latter, the company also has committed to reduce PFC emissions 10 percent by 2005 relative to 2000 levels.

It would not be possible for the company to track its progress toward these and other targets without an accurate and complete collection of GHG emissions data. IBM's GHG inventory, for instance, has shown that the company is exceeding its 4 percent annual reduction target by achieving reductions of 4.6 percent in 1998, 4.7 percent in 1999, 4.6 percent in 2000, and 6.8 percent in 2001.

Recognize performance: A GHG inventory helps IBM recognize locations that have succeeded in achieving significant emissions reductions. For example, in 2002 an IBM team in the U.K. received an IBM Environmental Excellence Award for its procurement of 48,000 megawatt hours of cost-competitive green power generated from landfill gas. The team's green power initiative exemplifies IBM's energy leadership and provides significant environmental benefits by avoiding 24,200 tons of CO_2 emissions annually.

Account for possible credits: IBM's inventory may help the company secure a claim to emissions reduction credits for which it would be eligible in future regulatory regimes (e.g., emissions markets).

Meet future regulatory requirements: A GHG inventory provides the information background that can help the company meet emissions regulations that might emerge.

To maximize the possible benefits of these policy frameworks, corporations will need to quantify and track the impact of their power choices by measuring changes in their emissions profiles. This can be accomplished through the creation and use of a *corporate greenhouse gas (GHG) emissions inventory*—a tool that allows managers to measure and record the emissions reductions achieved by switching to green power. Specifically, a GHG emissions inventory is a detailed list of a company's greenhouse gas emissions. It records emissions by source and by type of greenhouse gas in metric tons of the gas and in metric tons of carbon dioxide equivalent (CO_2e).

Recording changes in GHG emissions sets the foundation for corporations potentially to benefit from using renewable energy in future climate change policy frameworks.[1] Energy managers should be aware, however, that there is a risk that corporations may not be able to realize all the benefits of green power if emerging

policies fail to reward green power purchased by end-users.

This installment of WRI's *Corporate Guide to Green Power Markets* introduces corporate greenhouse gas emissions inventories as a fundamental first step to enabling green power to meet corporate energy and climate goals. It will outline the business case for GHG emissions inventories and articulate how they can serve as a management tool for valuing the climate change benefits of green power. This installment will explore the issue of who should account for GHG emissions reductions from corporate procurement of green power. Finally, it will suggest policy recommendations that maximize the ability of inventories to provide a foundation for rewarding corporate use of renewable energy.

II. The Business Case for Investing in a Greenhouse Gas Emissions Inventory

Given that the commercial and industrial sectors accounted for an estimated 45 percent of U.S. greenhouse gas emissions in 2000,[2] climate change is not only an environmental and political issue but also a business issue. Companies must be able to understand and manage their GHG emissions if they are to ensure long-term success in a competitive business environment and to be prepared for future national or regional climate policies. A GHG emissions inventory is a critical tool for achieving these and other objectives. With this awareness, leading companies such as IBM, DuPont, and Johnson & Johnson have started to develop and maintain their own GHG inventories. *(See Box 1.)*

Developing an emissions inventory is particularly important for companies that want to use green power as a means to reduce GHG emissions. Inventories record and quantify the emissions benefit of switching to cleaner energy sources such as solar photovoltaic systems, landfill gas, geothermal, wind-generated electricity, and power from hydrogen fuel cells. As Table 1 summarizes, switching to green power can yield significant reductions in greenhouse gas (as well as conventional pollutant) emissions.

Emissions reductions enabled by green power can be recorded in either "project-based" or "organizational-based" GHG inventories. A *project-based* inventory records reductions (relative to a baseline or reference case[3]) that are achieved through a specific GHG mitigation project. An *organizational-based* inventory records emissions from an entire corporation, business unit, or facility. This installment will focus on the latter given that this more comprehensive type of inventory offers many additional benefits to corporations. Furthermore, the accounting rules pertaining to project reductions and issues such as how to set boundaries, how to select a reference case, and how to take into account leakage are still being debated among policymakers and standard setters. How project reductions ultimately translate into credits will be the purview of the trading scheme architects.

A well-designed and maintained organizational-based inventory serves

Table 1 **Examples of Emissions Reductions Enabled by Switching to Green Power**

Corporate energy buyer switches…		Average avoided emissions rate, 2000 (lbs/MWh)		
from	**to**	**CO_2**	**SO_2**	**NO_x**
Grid electricity from Consumers Energy Company (MI)	100% wind-generated power	1,696.1	8.1	3.3
Grid electricity from New England Power Company (MA)	100% wind-generated power	1,859.9	11.3	2.9
Grid electricity from Puget Sound Energy, Inc. (WA)	100% geothermal-generated power	1,630.9	1.2	3.7
Grid electricity from TXU Generation (TX)	100% on-site solar photovoltaic systems	1,039.0	3.2	2.9

Source: EPA, E-GRID Database, 2002.

as the foundation that enables corporations to meet several business goals, including the following:

- **Manage GHG risks and identify reduction opportunities.** What gets measured gets managed. Compiling a comprehensive inventory improves a company's understanding of its GHG emissions profile and thereby its potential GHG liability or "exposure." A company's GHG or climate exposure is increasingly becoming a corporate management issue in light of heightened scrutiny by reinsurers, climate-related shareholder resolutions,[4] and the emergence of environmental regulations/policies designed to reduce GHG emissions (e.g., emissions limits, cap-and-trade emissions markets). For instance, operations of multinational corporations in countries that have agreed to GHG emission limits under the Kyoto Protocol will find it important (and perhaps necessary) to quantify and track their GHG emissions. Companies with U.S. operations will find it advantageous to establish GHG inventories now in preparation for future GHG emissions reduction and/or reporting regulations at the national, regional, or state levels.

  An inventory also helps companies identify the most effective opportunities for emissions improvements and allows them to calculate reductions enabled by practices such as using green power. In addition, it is a prerequisite for setting internal corporate emissions reduction goals and for subsequently measuring and reporting progress. Understanding different facilities' emissions profiles may also help prioritize certain locations for pursuing green power opportunities.

- **Participate in public reporting and voluntary reduction initiatives.** A GHG inventory enables corporations to participate in a number of voluntary emissions reporting and reduction initiatives established by governments and nongovernmental organizations (NGOs) (*see section V for examples*). For instance, as a member of both the U.S. Environmental Protection Agency's (EPA's) Climate Leaders Initiative and the World Wildlife Fund's (WWF's) Climate Savers Program, Johnson & Johnson can report the CO_2 emissions reductions caused by switching from grid power to on-site solar photovoltaic electricity at several corporate locations. Participating in these and similar programs can help companies establish relationships with policymakers, thereby providing opportunities to inform and contribute to future policy development.

