GovEnergy 2007

GovEnergy 2007
New Orleans, Louisiana August 5-8
Building GHG Inventories, Reporting,Trading

Carbon Solutions Group, LLC

GovEnergy
www.govenergy.gov

GHG Buildingprint

- What is a GHG Buildingprint?
- Why is it important?
- How is it calculated?
- How is it reported
- How to monetize reductions

What is a GHG Buildingprint?

Definition:

A carbon buildingprint is the net effect a facility has on the environment with relation to carbon dioxide and CO_2 equivalent Greenhouse Gases (GHGs).

Includes Carbon Dioxide, Methane, Nitrous Oxide, HFCs, PFCs, and SF_6.

Quotable

"Buildings are responsible for 39 percent of CO_2 emissions in the U.S., which directly impacts global climate change - however LEED buildings consume half the energy of conventional buildings”

-Rick Fedrizzi President, CEO, Founder USGBC

Proposed Regulations

Climate Stewardship and Innovation Act

-S. 280, Sen. Lieberman (CT) and McCain (AZ)

Electric Utility Cap-and-Trade Act

-S. 317, Sen. Feinstein (CA) and Carper (DE)

Climate Stewardship Act

-HR 620, Reps. Olver (MA) and Gilchrest (MD)

Clean Air Planning Act

-S. 1177, Sen. Carper (DE)

Clean Power Act

-Sen. Sanders (VT)

Proposed Regulations

All these proposed regulations include a cap on the power sector and an opportunity for the polluters to pay an economic disincentive to a less polluting entity or a voluntary reducer in another sector in the form of an offset purchase.

These would all make the building sector a possible offset supplier to the power sector.

Who is Responsible?

The direct polluter is generally the regulated party and therefore responsible for abatement of emissions under a cap. However, in practice the indirect polluter ends up paying much of the economic disincentive.

So, what is the difference between a direct and indirect emission?

Direct GHG emissions are emissions from sources that are owned or controlled by the reporting entity (ex. A Power Plant).

Indirect GHG emissions are emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity (ex An Office Building).

Who is Responsible?

Emissions are further categorized in scopes when determining a GHG inventory:

- **Scope 1**: All direct GHG emissions.
- **Scope 2**: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
- **Scope 3**: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

Carbon Costs Pass Through

To illustrate this concept we will take a power generator in Germany as an example. Let us say that it is a very warm summer in Germany and this has caused the power generator to burn more coal to sell more electricity to its clients (who use it to cool their homes). Now, lets assume that the German power generator reaches its limit August 31st (its Kyoto Cap). The generator has contracts with its clients to sell them electricity for the rest of the year, but they have used all their pollution rights.

Carbon Cost Pass Through

The generator will now consider its options:

1. **Do nothing** - Pay 100 €/tonne tax at the end of the compliance period
2. **Emissions Trading** - Find an Annex 1 power generator with pollution rights left over and purchase those rights for market prices (currently 23 €/tonne)
3. **CDM/JI** - Find an environmental project that has proven it has reduced carbon dioxide in a Non-Annex 1 country and purchase those rights for market prices (currently 10-15 €/tonne)

Carbon Cost Pass Through

The obvious choice financially would be option 3 in which the generator would buy “carbon credits” from the environmental project in a Non-Annex 1 country. However, because the ease of transaction is much higher for option 2 – most power generators currently pay the accompanying higher marginal cost.

This means that a polluting utility could purchase emissions reductions credits (offsets) from a Green Building in order to comply with its cap on marginal pollution.

Carbon Cost Pass Through

An interesting aside the this discussion is “who really pays for that marginal pollution?”

The answer is in the difference between the utility’s traditional energy spreads and their “Climate Change” adjusted spreads. These spreads are:

Spark Spread, Dark Spread, Spark Green Spread, and the Dark Green Spread. They show the profit margins per MWh given energy type, combustion efficiency, and carbon regulation compliance.

Carbon Cost Pass Through

Spark Spread =

Utility's Revenue Derived from the sale of 1 MWh of electricity

Less (-)

Utility's Cost to Produce 1 MWh of electricity from a natural gas source adjusted for efficiency

Dark Spread =

Utility's Revenue Derived from the sale of 1 MWh of electricity

Less (-)

Utility's Cost to Produce 1 MWh of electricity from a coal source adjusted for efficiency

Carbon Cost Pass Through

Spark Green Spread =

Utility's Revenue Derived from the sale of 1 MWh of electricity

Less (-)

Utility's Cost to Produce 1 MWh of electricity from a natural gas source adjusted for efficiency

Less (-)

The Cost to Comply with carbon regulation (.35kg/MWh)

Carbon Cost Pass Through

Dark Green Spread =

Utility's Revenue Derived from the sale of 1 MWh of electricity

Less (-)

Utility's Cost to Produce 1 MWh of electricity from a coal source adjusted for efficiency

Less (-)

The Cost to Comply with carbon regulation (.90kg/MWh)

Carbon Cost Pass Through

The reason these values are important is that theoretically the difference between the Spark (and Dark) Spread and the Spark Green (and Dark Green) Spreads should be the cost of carbon in the open market.

