

Green Tags and Carbon Trading

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ABSTRACT

Learn how to *cash-in* with the newly evolving Carbon Trading and Green Tag marketplace. This paper will decode the confusing concepts and help you determine how Green technology can actually provide savings! It will provide a helpful overview of how and where to obtain this money—and how many of you may already apply.

Today carbon is on the front page of every paper, in the stump speech of every politician, and is often the lead story on the evening news. As a result, the “Sustainability Professional” must understand the concept, the metrics and the market as he or she develops the corporate (or institutional) “green” program (aka sustainability plan). Basic knowledge requires an understanding of:

- Why has carbon taken such a firm grasp on the American and world psyche; and
- What is the carbon footprint and how can I change it?

In addition, markets are being developed, right now, specific to “carbon” and greenhouse gas offsets and trading. This paper will provide the fundamentals and many details associated with development of a solid understanding of greenhouse gases, “carbon” and carbon markets. In summary, it will decode the confusing concepts and help you determine how Green technology can actually provide income! It will provide a helpful overview of “what’s out there” in terms of value; and – as importantly – what’s coming relative to the “cap and trade” market this is developing.

Introduction

The EPA has proposed¹ the first comprehensive national system for reporting emissions of carbon dioxide and other greenhouse gases produced by major sources. Approximately 13,000 facilities would be covered under the proposed system. The facilities include fuel and chemical suppliers, manufactures of motor vehicles and engines, and large direct emitters from energy intensive sectors whose greenhouse gas emissions are equal or great than 25,000 metric tons per year. Under the proposed rule, companies would submit their first annual report to EPA in 2011 for calendar year 2010. Most small businesses would not be required to report their emissions because their emissions fall well below the threshold.

Wow!?! As you read this rule and as you respond to the eventual ruling and requirements, your first questions might include:

- *How do I know if I emit greater than 25,000 metric tons of GHG per year?*
- *What is a small business in relation to GHG?*

¹ EPA proposed rule in response to H.R. 2764; Public Law 110-161.

But, if you only react, you may be missing the biggest opportunity of your professional career and a significant profit center for your company. In fact, recognizing the profitability and financial opportunity afforded by Green Tags and Carbon Trading relates to a slight variation of theme of this summer study: *“Timing is Everything: Moving Investment Decisions to Energy Efficient Solutions by Leveraging the Carbon Advantage”*

To leverage the carbon advantage, it is important that financial basics are understood², coincident with understanding of greenhouse gas metrics.

Greenhouse Gas (GHG) and Carbon³ Basics

Carbon basics can sound complicated but can be surprisingly easy to understand. For instance, Carbon dioxide is not a “criteria pollutant” as defined by the EPA. In fact, carbon dioxide is a simple byproduct of human respiration. Did you know that human breath contains almost 5% carbon dioxide? Therefore, we each contribute to the problem with every breath we take. Every person’s output varies according to the amount of exercise taken, the food consumed, etc. But a reasonable metric⁴ is that each person exhales 445 liters of carbon dioxide per day (the average of 1000 samples measured by the USDA). In the course of a year this production by one average person represents 704 pounds of carbon dioxide.

There is a high probability that the U.S. is going to enter into a “cap-and-trade” system that is going to require seemingly complicated carbon footprint calculations and ultimately greenhouse gas emissions trading. Understanding value, therefore, will require a sound understanding of the basics. The basics of “carbon footprint” calculations are easily understood, particularly if considered in perspective. The following metrics are presented in three categories in order to create a calculational basis and enlightened perspective from which all calculations, no matter how complicated, can be easily understood:

² See paper #124, this summer study conference

³ At this early stage in GHG era, and although imprecise, the following terms are often used interchangeably: carbon emissions, carbon-dioxide emissions, and greenhouse gas emissions.