  Participation also can strengthen relationships with other stakeholders. For instance, companies can improve their standing with customers and with the public by being recognized for participating in GHG reporting and reduction programs. In expectation of a GHG-constrained world, shareholders may want to be assured that companies in which they invest have taken adequate steps to understand their corporate GHG exposure and have implemented strategies to reduce GHG liabilities. Voluntarily reducing and reporting GHG emissions also prepares companies for possible mandatory reporting or reduction programs, thereby providing leading companies with a competitive "head start" relative to other firms.

- **Participate in mandatory government reporting programs.** Governments increasingly are requiring large GHG emitters to report their emissions annually. The European Union has included GHGs in its European Integrated Pollution Prevention and Control Directive and the European Pollutant Emission Register. A corporate GHG inventory provides the information necessary for companies to report information at the facility level and to comply with these directives and future national or local regulations.

- **Trade in GHG markets.** Greenhouse gas emissions trading markets are being designed and are emerging in the United States and abroad. Examples include the Chicago Climate Exchange®, the U.K. Emissions Trading Scheme, and the European Union emissions trading program (the latter becoming effective in 2005). Corporations such as DuPont have already participated in some of these markets, capturing economic benefits from GHG mitigation activities by selling emissions reductions. *(See Box 2.)* In order for companies to partici-

pate in these and future emissions markets, they must first establish an accurate inventory of their greenhouse gas emissions and emissions reductions.

- **Provide recognition for early voluntary action.** A credible inventory may help ensure that a corporation's early, voluntary emissions reductions are recognized in future regulatory programs. To illustrate, suppose that in 1995 a company started reducing its GHG emissions by shifting its on-site powerhouse boiler fuel from coal to landfill gas. If a mandatory GHG emissions reduction scheme is later established in 2005 and it sets 2000 as the base against which reductions are to be measured, the scheme might not allow the emissions reductions achieved by the green power project prior to 2000 to count toward its targets. However, if a company's voluntary emissions reductions have been inventoried and registered, they are more likely to be recognized and taken into account when regulations requiring reductions go into effect. For instance, the state of California has stated that it will use its best efforts to ensure that organizations that register certified emission results with the California Climate Action Registry (CCAR) receive appropriate consideration under any future international, federal or state regulatory scheme relating to greenhouse gas emissions.

Box 2 DuPont Participation in Emissions Markets

The global manufacturing company DuPont has established several energy and climate targets:

- Reduce absolute greenhouse gas emissions 65 percent from 1990 levels by 2010.
- Hold energy consumption flat on an absolute basis from 1990–2010.
- Obtain 10 percent of total energy needs from renewable energy sources by 2010.

To help reach these targets in a cost-effective manner, DuPont participates in several greenhouse gas emissions trading markets including the Chicago Climate Exchange® and the U.K. Emissions Trading Scheme. Participation in these markets enables the company to meet several business goals, including the following:

- ***Capture financial value from the company's GHG emissions reductions.*** Emissions markets have helped DuPont "monetize" and receive a cash flow from the environmental benefits of its GHG reductions. For instance, through several activities DuPont reduced its N_2O emissions from adipic acid manufacturing facilities in the United Kingdom. These initiatives enabled the company to sell 10,000 metric tons of vintage 2002 GHG emissions allowances to the energy trading and marketing firm MIECO, Inc. This sale helped defray the costs of the N_2O emissions reduction investment and will encourage additional measures to reduce GHG emissions.
- ***Clarify the value of investing in sustainable business practices such as procuring green power.*** By placing a value on GHG emissions, markets signal to corporate managers the costs and future business risks of unmitigated GHG emissions. Consequently, they signal the value of avoided emissions and therefore help managers understand the financial value of investing in green power.
- ***Provide a competitive advantage.*** Participating in emissions markets positions DuPont with tools, information, and strategies to "get ahead of the curve" and obtain a competitive advantage as emissions markets develop.

Inventories of both corporate-wide emissions and of project-based emissions reductions are critical tools that enable DuPont to participate in emissions markets and thereby realize these business goals. For instance, in order for a company to be eligible to sell excess emissions allowances in the U.K. Emissions Trading Scheme, the U.K. government requires the firm to develop an organizational-based GHG inventory for its U.K. operations.

III. HOW TO DEVELOP A GREENHOUSE GAS EMISSIONS INVENTORY[5]

A strong business case exists for corporations interested in pursuing green power to develop and maintain a GHG inventory. Since a company usually wants to achieve more than one of the goals outlined above, it is prudent to develop an inventory that can provide information to serve all of these potential uses. Developing such a robust corporate GHG emissions inventory involves a seven-step process:

1. **Adopt and apply GHG accounting principles.** Just as credible financial information is underpinned by accounting principles, a credible GHG inventory will be based on similar guiding prin-

Box 3 GHG Accounting Guiding Principles

Relevance: Define boundaries that appropriately reflect the GHG emissions of your business and the decision-making needs of inventory users.

Completeness: Account for all emissions sources and activities within your chosen organizational and operational boundaries. Justify specific exclusions.

Consistency: Allow for meaningful comparison of emissions performance over time. Clearly state any changes to the basis of reporting to enable continued valid comparison.

Transparency: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any important assumptions and cite the calculation methodologies used.

Accuracy: Strive for precise GHG calculations and seek to provide reasonable assurance of the integrity of reported GHG information.

ciples. From the outset, a company developing a GHG emissions inventory should ensure that its accounting and reporting is relevant, complete, consistent, accurate, and transparent. (*See Box 3.*)

2. **Define the organizational boundaries of the inventory.** Defining organizational boundaries involves deciding how to account for GHGs produced by incorporated and non-incorporated entities in which the company holds an equity share. The choice of consolidation approach determines how the company accounts and reports for GHG emissions produced by entities in which it holds an economic interest and how it aggregates GHG data at a group level. In principle, two distinct approaches can be used to consolidate GHG data at a group level: *equity share* and *control*. For the equity share approach, the consolidation of GHG data should be analogous to the consolidation of financial data at a group level and follows similar principles. Under the control approach, a parent company reports 100 percent of the GHG emissions from incorporated and non-incorporated entities over which it has control, but takes no ownership of GHG emissions produced by entities in which it holds an equity share but over which it has no control.

   Governments usually require reporting on the basis of control either through a facility level-based system or through the consolidation of data within certain operational or geographical boundaries. For assessing risk, GHG reporting on the basis of the equity share approach provides a more complete picture. Given that most companies have several goals for GHG accounting, the GHG Protocol recommends that companies use both the equity share and control approach when compiling and reporting a corporate GHG inventory.