Basically, the utility's profit margin is cut into by the cost of carbon. However, in practice in most of Europe the Spark (Dark) and Spark Green (Dark Green) Spreads are flat. This means that the cost of carbon is simply reflected in higher revenue (prices) per MWh of electricity sold. Thus, profit margins stay the same as carbon goes up in price.

The moral of the story is that a cap and trade filters through in the form of higher energy prices to the consumer. This is why carbon and Green Building are so intertwined.

GHG Inventory Data

Grid Generated Electricity Use

- Monthly Electric Utility Bills

Mobile Combustion

- Fuel Purchase Records
- Fuel Inventory Records
- Vehicle Miles Traveled
- Inventory of Vehicles (Make/Model)

Stationary Combustion

- Monthly Utility Bills
- Fuel Purchase Records
- CEMs Data (if available)
- Inventory of Stationary Combustion Facilities

GHG Inventory Data

Cogeneration

- Monthly Utility Bills
- Fuel and Efficiency Data from Supplier

Imported Chilled Water/Steam

- Monthly Utility Bills
- Fuel and Efficiency Data from Supplier

District Cooling/Heating/Refrigeration

- Monthly Utility Bills
- Refrigerant Purchase Records
- Fuel and Efficiency Data from Supplier

Optional Emissions Data

- Employee travel records
- Upstream and downstream products to be included
- Outsourced operations

GHG Inventory Emissions

Which GHG's are polluted and what are the emissions factors (GWP)?

Indirect

- Carbon Dioxide (1)
- Methane (21-23)
- Nitrous Oxide (310)

Direct

- Carbon Dioxide (1)
- Methane (21-23)
- Nitrous Oxide (310)
- HFCs (5000-20000)

GHG Buildingprint Example

Electricity Consumption:

100,000 Square Feet
Average Office Space
Median Electrical Intensity of 8 kWh/Sq.Ft/yr*

100,000 Sq.Ft * 10 kWh/Sq.Ft/Yr =
Electricity Consumption of 1,000,000 kWh/yr

*CBECS 2004

GHG Buildingprint Example

Natural Gas Consumption (Heating):

This value will vary in use by region. For instance, heating oil is more likely to be consumed in the Northeast, whereas the prevalence of natural gas in the rest of the country lends to its use more often.

15000 Therms/Year

GHG Buildingprint Example

Emissions result from:

- 1,000,000 kWh of electricity consumption
- 15,000 Therms of natural gas combusted
- Refrigerant use (varies widely)

GHG Buildingprint Example

Electricity Consumption:

1,000,000 kWh must be multiplied times the average grid emission factor which varies by region depending on the overall generation makeup.

The average grid results in an average emissions factor of 1.2lbs/kWh resulting in 1,200,000 lbs CO_2/year or 544 Metric Tonnes.

However, there is also small amounts of methane and nitrous oxide emitted when fossil fuels are combusted for electricity generation.

GHG Buildingprint Example

Natural gas combustion:

15,000 Therms must be multiplied by the IPCC (Intergovernmental Panel on Climate Change) default emission factor for natural gas of 5.28kg CO_2/Therm resulting in 79,200 kg or about 80 Metric Tonnes of CO_2 annually.

GHG Buildingprint Example

			GWP
HFC-23	CHF3	trifluoromethane	11,700
HFC-32	CH2F2	difluoromethane	650
HFC-125	C2HF5	pentafluoroethane	2,800
HFC-134a	C2H2F4	tetrafluoroethane	1,300
FHC-143a	C2H3F3	trifluoroethane	3,800
HFC-152a	C2H4F2	difluoroethane	140
HFC-236fa	C3H2F6	hexafluoropropane	6,300
PFC-116	C2F6	hexafluoroethane (perfluoroethane)	9,200
PFC-14	CF4	tetrafluoromethane (perfluromethane)	6,500

GHG Buildingprint Example

544 metric tonnes from Electricity Usage

80 metric tonnes from Natural Gas Combustion

De minimis emission from Fugitive Sources

---

624 metric tonnes total GHG Buildingprint

GHG Inventory: Next Steps

- Setting a Baseline
- Setting an Objective
- Reporting
- Determining Reduction Opportunities

Setting A Baseline

An GHG Inventory Baseline should be set for a year or range of years where data is most complete in order to best represent the historical emissions profile of the entity or building.