⁴ Your Role in the “Greenhouse Effect”; Jerry Hannan, PhD; Institute for Theological Encounter with Science and Technology; Document ID: HANNA002; www.archstl.org

per Capita (base metrics)	Composition	Conversion
<p>Per capita U.S. ghg emissions are generally stated⁵ at approximately 19 metric tons (tonnes) per person per year. A metric ton (tonne) is 2205 pounds (i.e. as opposed to an U.S. ton at 2000 pounds). U.S. greenhouse gas emissions, per capita, are easily twice that of the UK and most western European countries. When compared to the anticipated EPA regulation threshold of 25,000 tonnes, this would correspond to approximately 1300 U.S. citizens. As another perspective, the average U.S. automobile emits approximately 5 tonnes per year of CO₂ (e.g. 5000 cars would require EPA reporting).</p>	<p>The climate change “industry” often refers, interchangeably, to: carbon emissions, carbon dioxide emissions and greenhouse gas (ghg) emissions. To be precise, total ghg emissions are only 80% carbon dioxide⁶. This is because GHG’s also include methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases. Likewise, the various ghg components are not equally weighted in their “warming” impact. For methane, 1 pound is 30 times more detrimental to global warming than is one pound of carbon dioxide. The reader is directed to Figure 1 for perspective.</p>	<p>It is important to recognize that the specifics of greenhouse gas (and carbon dioxide conversion) vary based on assumptions, location and area. However a reasonably accurate approximation of carbon dioxide emission from the most commonly used fuel and power sources are: Gasoline: 20 lbs/gallon⁷ Natural gas: 12 lbs/therm Power: 1 lb per kWh Coal: 220 lbs per mmBtu⁸ Fuel Oil⁹: 26 lbs per gallon All “pounds” (lbs) are “pounds of CO₂” from the combustion process. Unless otherwise noted, metrics are sourced to www.climatetrust.org. These conversions will be used at the conclusion of this paper.</p>

⁵ Numerous sources state 18 to 20 tonnes per capital U.S. There can be significant variances between sources.

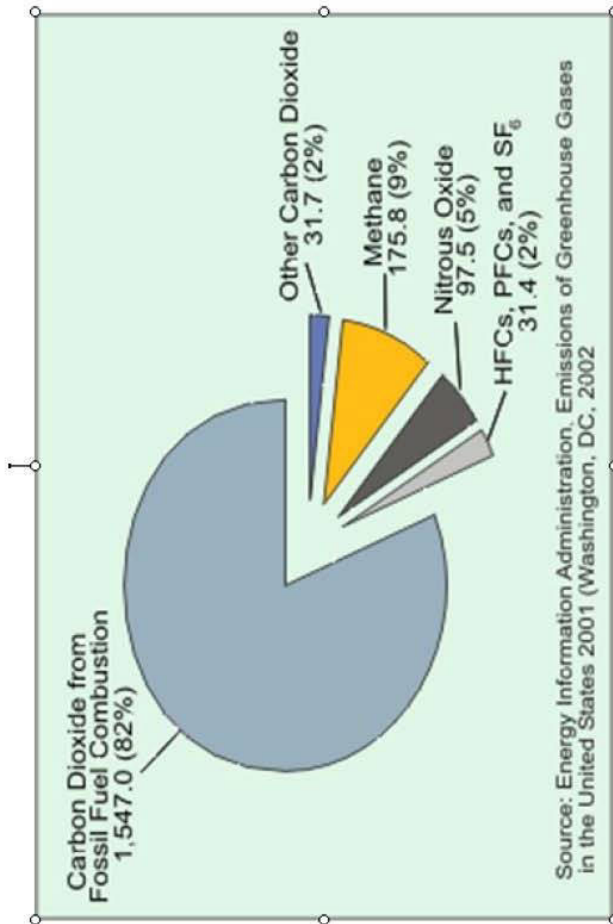
⁶ U.S Energy Information Agency

⁷ epa.gov/OMS/climate; states 19.4 per gallon

⁸ Varies between 227 (anthracite) and 215 (lignite) per million btu

⁹ Number 5 and #6 fuel oil

Greenhouse Gas Distribution Matrix and Global Warming Potential



Gas	2001 IPCC GWP
Carbon Dioxide	1
Methane	23
Nitrous Oxide	296
HFC-23	12,000
HFC-125	3,400
HFC-134a	1,300
HFC-143a	4,300
HFC-152a	120
HFC-227ea	3,500
HFC-236fa	9,400
Perfluoromethane (CF ₄)	5,700
Perfluoromethane (C ₂ F ₆)	11,900
Sulfur Hexafluoride (SF ₆)	22,200

Background: Global warming potentials (GWP's) are used to compare the abilities of different greenhouse gases to trap heat in the atmosphere. GWP's are based on the heat absorbing ability of each gas relative to that of CO₂ as well as the decay rate of each gas (the amount removed from the atmosphere over a given number of years) relative to that of CO₂. The GWP provides a construct for converting emissions of various gases into a common measure denominated in carbon or carbon dioxide equivalent (CO₂e). The generally accepted authority on GWP is the Intergovernmental Panel on Climate Change (IPCC). These tables present 2001 IPCC estimates.