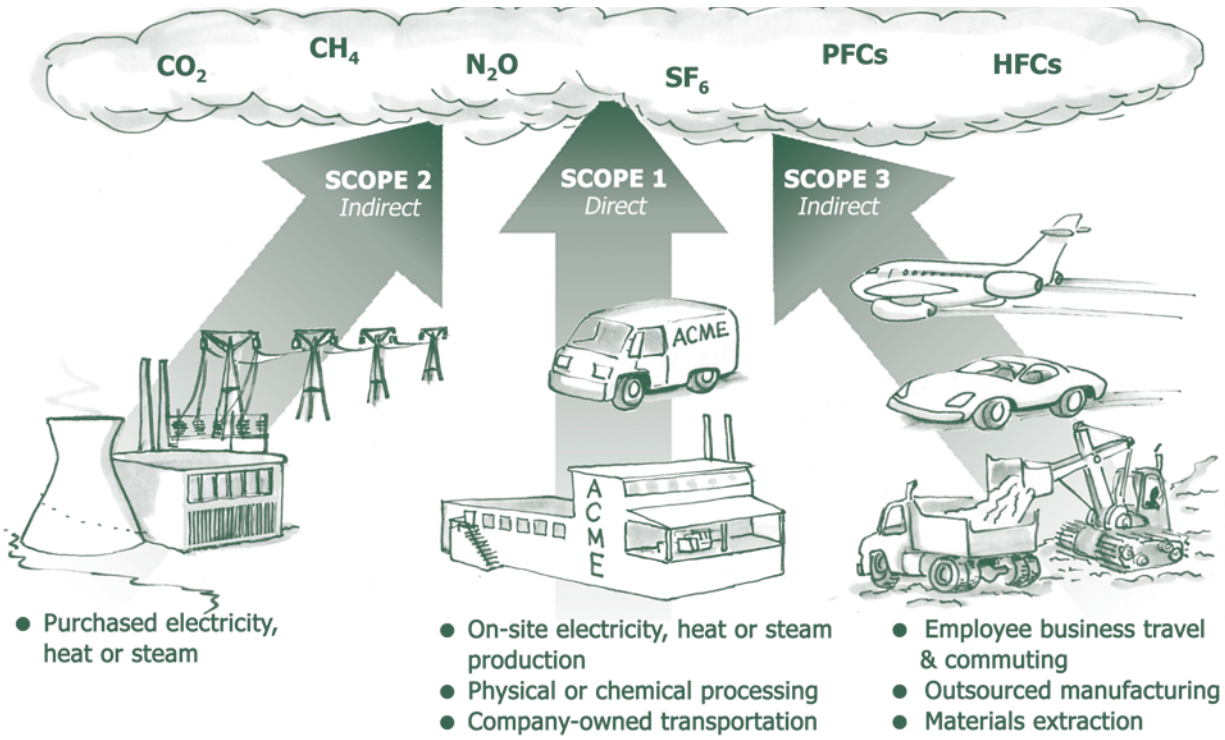
3. **Define the operational boundaries of the inventory.** Setting the operational boundary involves deciding on which up- and downstream emissions-generating activities to include in an inventory. The emissions in a corporate inventory can be classified as either "direct" or "indirect" emissions. *Direct GHG emissions* are those from sources that are owned or controlled by the reporting company. Also known as "Scope 1 emissions" in GHG Protocol Initiative terminology, these direct emissions usually include the following:

   - on-site production of electricity, heat, or steam;
   - physical or chemical processing (e.g., cement, ammonia manufacturing);
   - transportation of materials, products, wastes, and employees in company-owned or company-controlled vehicles; and
   - fugitive emissions such as the intentional or unintentional release of GHGs from seals, coal mines, and air conditioning equipment.

   On-site renewable energy sources such as direct use of landfill gas for industrial heat and steam applications can help reduce a company's Scope 1 emissions.

   Indirect GHG emissions are those that are a consequence of the reporting company's activities but that occur from sources owned or controlled by another entity.

Figure 1 **The Three Scopes of GHG Emissions**



Indirect emissions can be categorized as either "Scope 2" or "Scope 3." Scope 2 specifically accounts for indirect emissions associated with the generation of purchased electricity (from the grid), heat, or steam. These GHG emissions arise, for example, from the combustion of coal, oil, or natural gas at a central power station.[6] Purchasing green power from a utility can reduce a company's Scope 2 emissions.

Scope 3 accounts for all other indirect emissions, such as employee travel on scheduled flights, employee commuting, and contract manufacturing. (*See Figure 1.*) At a minimum, the GHG Protocol recommends including emissions from sources owned or controlled by the reporting organization (Scope 1), as well as emissions from purchased electricity, heat, or steam (Scope 2). Scope 3 emissions are left to the company's discretion to report. It is strongly advised in the GHG Protocol that an organization assess its material sources of GHG emissions and report Scope 3 if those emissions are a significant part of its inventory.

4. **Gather relevant data and calculate GHG emissions.** Once a company has decided which GHG sources to include in its organizational and operational boundaries, it will need to collect the data required for calculating emissions. Emissions data should be collected for each GHG separately. Distinguishing between gases is important because they differ in terms of global warming potential. For example, one metric ton of methane has the same global warming potential as 23 metric tons of carbon dioxide.[7] For this reason, capping landfills to collect the gas and then burning the gas (which is approximately 55 percent methane) to produce energy for corporate use can be a strategy that significantly benefits the environment.[8]

The most common GHGs measured are the Kyoto Protocol's basket of six gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6),

hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). Emissions of each gas can be aggregated into metric tons of CO_2 equivalent (CO_2e). Data also should be gathered for any GHG emissions reductions that the company generates in order to sell or to bank (i.e., save for future use).

Corporate GHG emissions are calculated using a bottom-up approach. Emissions from individual sources are calculated and then aggregated first to the facility level and then to the corporate level. This enables companies to group and analyze GHG emissions information on different scales (e.g., facility, business unit, country). Reductions can then be measured by comparing absolute changes in emissions over time for the chosen scale.

The most common calculation methodology involves using emissions factors (i.e., amount of gases released per unit of fuel). Source-specific emissions factors are well-documented quantities that relate GHG emissions (e.g., pounds of CO_2e) to some characteristic of the emissions source (e.g., per metric ton of coal). GHG emissions are calculated by multiplying the emissions factor by the appropriate activity data (e.g., metric tons of coal combusted, kilowatt hours of electricity used).