Setting An Objective

A facility GHG objective could be set at a % reduction below 1990 levels to be in line with Kyoto Protocol. Or for a new building a more aggressive target could be set.

World Resources Institute/World Business Council for Sustainable Development: Corporate Accounting and Reporting Standards

GHG Reporting

Other voluntary reporting protocols include:

- US DOE 1605(b)
- California Climate Action Registry
- EPA Climate Leaders
- Chicago Climate Exchange

Carbon Trading - CCX

Chicago Climate Exchange (CCX)

CCX is a voluntary emissions reductions and trading platform, but once an entity has joined it agrees to a legally binding emissions reduction commitment.

Carbon Trading Example on CCX:

Lets use our building from earlier with a total GHG inventory of 624 tonnes per year. CCX participants commit to 6% reductions by 2010.

So, if a building owner implements energy efficiency measures that reduces emissions 20% (125 tonnes) per year by 2010 - it has 100 tonnes left over which it can sell on the open market.

At current CCX market prices ($3.40/tonne) these energy conservation measures would be worth $340/year. It is unlikely that at CCX prices a building could make meaningful long term investments based on carbon finance. However, as we will see international compliance markets offer much higher per tonne revenues.

Carbon Trading- RGGI

Regional Greenhouse Gas Initiative:

RGGI is much more specific in its definition of an offset. The project (at least initially) must be an ECM that displaces direct combustion of a fossil fuel.
So, lets say that we put in a cogeneration plant that reduces our consumption of natural gas by 50% to 7500 therms. This would equate to a savings on 40 metric tonnes per year which could be marketed to a utility in the northeast as unit for their emissions compliance. Initial market estimates put prices around $7.00/metric tonne.

These reductions would be available for up to a ten year period. So, in a compliance market we can see that the monetization of emissions reductions begin to have potential to impact capital investment decisions.

Carbon Trading - Kyoto Protocol

Thus far there has been one Clean Development Mechanism project that has been certified under Kyoto.

ITC Hotel Sonar Bangla Sheraton & Towers at Kolkata, India.

The registration of the project under CDM allowed it to monetize the annual reduction of 2987 mtCO2eq. The non-renewable crediting period allows for reduction credits to be generated for ten years. (Some projects under CDM allow for renewable 7 period crediting periods up to 21 years)

The total carbon financing for this project amounted to:

2987 mtCO2eq * 10 years * 7 Euro/tonne = € 209,090

Carbon Trading - Kyoto Protocol

- The demand side energy efficiency measures adopted under the CDM project activity leads to saving of electrical energy only.
- The technology and the measures includes:
- Installation of various frequency drives;
- Retrofit of existing heat, ventilation and air-conditioning (HVAC) system to reduce unwarranted moisture laded air load in the pre-cooled air unit (PAU) by in stalling "U" shaped heat pipes that improves efficient heat transfer in the PAU pipes and thus reduce chiller load;
- Retrofitting various pumps located at many site within the hotel facility;
- Enhancement of the treatment efficiency of the sewage treatment unit that will lead to reduction in electricity consumption as compare to the baseline for treatment of equivalent organic load;
- Replacement of electric water heater with solar alternative;

Carbon Trading - Developing Trends

Programme of Activities:

- Bonn, 27 June 2007 – The Kyoto Protocol's clean development mechanism (CDM) is set to scale up, in reach, scope and effectiveness, as a result of new procedures and guidance for programmatic CDM adopted by the mechanism's Executive Board.
- "Until now, we've registered single projects, in single locations. With the new procedures and guidance, developed in response to requests from Kyoto Protocol countries, the way is now clear for project developers to submit for registration many projects, covering a wide area, under a single 'programme' umbrella," said Hans Jürgen Stehr, chair of the Executive Board of the CDM.

Carbon Trading - Developing Trends

Programme of Activities:

Programme of Activities allows a manufacturer to earn carbon credits by taking measures to market lower-carbon alternatives to current products or services. The first example of this type of project will likely be an Indian Compact Fluorescent Light bulb project where a group of manufacturers monetize the emissions reductions associated with over 1 Million light bulbs to be marketed at more competitive costs (relative to traditional bulbs). Market penetration will be increased due to lower sales prices, however the narrowed margins will be made up for by the monetization of the carbon credits as Kyoto tradable Certified Emissions Reductions (CERs). This trend is likely the way in which carbon will be monetized in the US under RGGI, AB-32, or a future US ETS.

Carbon Solutions Group

Questions?

GovEnergy

www.govenergy.gov

New Orleans

August 5-8