Figure 1

Cap and Trade and Valuing GHG Emissions

Although greenhouse gas emissions already have value, they will become more valuable as a mandatory cap and trade system is formalized. A basic description of the probable cap and trade system is provided by the Center for American Progress¹⁰ as follows:

Each large-scale emitter, or company, will have a limit on the amount of greenhouse gas that it can emit. The firm must have an “emissions permit” for every ton of carbon dioxide it releases into the atmosphere. These permits set an enforceable limit, or cap, on the amount of greenhouse gas pollution that the company is allowed to emit. Over time, the limits become stricter, allowing less and less pollution, until the ultimate reduction goal is met. This is similar to the cap and trade program enacted by the Clean Air Act of 1990, which reduced the sulfur emissions that cause acid rain, and it met the goals at a much lower cost than industry or government predicted.

The “amount of greenhouse gas pollution” that the company emits (and/or that the company is allowed to emit) will most likely be calculated by employing protocols established by the World Resource Institute. The presentation which accompanies this paper will provide an example as suggested by Figure 2.

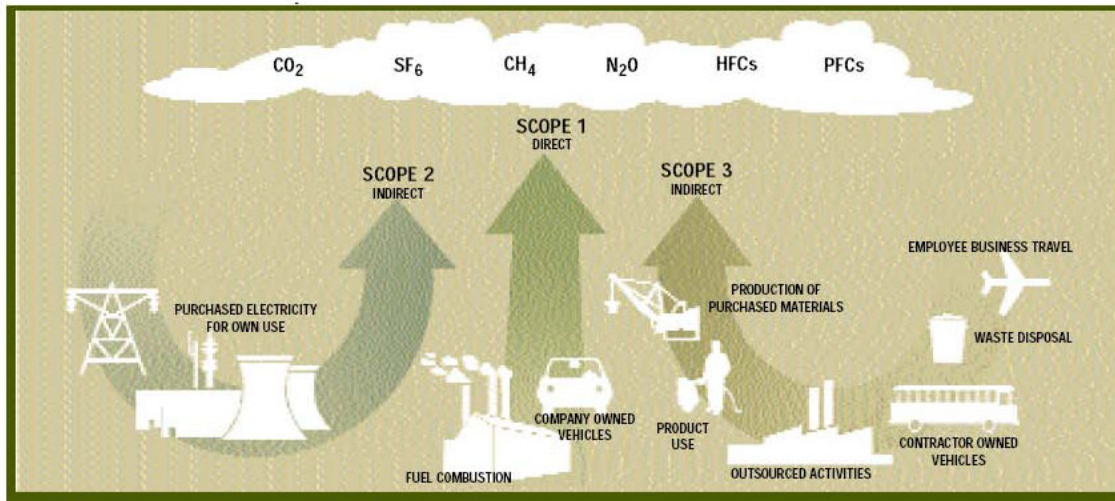
Currently with no mandatory Cap and Trade in effect, the value of greenhouse gas emissions is relatively low. However, once a mandatory Cap and Trade system is in effect the value may approach as much as \$40 per tonne or more. Whether the value is \$2 per tonne or \$40 per tonne, it is important that the reader understand where it comes from, and how to leverage this value against that of his/her energy efficiency projects.

¹⁰ CfAP at 1333 H Street, NW, Washington D.C. 20005; www.americanprogress.org

Figure 2

Greenhouse Gas Protocol

Overview of Scopes and Emissions Across a Value Chain



Source: World Resource Institute,

How, Where and Why Do GHG Offsets Have Value?

The two dominant greenhouse gas emissions¹¹ trading markets in the US are: (1) the Chicago Climate Exchange (CCX); and (2) the marketplace as defined by the Regional Greenhouse Gas Initiative. Before discussing these, it is important to acknowledge the European Climate Exchange (ECX). The ECX is said to be the leading marketplace for trading carbon dioxide (CO₂) emissions in Europe and internationally. It should be noted that ECX greenhouse gas trading volumes are experiencing tremendous growth. The carbon market's total value for 2008 was estimated at \$125 billion; which is more than double what it was worth in 2007.