Relevant activity data can be gathered from sources such as company electricity bills, fuel bills, and vehicle log books. For instance, calculating Scope 2 emissions is quite simple in the United States, given that emissions factors of the electricity purchased from utilities are publicly available (e.g., either directly from the utility or through the EPA's E-GRID database[9]), and given that most companies have records of their purchased electricity. Once calculated, emissions from each source and facility can be rolled up to obtain an overall corporate inventory.

The benefits of green power are reflected in inventories due to the fact that most renewable resources (e.g., solar, wind, geothermal) have GHG emissions factors of "zero." Table 2 illustrates through several scenarios the corporate accounting for GHG emissions reductions enabled by using green power.

5. **Track performance over time.** Inventories should be conducted on a periodic basis (e.g., annually). This will allow managers to quantify the impact of emissions management activities they implement such as shifting from fossil fuels to renewable energy sources.

   Some companies may decide to establish GHG emissions reductions targets. To enable managers to meaningfully measure progress toward these targets, companies will need to select an emissions base year (an historic reference point). The base year should be one for which sufficient, verifiable corporate emissions data can be gathered. Some programs—such as the Chicago Climate Exchange® and the U.K. Emissions Trading Scheme—stipulate an average of selected years as the base period that participants must use. Therefore, it is important for companies intending to participate in voluntary GHG reductions programs or in GHG emissions trading systems to check with the relevant scheme to determine which rules apply for selecting base year emissions.

6. **Report.** Once completed, a GHG inventory can be published and shared with a variety of corporate stakeholders including employees, customers, shareholders, or the wider public. *(See section II above.)* Reports should include the best available data as well as references to all supporting information. Limitations and uncertainties should be clearly articulated. In addition, an inventory should report any GHG emissions reduction credits that the company has purchased or sold.

7. **Independently verify.** An additional step a company can take is to have the inventory verified by an external third party. During verification, an accredited party may evaluate the underlying assumptions and accounting principles used in establishing and updating the entity's greenhouse gas emissions tracking system. In addition, the verification process may assess the completeness and accuracy of emissions and emissions reduc-

tion information, ensuring that the data are adequately documented and readily traceable to the sources. Verification can add credibility to inventories and improve inventory quality, thereby increasing both internal corporate and external stakeholder confidence in the information. Third-party verification may be required if the inventory is to be submitted to an emissions registry, an official record of corporate GHG emissions. The California Climate Action Registry, for example, requires independent verification. Finally, third-party verification is nearly always required if a company plans to participate in GHG emissions trading schemes.

IV. Designing GHG Inventories to Support Corporate Procurement of Green Power

As discussed in section II, a GHG emissions inventory is a valuable management tool. However, several design features are necessary to ensure that an inventory fully captures the GHG benefits of green power procurement and to ensure that a company is recognized for its use of green power. In particular, inventories must:

- include both direct emissions from sources it owns or controls and indirect emissions from the use of purchased electricity, and
- be based on common international GHG accounting standards such as the GHG Protocol Initiative.

1. Include Both Direct Emissions and Indirect Emissions

In order to track the emissions reduction benefits of using on-site renewables (e.g., solar photovoltaic systems) or of buying green power from a utility, a company will need to measure and record (at a minimum) both its direct emissions and the indirect emissions from purchased electricity.

Direct GHG Emissions

Direct GHG emissions (Scope 1) are those from sources that are owned or controlled by the reporting company. Tracking Scope 1 emissions enables companies to record the GHG reductions that result from such activities as substituting renewable fuel sources for fossil fuels in company-owned, on-site energy generation systems. For instance, by replacing natural gas with landfill gas as the fuel for a powerhouse boiler at one of its assembly plants, General Motors reduced the facility's Scope 1 CO_2 emissions by more than 33,000 metric tons per year.[10]

Indirect GHG Emissions from the Use of Purchased Electricity

Emissions from purchased electricity (Scope 2) are also very important to quantify and track because for many companies purchased electricity represents a major source of GHG emissions. In fact, 59 percent of CO_2 emissions from the U.S. commercial and industrial sectors in 2000 came from their use of grid-based electricity generation.[11] Consequently, purchased electricity represents a significant reduction opportunity.

For corporate energy managers, green power can play an important role in reducing Scope 2 emissions.[12] Switching to green power reduces the GHG-intensity of the electricity the company uses. For instance, an IBM facility in Austin, Texas, recently reduced its Scope 2 CO_2 emissions by an estimated 2,300 metric tons per year by switching some of its electric load from natural gas-fired power to wind-generated electricity through a utility's green power program.

Given the impact that effective management of Scope 2 emissions can have on corporate greenhouse gas emissions, policymakers and corporate managers alike should support the inclusion of Scope 2 emissions in GHG inventories and registries. Including Scope 2 emissions sets the foundation for policy frameworks (e.g., emissions markets) to create positive incentives for corporate use of "imported" (purchased from off-site sources) power, heat, or steam generated from renewable sources.

In the absence of an accurate record of its Scope 2 emissions, a company might not be able to realize economic benefits (e.g., from an emissions market) for the emissions reductions caused (and funded) by its deliberate choice of green power. Similarly, if an internal corporate emissions reduction initiative or an emissions trading market did not

Table 2 **Corporate Accounting of GHG Emissions Reductions Enabled by Switching to Renewable Energy**

↓ reduction ↑ increase

	Corporate end-user switches …		GHG emissions impact			
	from	to	Scope 1[a]	Scope 2[b]	Description	Comment
Scenario 1	Coal-fired power from the grid	Wind-generated power from the grid	—	↓↓	Scope 2 emissions decline according to formula: (MWh coal-fired power/year X metric tons of CO_2e/MWh coal-fired power) - zero (wind power has GHG emissions factor of zero)	For an estimate of avoided emissions, one can use emissions factors for the specific utility from which power is purchased. This information can be obtained directly from the utility or from the EPA's E-GRID database.
Scenario 2	Coal-fired power from the grid	On-site solar PV power	—	↓↓	Scope 2 emissions from coal-fired power decline by amount of displaced coal-fired power (MWh coal-fired power/year X metric tons of CO_2e/MWh coal-fired power). Scope 1 emissions do not change since solar power has GHG emissions factor of zero.	
Scenario 3	Coal-fired power from the grid	On-site biomass-fired power	—	↓↓	Scope 2 emissions from coal-fired power decline by amount of displaced coal-fired power (MWh coal-fired power/year X metric tons of CO_2e/MWh coal-fired power). Scope 1 emissions do not change since biomass has net GHG emissions factor of zero.[c]	CO_2 emissions from biomass fuels typically are considered on a lifecycle basis (i.e., vegetation assumed to regrow and sequester the CO_2 released during combustion). Thus, combusted biomass has net zero CO_2 emissions.[c] Report the gross GHG emissions (i.e., the CO_2 emissions from the on-site combustion of the biomass) in "supplementary information."
Scenario 4	On-site oil-generated power	On-site solar photovoltaic power	↓↓	—	Scope 1 emissions decline according to formula: (MWh oil-generated power/year X metric tons of CO_2e/MWh oil-generated power) - zero (solar power has GHG emissions factor of zero).	
Scenario 5	On-site natural gas-fired boiler for heat & steam	On-site, direct use of landfill gas (LFG) in boiler for heat & steam (NSPS site where alternative is flaring of LFG at landfill)	↓↓	—	Scope 1 emissions decline according to formula: (million cubic feet of natural gas consumed/year X metric tons of CO_2e/million cubic feet of natural gas) - zero (combusted LFG has net GHG emissions factor of zero).[d]	Emissions reduction reflects avoided emissions from natural gas combustion at company facility. GHG emissions from LFG typically are considered on a lifecycle basis (i.e., assumes organic materials that are source of LFG regrow). Thus, combusted LFG has zero net GHG emissions.[d] Report the gross GHG emissions (i.e., the CO_2 emissions from the on-site combustion of LFG) in "supplementary information."

Table 2 continued

↓ reduction ↑ increase

	Corporate end-user switches …		GHG emissions impact			
	from	**to**	**Scope 1[a]**	**Scope 2[b]**	**Description**	**Comment**
Scenario 6	Coal-fired power from the grid	On-site, cogeneration of power and heat from landfill gas (lfg)	—	↓↓	Scope 2 emissions from coal-fired power decline by amount of displaced coal-fired power (MWh coal-fired power/year X metric tons of CO_2e/MWh coal-fired power). Scope 1 emissions do not change since landfill gas has net GHG emissions factor of zero.[d]	GHG emissions from LFG typically are considered on a lifecycle basis (i.e., assumes organic materials that are source of LFG regrow). Thus, combusted lfg has zero net GHG emissions.[d] Report the gross GHG emissions (i.e., the CO_2 emissions from the on-site combustion of lfg) in "supplementary information."
Scenario 7	Coal-fired power from the grid	Continued use of coal-fired power from the grid + purchase of renewable energy certificates (green tags)	—	—	No change in emissions in either scope. Company still buying coal-fired power from grid.	Currently, the Greenhouse Gas Protocol recommends reporting the environmental attributes (e.g., avoided emissions) of green tags as an external GHG reduction project (project purchased by reporting company). Tags do not reflect an actual change in the reporting company's Scope 2 emissions. Role green tags can play in emissions markets to be determined by policymakers. Currently, green tag providers calculate avoided emissions according to different methodologies (e.g., relative to state average grid emissions factors, relative to marginal generation emissions factors). The GHG Protocol is developing guidance that will inform these methodologies.

Notes:

a. Direct GHG emissions.
b. Indirect GHG emissions from purchased electricity.
c. According to the Intergovernmental Panel on Climate Change (IPCC) *Greenhouse Gas Inventory Reference Manual*, Volume 3 (1995), emissions from combusting biomass-derived fuels (e.g., wood, energy crops) to generate energy should not be included in CO_2 emissions calculations. If biomass is being regrown at roughly the same rate as it is being harvested on an annual basis, the net flux of CO_2 to the atmosphere is zero. Nevertheless, rules regarding emissions of landfill gas and biomass may vary by emissions registry program. Please consult each program's rules.
d. According to the IPCC *Greenhouse Gas Inventory Reference Manual*, Volume 3 (1995), methanogenic bacteria in landfills break down organic matter in the waste to produce methane. Landfills also produce substantial amounts of CO_2. The "CO_2 is primarily from decomposition of organic material derived from biomass sources (e.g., crops, forests) which are regrown on an annual basis. Hence, these CO_2 emissions are not treated as net emissions from waste in the IPCC methodology."

Table 3	Possible Lack of Incentives to Corporations if Scope 2 Emissions are not Reported					
	If corporate end-user were to switch …		…then actual impact on GHG emissions would …		Will switching reduce net GHG emissions?	Is there an incentive to switch if Scope 2 emissions are neither reported nor rewarded in emissions programs?
	from	to	Scope 1	Scope 2		
Scenario 1	Coal-fired power from the grid	Wind-generated power from the grid	—	↓↓	Yes	No incentive to switch since no change in end-user Scope 1 emissions
Scenario 2	Coal-fired power from the grid	On-site solar photovoltaic power	—	↓↓	Yes	No incentive to switch since no change in end-user Scope 1 emissions
Scenario 3	Coal-fired power from the grid	On-site natural gas-fired fuel cell system	↑	↓↓	Yes	No incentive to switch since Scope 1 emissions increase (despite net decrease in GHG emissions)

recognize Scope 2 emissions, corporate energy buyers would have less incentive to buy green power. *(See Table 3.)*

A related issue concerns which entity should account and report for the emissions reduction caused by a company switching from fossil-fired power to green power. GHG inventories will not have maximum ability to support the development of green power markets if a corporate energy buyer cannot claim the emissions reduction at the power plant that results from the company's choice of (and payment for) green power. To ensure that a corporation's procurement of green power yields an environmental benefit that the company can claim as its own, the emissions reduction should be assigned to the energy buyer. This can be achieved through the contract between the energy supplier (e.g., utility) and the corporate energy buyer. The contract should articulate which entity owns the emissions reductions associated with the underlying green power generation, regardless of future regulatory frameworks.

If these emissions reductions are not clearly assigned, then energy generators may claim reductions achieved through corporate procurement of green power. If emissions are not regulated, this may not be a major corporate concern. However, for companies who want to legally claim the emissions reductions or credits in expectation of future regulations or markets, the ownership of the environmental attributes of green power is very important.

Will This Lead to "Double Counting?"

One concern that is sometimes raised with regard to including indirect emissions in a corporate GHG inventory is that it could lead to double counting of emissions or emissions reductions. This is because indirect emissions, such as the Scope 2 emissions recorded by a corporate buyer of imported electricity, are another entity's direct emissions (in this case the central power station that supplied the electricity). The degree to which double counting *occurs* depends on the consistency with which direct and indirect emissions are reported. However, the degree to which double counting *matters* depends on how the information in the inventory is used. For corporate purposes such as GHG risk management, internal corporate emissions reduction programs, and public reporting, double counting typically is not a material issue. However, for credible GHG emissions trading markets, double counting must be avoided. Two market participants should not be able to claim ownership of the same emissions reduction. Ideally, the entity making the investment in the emissions reduction should have a claim to it, irrespective of whether or not it is a direct or indirect emission for the company.