The ECX is a member of the Climate Exchange Plc group of companies. Other member companies include the Chicago Climate Exchange. It is the Chicago Climate Exchange that has been the leading marketplace for the voluntary greenhouse gas market in the US.

Chicago Climate Exchange (CCX)

The Chicago Climate Exchange (CCX) operates North America's only cap and trade system for all six greenhouse gases, with global affiliates and projects worldwide. CCX Members are leaders in greenhouse gas (GHG) management and represent all sectors of the global economy, as well as public sector innovators. Reductions achieved through CCX are the only reductions made in North America through a legally binding compliance regime, providing

¹¹ In their early era of GHG the terms "emissions offsets" and "emissions" are used interchangeably. In both cases they typically refer to "tonnes" of greenhouse gas.

independent, third party verification by the Financial Industry Regulatory Authority (FINRA, formerly NASD).

CCX emitting Members make a voluntary but legally binding commitment to meet annual GHG emission reduction targets. Those who reduce below the targets have surplus allowances to sell or bank; those who emit above the targets comply by purchasing CCX Carbon Financial Instrument® (CFI®) contracts. Because of its long history, it is instructive to review the value of greenhouse gas offsets on the CCX. Figure 3 provides historic valuation of these emissions, as traded, and compares them to the pricing of ghg emissions offsets on the ECX. As noted from Figure 3, the price of European offsets is 10x that of U.S. offsets.

Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI, referred to as “Reggie”) is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. Ten Northeastern and Mid-Atlantic states will cap and then reduce CO₂ emissions from the power sector 10% by 2018. States will sell emission allowances through auctions and invest proceeds in consumer benefits: energy efficiency, renewable energy, and other clean energy technologies. Because of the mandatory nature of the RGGI, it appears to be overtaking the CCX as a dominant market in carbon and carbon offset trading. As this paper goes to press, however, whether CCX or RGGI or a different organization becomes the dominant market place may be irrelevant. This is because: *“As of May 22, 2009 a landmark proposal to curb U.S. greenhouse gas emissions cleared a key congressional panel... The government will put a price on carbon for the first time (this bill will mark) a major shift in how the U.S. uses energy”¹².*

The proposed legislation goes on to point out that: *“Initially 85% of the permits would be given away free, with the bulk of them going to utilities, auto makers, oil refiners and trade-sensitive industries. The rest would be auctioned off, at a minimum initial price of \$10 per ton of emissions ... allowing the government to issue a limited number of additional permits once the price hits \$28 (per tonne) in the first year of the program. ... And also require all utilities to obtain ...6% and 20% of their electricity from renewable sources by 2012 and 2020 (respectively).*

This legislation is sticking in the valuation of carbon/ghg emissions because, as of March 18th, the clearing price of a tonne of carbon emissions on the CCX was only \$3.05. With legislation estimated to be enacted as early as 2010, this price at as much as \$28 per tonne, more closely reflects the price of carbon emissions on the ECX.

Possibly the most striking part of this legislation is that *“...utilities could claim credit for energy efficiency to offset part of (the requirement for)... electricity from renewable sources”*

Implications for Energy Managers in Industrial Facilities

Although groundwork has been provided, in early parts of this paper, it is now appropriate to reveal the value of the current and anticipated situation. To really understand and leverage the value it is important to understand the relevant terms, mechanisms and details, including:

¹² Wall Street Journal, 5/22/09, *House Panel Clears Plan to Cut Greenhouse Gases*, I. Talley, S. Power

1. Carbon Emissions Sales (and purchase) through Providers and Aggregators
2. Green Tags, White Tags and Renewable Energy Certificates
3. A brief discussion of the ghg calculation protocols.
4. A case study, valuation, of the carbon benefits of an energy efficiency project

Understanding the current market for Carbon Sales (and purchase) through Aggregators also provides an understanding of the relative magnitude of the EPA's reporting requirements discussed earlier in this paper. Currently tradable carbon dioxide emission Offsets can be registered and traded in the CCX by both "offset providers" and "offset aggregators".