As discussed above, contracts are one provision for addressing this issue. For example, in the case of purchased electricity generated by renewable sources, contracts between the corporate buyer and the green power supplier could articulate which entity owns the emissions reductions associated with the purchased electricity. Similarly, governments or regulatory authorities could develop policies to clarify the trading rights of GHG emissions reductions. The U.K. Emissions Trading Scheme assigns responsibility to energy end-users for Scope 2 emissions and thus for any resulting reductions enabled by green power, energy efficiency, and energy conservation.

2. Establish Common Accounting Standards

To be of maximum value to corporations, GHG emissions inventories must be based on common, international accounting and reporting standards. This is true for several reasons. First, common standards provide the internal and external accounting consistency and credibility needed for climate initiatives such as internal emissions reductions programs, public reporting, and emissions trading. Second, common standards simplify the measurement and reporting process, thereby minimizing the time and cost of developing an inventory. This benefit is particularly valuable to companies with facilities and operations across multiple states and/or countries. *(See Box 4.)* If states and/or countries develop different GHG accounting standards and reporting requirements, then creating and maintaining an inventory will become a very complex, cumbersome, and expensive activity for large, geographically dispersed companies. Third, common standards between countries will facilitate the emergence of climate initiatives such as international emissions trading and internal GHG emissions reduction initiatives of multinational corporations.

Recognizing the value of a common accounting standard, WRI and the World Business Council for Sustainable Development (WBCSD) jointly convened the GHG Protocol Initiative in 1998 to develop and promote internationally accepted corporate GHG accounting and reporting standards. *(See Box 5.)*

Box 4

Interface's Experience with Developing its GHG Inventory

Interface is a global manufacturer of modular and broadloom carpets and of panel and upholstery fabrics for the commercial and institutional interiors markets.

In 2001, Interface decided to develop its own greenhouse gas inventory in order to accomplish several corporate goals. First, an inventory could enable the company to identify emissions reduction opportunities, many of which could mean significant savings to the bottom line. Second, in light of evolving climate change policies, Interface wanted to ensure that it would be in a position to receive credit for its early actions to reduce GHG emissions. Third, an inventory would enable the company to fulfill its commitment to stakeholders for increased transparency regarding its business impact on the environment.

When Interface started the process of developing its GHG inventory in 2001, the company was already tracking its energy consumption. However, it had not yet begun to measure or calculate corporate GHG emissions. Interface immediately started looking into the requirements for developing a GHG inventory. To its dismay, the company found plenty of conflicting emissions information and more than a few methodologies for developing an inventory. In 2002, the company joined the EPA's Climate Leaders Program and started using a methodology that was consistent with the internationally recognized GHG Protocol Initiative. It was vitally important to the company that the Protocol was developed as an international standard. With 23 manufacturing plants on four continents and 75 sales locations in more than 30 countries, the company wanted to use the same accounting practice for all facilities, not only to save time and money but also to ensure consistency.

As of late 2002, Interface had completed its first emissions inventory covering both Scope 1 emissions (direct emissions from on-site combustion) and Scope 2 emissions (from purchased electricity). The company believes that tracking Scope 2 emissions is vitally important because it will enable them to recognize and account for reductions due to practices such as choosing green power.

Interface is now engaged in identifying and measuring its Scope 3 emissions, which will include inbound and outbound transportation, business travel, and other indirect emissions.

Box 5

The Greenhouse Gas Protocol Initiative: Developing International Accounting and Reporting Standards

In 1998, WRI and the WBCSD jointly convened the Greenhouse Gas Protocol Initiative in order to develop "generally accepted accounting and reporting practices" for corporate GHG emissions, analogous to practices established for corporate financial performance. In 2001, the initiative released the first edition of its accounting and reporting standards, the Greenhouse Gas Protocol. The Protocol was developed through an open and inclusive multi-stakeholder process involving more than 350 businesses, NGOs, governments, and intergovernmental organizations. It was "road-tested" by more than 30 companies in 10 countries, has been subject to extensive peer reviews, and continues to be revised using feedback from its application. The Protocol outlines the GHG accounting and reporting principles and also provides practical guidance to corporate managers for tasks such as:

- setting organizational and operational boundaries,
- setting an historic performance datum,
- identifying and calculating GHG emissions,
- accounting for GHG reductions,
- managing inventory quality, and
- reporting and verifying GHG emissions.

An emissions inventory developed according to the GHG Protocol should enable a company to meet nearly all potential accounting and reporting requirements and objectives. The Protocol has been designed to provide GHG information building blocks that can be used as the foundation for supporting a variety of information requirements, including those resulting from market-based regulatory systems. Consequently, use of the Protocol is gaining momentum. Numerous government, NGO, and industry-led climate initiatives are based on or informed by the Protocol (*see Table 4*), and many businesses have used the Protocol to develop their emissions inventories (*see Table 5*). The GHG Protocol is also in the process of developing standards governing the accounting of GHG projects. For more information, visit http://www.ghgprotocol.org.

Table 4

Climate Initiatives Based on or Informed by the Greenhouse Gas Protocol

Industry Initiatives
- International Forum of Forest & Paper Associations
- WBCSD Sustainable Cement Initiative
- International Aluminum Institute
- Carbon Disclosure Initiative

Reporting Programs
- Global Reporting Initiative
- French REGES Protocol
- California Climate Action Registry
- Wisconsin GHG Registry
- WEF GHG Registry (proposed)

GHG Reduction Initiatives
- EPA Climate Leaders
- World Wildlife Fund Climate Savers
- Respect Europe (BLICC)
- New Zealand BCSD

Trading Programs
- Chicago Climate Exchange®
- U.K. Emissions Trading Scheme

Other
- USAID GHG Pollution Prevention
- EBRD

Table 5

Some of the Businesses Using the Greenhouse Gas Protocol

- Alcan Aluminum, U.S.A.
- Alcoa, U.S.A.
- AES, U.S.A.
- AstraZeneca, U.K.
- Bethlehem Steel, U.S.A.
- Birka Energi, Sweden
- The Body Shop, U.K.
- BP Oil New Zealand Ltd.
- BP, U.S.A.
- Cinergy, U.S.A.
- Eastman Kodak, U.S.A.
- CODELCO, Chile
- Edison Mission Energy, U.S.A.
- Ford, U.S.A.
- ENDESA, Spain
- Green Mountain Energy, U.S.A.
- Holcim, U.S.A.
- Hubbard Foods Ltd, New Zealand
- IBM, U.S.A.
- IKEA International, Sweden
- Interface, U.S.A.
- International Paper, U.S.A.
- Johnson & Johnson, U.S.A.
- Kansai Electric Power, Japan
- Landcare Research, New Zealand
- Lockheed Martin, U.S.A.
- Meridian Energy Ltd, New Zealand
- Milburn New Zealand Ltd.
- Miller Brewing Co., U.S.A.
- Mirant, U.S.A.
- National Renewable Energy Laboratory, U.S.A.
- Nike, U.S.A.
- Norm Thompson Outfitters, U.S.A.
- Norsk Hydro, Norway
- N.V. Nuon Energy, Netherlands
- Philips & Yaming, China
- PSEG, U.S.A.
- PWC, New Zealand
- S.C. Johnson & Son, U.S.A.
- Seattle City Light, U.S.A.
- Simplex Paper & Pulp, India
- Sony Electronics, Japan
- STMicroelectronics, Switzerland
- Suncor, U.S.A.
- Tata Steel, India
- Tokyo Gas, Japan
- Urgent Courriers, New Zealand
- Volkswagen, Germany
- We Energies, U.S.A.
- 500 PPM GmbH, Germany

V. USING CORPORATE GHG INVENTORIES IN CLIMATE INITIATIVES

Corporations that develop a GHG inventory can participate in a variety of climate initiatives including voluntary reduction programs, emissions registries, and GHG markets. Many of these initiatives recognize emissions reductions enabled by using green power.

Voluntary Reporting and Reduction Initiatives

By having a GHG inventory, companies can participate in a number of existing voluntary emissions reporting and reduction initiatives. For example, companies can join the GHG emissions reduction programs of NGOs, including WWF's Climate Savers Program, the Climate Neutral Network, and Environmental Defense's Partnership for Climate Action. Inventories also open the door for participation in voluntary government GHG programs. Examples at the national government level include the EPA's Climate Leaders Initiative and Australia's Greenhouse Challenge Program.

Greenhouse Gas Emissions Registries

Once a company has measured and recorded its GHG emissions, it can submit the inventory to an official registry. Given uncertainties concerning what shape GHG emissions policies will take in the future, corporate investments in green power can be at risk of not being recognized unless the reductions are recorded in a registry. Several registry programs have already been developed including the U.S. Department of Energy's 1605b Voluntary Greenhouse Gas Reporting Program and the Canada Climate Change Voluntary Challenge and Registry. In addition, states in the U.S. increasingly are introducing registries to which companies can voluntarily submit their GHG inventories. For instance, California has its CCAR and New Hampshire has its Voluntary GHG Reductions Registry.[13] Wisconsin's Voluntary Emissions Reduction Registry is expected to be operational in early 2003.[14]

Greenhouse Gas Emissions Markets

Emissions reductions recorded in an inventory could be eligible for trading in GHG emissions markets.[15] Several such markets are beginning to emerge. A major impetus has been government and corporate expectations of a carbon-constrained world as a result of the Kyoto Protocol, which establishes a series of national GHG reduction targets and allows for national and international GHG emissions trading schemes. Despite the lack of U.S. participation in the Protocol, the international agreement appears likely to come into force with Russia signaling its intent to ratify.[16] In preparation, several European markets have been established such as the mandatory Danish CO_2 emissions trading program and the U.K. Emissions Trading Scheme. An E.U. Emissions Trading Scheme will become effective in 2005. Multinational corporations, in particular, are likely to have operations in countries that will have GHG emissions markets in the future. In the United States, GHG markets are being developed at the subnational level, such as the Chicago Climate Exchange®.

Corporations can participate in these and other early GHG emissions markets. Some firms such as BP[17] and Shell developed and piloted their own company-wide internal emissions trading programs as a means of encouraging cost-effective, corporate-wide GHG emissions reductions. Other companies are taking early action and are participating in intercompany markets, thereby gaining valuable experience and placing themselves in a position to gain a competitive advantage when future GHG markets emerge. DuPont, for instance, participates in the Chicago Climate Exchange® and the U.K. Emissions Trading Scheme.

Table 6 outlines several of these existing and emerging climate initiatives. As the table indicates, multiple opportunities exist for corporations to utilize their GHG inventories and to have their use of green power recognized. For example, WWF's Climate Savers Program and the EPA's Climate Leaders Initiative recognize emissions reductions enabled through on-site use of renewable energy sources and through procurement of green power. Likewise, some (but not all) emerging GHG emissions markets will create incentives for companies to purchase green power.

Table 6 **Overview of Selected Climate Initiatives**

Type of initiative	Example	Participating sectors	Gases covered	Operational boundaries	Opportunity for green power to participate	For more information
Voluntary reporting & reduction	WWF Climate Savers Program	All eligible	Energy-related CO_2, others on negotiated basis	Scopes 1 & 2 required, Scope 3 optional	Recognizes Scope 1 emissions reductions through on-site renewables and recognizes Scope 2 emissions reductions through imported green power.	www.worldwildlife.org/climate/climate.cfm?sectionid=189&newspaperid=16
	EPA Climate Leaders Initiative	All U.S. firms eligible	Six Kyoto gases	Scopes 1 & 2 required, Scope 3 optional	Recognizes Scope 1 emissions reductions through on-site renewables and recognizes Scope 2 emissions reductions through imported green power.	www.epa.gov/climateleaders/
Emissions registry	DOE 1605b Voluntary GHG Reporting Program	All U.S. firms eligible	Six Kyoto gases and ozone precursors	Flexible (Scopes 1, 2, or 3)	Recognizes Scope 1 emissions reductions through on-site renewables and recognizes Scope 2 emissions reductions through imported green power.	www.eia.doe.gov/oiaf/1605/1605b.html
	Canada Climate Change Voluntary Challenge and Registry	All Canadian firms eligible	CO_2 required, other Kyoto gases optional	Flexible (Scopes 1, 2, or 3)	Recognizes Scope 1 emissions reductions through on-site renewables and recognizes Scope 2 emissions reductions through imported green power.	www.vcr-mvr.ca
	California Climate Action Registry	All firms with operations in California eligible	Six Kyoto gases	Scopes 1 & 2 required, Scope 3 to be determined	Recognizes Scope 1 emissions reductions through on-site renewables and recognizes Scope 2 emissions reductions through imported green power.	www.climateregistry.org
Emissions market (cap & trade)	Danish CO_2 Emissions Trading Program	Danish utility electric generators	CO_2	Scope 1		www.mst.dk/
	E.U. Emissions Trading Scheme (to become effective in 2005)	Selected industries[a] in the E.U.	CO_2 initially	Scope 1	Scope 1 emissions reductions through on-site renewable energy generation eligible.	europa.eu.int/comm./environment/docum/0087_en.htm
Emissions market (cap & trade with credits)	U.K. Emissions Trading Scheme	Industrial energy users operating in the U.K.	Six Kyoto gases	Energy-related Scope 1 & 2	Scope 1 emissions reductions through heat & power from on-site renewables eligible. Scope 2 emissions reductions through imported green power (from new sources) eligible.	www.defra.gov.uk/environment/climatechange/trading/
	Chicago Climate Exchange®	Power generation, manufacturing, forest products, agriculture	Six Kyoto gases	Scope 1 & 2	Scope 1 emissions reductions through on-site renewables energy generation eligible. Ability of imported green power to earn tradable credits unclear.	www.chicagoclimatex.com/

Note:

a. Energy sector (including combustion installations larger than 20 MW, mineral oil refineries, and coke ovens), metal ore roasting, pig iron, and steel production facilities, installations for cement clinker, glass and ceramic products, industrial plants for the production of paper, board, and pulp sectors.