- **Offset Providers and Offset Aggregators.** An Offset Provider is an owner of an offset project or projects that registers those offsets directly on the exchange, and sells offsets on its own behalf. An Offset Aggregator, on the other hand, is an entity that serves as the administrative representative, on behalf of offset project owners, of multiple offset-generating projects. Offset projects involving less than 10,000 tonnes of CO₂ equivalent per year should be sold through an Offset Aggregator. In all cases the magnitude of the emissions offsets must be verified and/or sourced to the calculation protocols established by the World Resource Institute (Figure 2).

An example of value attributable to aggregators is provided by surfing any one of scores of "Carbon Purchasing" websites. There are scores, possibly 100's, of carbon offset websites which are currently selling offsets which provide for "carbon free travel" or a "carbon free automobile" or a "carbon free lifestyle" through the simple purchase of the same carbon offsets already discussed. In the case of a recent visit to www.buycarbon.org, for instance, anyone can drive a "carbon neutral" Range Rover for less than \$50 per year!! But let's explore the market nomenclature, and develop our own calculation of value and offset using accurate estimates and established protocols:

- **Green Tags, A.K.A:** Renewable Energy Certificates (RECs), Renewable Energy Credits, Tradable Renewable Certificates (TRCs). These are generally interchangeable and defined as "a tradable commodity represented by a certificate of proof of one (1) megawatt-hour (MWh) of power/electricity generated by a verifiable, renewable energy source. Green tags have proliferated since the advent of the CCX and due to the renewable portfolio requirements of regulated utilities and municipal utilities. The result has been:
 - 100 or distinct green pricing programs exist in US (per NREL)
 - Premiums for these options over conventional electric power range from 0.6 cents to 17.6 cents per kWh and average 2.62 cents/kWh.
 - Over 265,000 buyers, including about 6,500 nonresidential customers, participated in green pricing programs as of the end of 2003, currently there are 1% to 2% (of even more) of eligible customers in many utility's service territory on average.
- **White Tags**¹³ *reward the efficient use of electricity (i.e. energy efficiency projects) as if it were a renewable energy project. White Tags each represent 1 MWh (megawatt hour) of*

¹³ Trademarked by Sterling Planet, italicized text per www.sterlingplanet.com

electricity savings. Like REC's, White Tags™ are the latest energy trading certificates to hit the market and trade much like Renewable Energy Certificates (RECs) or Green Tags. But unlike RECs, which come from renewable power and are measured by meter readings, White Tags™ are defined through energy savings calculations. To date, three states – Connecticut, Nevada and Pennsylvania - have adopted legislation requiring energy efficiency credits as part of a mandated portfolio standard. Particularly when framed against the anticipated legislation discussed in this paper, all or most states are expected to follow suit. Note, also, that Energy Efficiency Certificates are currently better known in Europe, where the market originated in the United Kingdom, France and Italy.

- **Greenhouse Gas Protocols**, for precise calculations of carbon footprint and carbon emissions or offsets are coalescing around those tools and procedures established by the World Resource Institute (Figure 4). As stated¹⁴: “Our tools enable companies to develop comprehensive and reliable inventories of their GHG emissions. Each tool reflects best practice methods that have been extensively tested by industry experts. Every tool is comprised of an Excel workbook and a PDF guidance document”.
- **EPA Power Profiler** for precise conversions associated with ghg (and other emissions associated with electric production), the EPA Power Profiler¹⁵ provides an excellent and precise conversion. A recent visit to the EPA power profiler indicates the similarity between the amount of ghg emissions associated with electricity in San Jose, CA and the same kWh provided to Niagara Falls, NY. (721 and 724 lbs-ghg per MWh, respectively) vs. the national average (1329 lbs-ghg per MWh). Using the EPA energy profiler and the World Resource institute tools, a comparison is made to the “rules of thumb” provided on page 3:

Table 2

Element	Units	Conversion (lb-ghg per unit of energy)	
		Accurate (Table 1)	Precise (EPA/WRI)
Electricity	kWh	1	0.721
Natural Gas	Therm	12	12.23
Gasoline	gallon	20	19.4

Combining, Valuing and Leveraging Energy Efficiency Projects

There is ample room for discussion and argument over an accurate vs. precise calculation of carbon footprint or greenhouse gas emissions offset. However, there is now no argument against employing the value of Greenhouse Gas Emissions to provide added financial leverage to an energy efficiency project. In the presentation of this paper, a discussion will be provided re: accuracy vs. precision. For instance, using the conversion factors above, one could calculate, with reasonable accuracy, the amount of electric and gas use which would trigger the 25,000 tonne EPA threshold identified in the beginning of this paper:

¹⁴ World Resource Institute www.wri.org

¹⁵ www.epa.gov/powerpro

This accurate *calculation* would indicate a use of 20million kWh and 3million therms (total 25,397 tonnes ghg); whereas a precise calculation would indicate a total of 23,179 tonnes ghg. Both calculations use all Scope 2 elements, but only part of Scope 1¹⁶. Let’s expand that to an illustrative and accurate case study of the leverage provided by greenhouse gas emissions offsets from a conventional, energy efficiency project. Using the conversion factors provided in Table 1, take a hypothetical industrial efficiency project which resulted in savings of 500,000 kWh of electricity and 200,000 therms of natural gas. The emissions benefit, and calculation identifies the value as follows:

Table 3

Conventional Savings from an Industrial Efficiency Project (in kWh and \$dollars)				Added Value and Metrics of Offsets		
				Conversion ¹⁷	Offset ¹⁸	Added \$Savings @ \$3, \$10, \$28
Savings	type	Rate	\$ savings			
500,000	kWh	\$0.10	\$50,000	1	227	
200,000	therms	\$0.90	\$180,000	12	1,088	
Subtotal energy savings			\$230,000		1,315	
TOTAL PROJECT			<i>with</i>	\$233,945	\$3	\$3,945
COST SAVINGS			<i>“ghg”</i>	\$243,150	\$10	\$13,150
			<i>bonus</i>	\$266,820	\$28	\$36,820

The above example is provided to show that the added value of the offsets can add as much as 16% (over \$36,000) to the value of an energy efficiency project.

Conclusion

The carbon trading industry is in flux right now. But unlike the economy at large which is undergoing a readjustment and devaluation, the energy efficiency industry is moving from good to very good due to increasing rates and the influence, and probable increased future value of carbon offset programs. Each day, each new bit of legislation, each new project can be identified using the old terms of payback and energy efficiency but ALSO using the new terms of “green”, carbon footprint reductions, or emissions offsets.

As a result, and after understanding the new basics of “green”, it must be recognized that carbon emission basics are simply an extension of the basic principals of energy efficiency audits and energy efficiency projects. An accurate carbon conversion calculation really is, almost, that easy. Therefore, instead of getting mired down in what appears to be complicated protocols (and futher allowing that these apparent complications pave the way¹⁹ for exploitation by special interests or for gaming), use the basics presented herein to leverage your efficiency projects.

This will allow the industrial energy engineer to quickly develop accurate calculations, and leverage “green tag” value and “emissions offset” value, as a basis for timing and justification of any energy efficiency or renewable energy project.