In the E.U. Emissions Trading Scheme, a corporation from a participating sector could reduce its GHG emissions through on-site use of renewable energy and thereby possibly enable the company to have extra emissions allowances that it could trade on the market. Moreover, the U.K. Emissions Trading Scheme enables corporate energy users to count indirect emissions reductions due to buying green power.

VI. SUMMARY

A corporate GHG emissions inventory is an important tool for corporate managers using green power as a means of reducing the climate impacts of their businesses. It enables corporate managers to measure, record, and track emissions reductions due to switching to green power. An inventory provides business benefits in that it helps managers identify emissions reduction opportunities and corporate GHG exposure to future regulations. Inventories allow companies to participate in voluntary reduction initiatives and reporting programs and to claim recognition for early voluntary action. In addition, an inventory provides an "accounting foundation" for allowing a corporation to capture the benefits of using renewables in emissions trading markets and other climate protection initiatives. Emissions markets would monetize the beneficial environmental attributes of green power, thereby reducing its cost.

In order for inventories to have maximum ability to support corporate procurement of green power, however, inventories should include both direct emissions and indirect emissions. Policymakers also should ensure that the GHG accounting requirements of corporate-focused climate policy initiatives are based on common international GHG accounting standards such as those developed by the GHG Protocol Initiative. Emissions markets that value the clean power attributes of renewables may help overcome some of the financial barriers currently facing green power in the marketplace. Combined, emissions inventories and climate policy initiatives could help accelerate corporate markets for green power and support the development of a clean, sustainable energy future.

The Green Power Market Development Group

Convened in 2000 by the World Resources Institute and Business for Social Responsibility, the Green Power Market Development Group is a unique commercial and industrial partnership dedicated to building corporate markets for green power. The Group is working to transform energy markets to enable corporate buyers to diversify their energy portfolios with green power and thereby reduce their impact on climate change. The Group seeks to develop 1,000 MW of new, cost-competitive green power—enough energy to power 750,000 homes—by 2010. Group members include Alcoa Inc., Cargill Dow LLC, Delphi Corporation, DuPont, General Motors, Kinko's, IBM, Interface, Johnson & Johnson, and Pitney Bowes.

Working closely together over the last 2 years, WRI and the Group's 10 companies have:

- conducted research on green power technologies, applications, and suppliers;
- mapped renewable resource locations and corporate facility demand;
- reviewed and facilitated green power project negotiations;
- developed innovative analytical tools to build the business case for green power; and
- recommended public policy actions to address barriers to corporate procurement of green power.

More information about the Group and its activities can be found on its website, www.thegreenpowergroup.org. The website also contains publications, background information on various green power technologies, an on-line green power marketplace, and a software tool for calculating emissions reductions enabled by switching from conventional to green power sources.

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NOTES

1. How corporations benefit could differ depending upon the policy framework design. Suppose corporate energy end-users are part of a greenhouse gas emissions trading market and can claim the emissions reductions achieved through switching their purchased electricity from conventional power to renewable power. In this scenario, corporate energy end-users could earn excess emissions allowances or credits that could be traded on the market. Alternatively, suppose that GHG emissions allowances are allocated only further "upstream" to primary energy producers. In this scenario, the increased cost of fossil fuels would send a price signal through the energy procurement chain. Corporations that switch to renewables could have less exposure to the increased prices. In either scenario, a GHG emissions inventory can help a corporation identify and manage its exposure to the impacts of the climate policy.
2. Includes the emissions from purchased electricity for these sectors. U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000*, Final Version, #430-R-02-003, Figure ES-6, 2002.
3. The baseline represents emissions that would have resulted without the intervention of a greenhouse gas reduction project (emissions that would occur under a "business-as-usual" scenario).
4. For examples, see www.shareholderaction.org/news/news020104.cfm.
5. For more detailed guidance on how to develop a corporate GHG emissions inventory, consult *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*, WRI and WBCSD, 2001. The Protocol can be found at www.ghgprotocol.org. In addition, a GHG emissions management guide designed specifically for office-based organizations, *Working 9 to 5 on Climate Change: An Office Guide* is available on-line at www.safeclimate.net.
6. GHG emissions from activities upstream of the reporting entity's electricity provider (e.g., exploration, drilling, flaring, refining, and transportation) are not included under Scope 2 but may be reported under Scope 3 (WRI and WBCSD, *The Greenhouse Gas Protocol*, 2001).
7. For details about the global warming potentials of selected gases, see Intergovernmental Panel on Climate Change, *Climate Change 2001: Synthesis Report*, 2002.
8. For details, see Atcha, S.Y., and Vince T. Van Son, *Corporate Guide to Green Power Markets* (Installment 2): *Opportunities with Landfill Gas*, 2002.
9. Available at http://www.epa.gov/airmarkets/egrid/
10. For more details, see Atcha, S.Y., and Vince T. Van Son, *Corporate Guide to Green Power Markets* (Installment 2): *Opportunities with Landfill Gas*, 2002.
11. U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2000*, Final Version, #430-R-02-003, Table ES-9, 2002.
12. Energy efficiency measures (e.g., installing energy-efficient lighting and equipment) are another important means of reducing Scope 2 emissions.
13. Center for Clean Air Policy, *State and Local Climate Change Policy Actions*, 2002.
14. Rabe, B.G. , *Greenhouse & Statehouse: The Evolving State Government Role in Climate Change*, 2002.
15. Emissions reductions may have to be verified by an independent third party. The eligibility of market participants and types of emissions reductions may vary between markets and will depend on each market's design.
16. Environmental Media Services, *The Kyoto Protocol*, 2002. Available at http://www.ems.org/climate/kyoto_protocol.html.
17. Having achieved its target reductions, BP has now ended its internal trading program.

The World Resources Institute is an environmental think tank that goes beyond research to create practical ways to protect the Earth and improve people's lives. Our mission is to move human society to live in ways that protect Earth's environment for current and future generations.

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