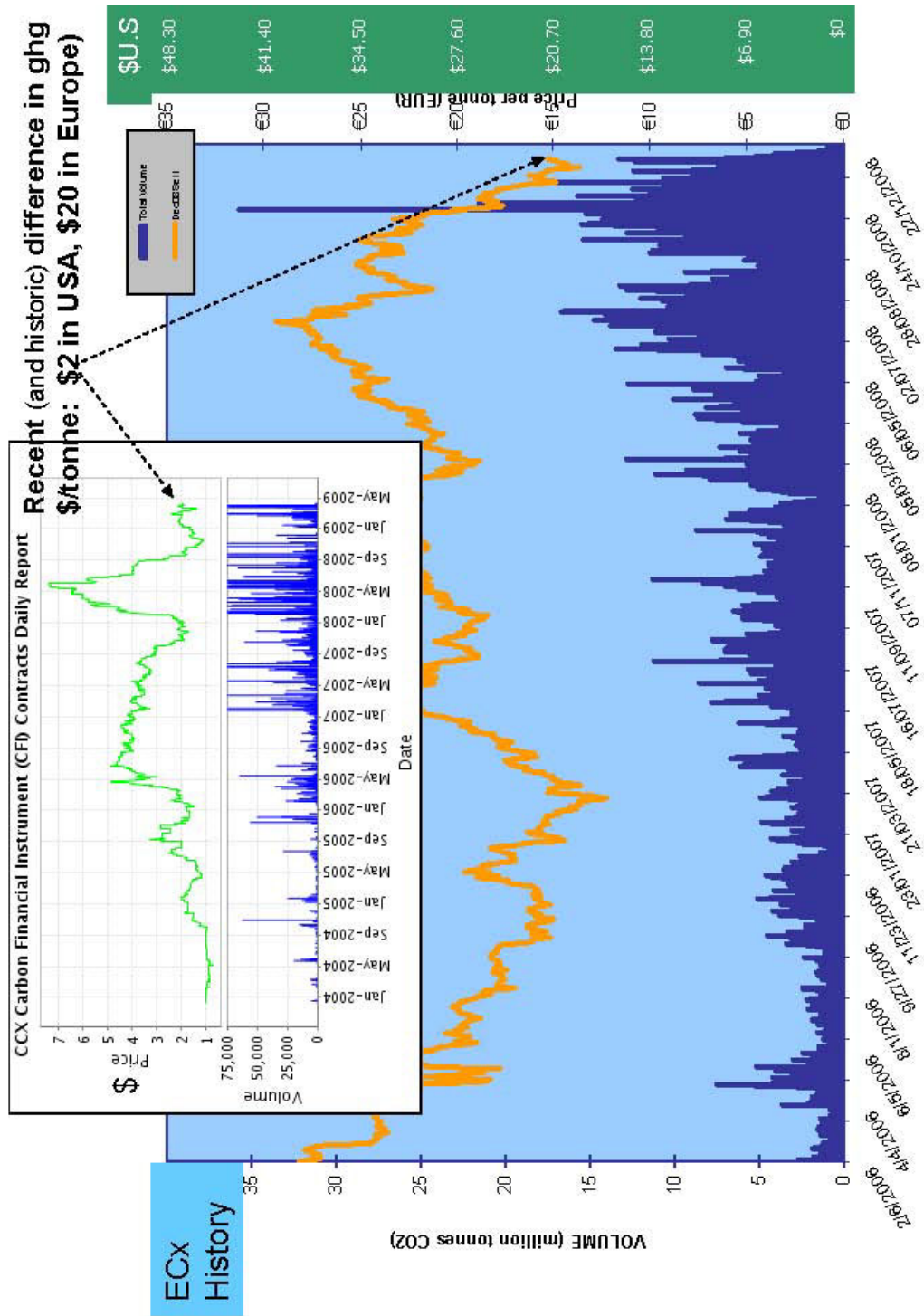
¹⁶ The presentation will reveal issues associated with Scope 1, Scope 2 and Scope 3 elements.

¹⁷ Pounds (lbs) of ghg per unit of saved energy

¹⁸ Tonnes of ghg emissions offsets at 2,205 metric tons per lbs of ghg emissions offsets

¹⁹ See arguments in the carbon tax center re: carbon tax vs. cap-and-trade. www.carbontax.org

Figure 3



ECX vs. CCX Historic Pricing and Volume

PROTOCOLS and TOOLS for PRECISE CALCULATION of CARBON FOOTPRINT

1) Find through www.wri.org (World Resource Institute)

The Greenhouse Gas Protocol Initiative
The foundation for sound and sustainable climate strategies

Navigation: About | Programs and Registries | Standards | Calculation Tools | Newsletter | Media

ALL TOOLS

Below is a complete listing of all tools provided by the GHG Protocol.

DOWNLOADS

Gross Sector Tools
These tools are applicable to many industries and businesses regardless of sector.

Calculation Tool	Version	Guidance	Worksheet
GHG emissions from stationary combustion	4.0 (Feb 2009)	2 MB	2 MB
Indirect CO2 emissions from Purchased Electricity, Heat, or Steam	2.0 (Mar 2008)	206 KB	810 KB
CO2 emissions from transport or mobile sources	1.3 (Jan 2005)	211 KB	179 KB
Indirect CO2 emissions from purchased electricity	3.0 (Mar 2008)	206 KB	348 KB
Emissions from employee commuting	2.0 (Jun 2006)	179 KB	179 KB
Measurement and Estimation Uncertainty of GHG Emissions	1.0 (Sep 2003)	227 KB	57 KB
CO2 emissions from fuel use in facilities	3.0 (Mar 2008)	2 MB	2 MB
CO2 emissions from business travel	1.2 (Aug 2005)	179 KB	179 KB
Allocation of Emissions from a Combined Heat and Power (CHP) Plant	1.0 (Sep 2006)	231 KB	50 KB

2) Click "Calculation Tools"

3) Click "All Tools"

4) Download Stationary Combustion tool

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Figure 4