Triple Convergence of Environmental and Capital Markets

By Peter C. Fusaro and Marion Yuen

In the fall of 2001, soon after the California "energy crisis" and the tragic events of September 11, we saw a unique opportunity to focus on an American invention that could help to alleviate the human contribution to global pollution and climate change. When we met at a seminar on environmental trading in New York City right after 9/11, Marion sensed that it was time to refresh public discussion of energy efficiency as capsulated by Amory Lovins'[1] term, Negawatt. She was looking for a way to bring together practitioners from around the country to discuss their experiences in Negawatt trading (often in the form of load curtailment and load management programs). Peter saw the potential of broadening this idea to include trading of emissions reduction and renewable energy certificates. So we created the term GreenTrading™, to build on the Triple Convergence of the emissions, renewables, and energy efficiency markets. This phenomenon, we believe, will become increasingly important as the enviromental and capital markets converge.

In the spring, we hold the **Annual GreenTrading Summit™: Emissions, Renewables & Negawatts** in New York City, the environmental finance center of the world. The inaugural 2002 conference was attended by participants from five continents. At each annual conference, we intend to break new ground in the continuing evolution of the environmental financial markets. As we do so, we facilitate not only the creation of new jobs, but also new types of jobs in the energy, agriculture, financial service, and advisory service industries as these sectors begin to embrace climate change as a business opportunity—not as a business impediment. We also encourage young people from undergraduate and graduate programs who are eager to join this emerging industry to participate in this annual event.

AMERICAN ORIGINS OF ENVIRONMENTAL TRADING

Environmental trading began in the U.S.A. as the trading of "allowances" to emit air pollutants, for sulfur dioxide (SO_2) in 1995 and for nitrogen oxides (NOx) in 1999. Such trading, based on the U.S. experience, has been modeled around the world and extended to emission reduction of carbon dioxide and other gases that many scientists believe contribute to global warming. The trading of credits or "allowances" for emission reduction or emission avoidance of greenhouse gases (GHGs) forms the basis of the proposed international agreement—the Kyoto Protocol. Unfortunately, the United States has declined participation in the Kyoto Protocol, even though the concepts of emissions trading had been proposed and accepted at the Rio Conference a decade before this agreement.

Nevertheless, the U.S. market possesses the most accumulated experience in using market mechanisms to enforce environmental regulations. The world's largest voluntary trading scheme, Chicago Climate Exchange, began operation in September 2003. Its founding members collectively are responsible for GHG emissions that amount to more than half the total emissions in Britain.

In the late 1980s, acid rain was severely poisoning America's lakes, rivers, and forests. Since acid rain is the result of sulfur dioxide (SO_2) in the air, Environmental Defense (a U.S. environmental organization) proposed to the first Bush administration a market mechanism to reduce SO_2 levels. In 1995, the first emissions trading began with the U.S. Sulfur Dioxide Allowance Program (a cap-and-trade program) in which all trading occurs under a nationwide "cap" that represents a reduction in SO_2 emissions from power plants. The goal is to achieve by 2010 an overall cap of 50 percent of the 1980 SO_2 emission levels. The U.S. Environmental Protection Agency (EPA) estimates annual health benefits to exceed U.S. $50 billion.

On the regional level, the Southern California Regional Clean Air Incentives Market (RECLAIM) was initiated in 1994 with the goal of reducing nitrogen oxide (NOx) emissions from industries and businesses to 75 percent and SO_2 to 60 percent by 2003 relative to the 1994 baseline. Under a cap-and-trade program in the northeastern states, NOx emissions have decreased since 1999 by 60 percent of the 1990 levels.

As a result of these and other initiatives, there is now a liquid market for trading emission reduction credits for SO_2 (nationally) and NOx (regionally). In addition, over-the-counter (OTC) forward markets trade credits are vintaged through the year 2030. The commodities or traded

credits represent measures of avoided or reduced emissions. Technically, they are unused "allowances" to emit and are authorized under various programs or measured against agreed-upon baselines.

The national regulatory framework for SO_2 and NOx is the 1990 Clean Air Act Amendments. Under this legislation, the U.S. EPA sets national air quality standards for six principal air (criteria) pollutants: nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), carbon monoxide (CO), lead, and particulate matter. Notably, it is the view of the current Bush administration that this legislation does not cover several greenhouse gases, including carbon dioxide (CO_2) and methane (CH_4).

THE CURRENT U.S. SCENE

The United States, the largest contributor to global warming, is responsible for over 25 percent of the world's carbon dioxide emissions. According to the U.S. Energy Information Administration, energy-related carbon dioxide emissions increased by 16 percent (an average of 1.2 percent per year) between 1990 and 2002; in 2002 it rose by 1.3 percent. The same source reports that, between 1990 and 2000, this country increased by 13.3 percent its total emissions of the six greenhouse gases addressed by the Kyoto Protocol: carbon dioxide, methane, nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluourocarbons (PFCs), and sulfur hexafluoride (SF_6) (table 1).

Table 1

U.S. Energy-Related Carbon Dioxide Emissions, 1990-2002

Energy Sector	Total Percentage Change 1990–2002	Annual Average Percentage Growth 1990–2002	2001–2002
Residential	26.0	1.9	2.5
Commercial	30.2	2.2	-0.5
Industrial	-0.3	0.0	1.5
Transportation	20.3	1.6	1.5
Total Energy	16.0	1.2	1.3

Sources: U.S. Energy Information Administration

U.S. domestic developments are more pronounced at the state level with renewable portfolio standards and carbon registries in several states. Additionally, there is growing momentum in many other areas to move forward into green trading. Notably, 10 northeastern states have begun collaborative efforts to design a cap-and-trade program for carbon dioxide from power plants, with a goal of reaching an agreement by April 2005. Since the U.S. EPA does not regard carbon dioxide as a criteria pollutant, there is little action at the federal level, aside from some carbon sequestration projects. This may change, however, as the environment is really a nonpartisan issue with most Americans. What is really needed is mandated government standards on GHG emissions. However, since such mandates seem unlikely under the current Congress and Administration, state-level initiatives will continue to be the best indicator of activity in the green trading space.

THE KYOTO PROTOCOL

The Kyoto Protocol was adopted at a 1997 Conference of the Parties to the United Nations Framework Convention on Climate Change. It is a step toward arresting and reversing the upward trend in GHG emissions that started in the industrialized (Annex I) countries over 150 years ago. Under the Protocol, nations would commit to reducing their collective GHG emissions to at least 5 percent below 1990 baseline levels by the year 2012. To do this, each participating country would determine how to achieve its particular target, including the trading of emissions rights within and across national boundaries.

The United States contributed 36.1 percent of the total 1990 carbon dioxide emissions of Annex I countries. As table 2 shows, between 1990 and 1999, the United States increased its emission of greenhouse gases by 11.2 percent. Over the same period, Germany decreased its GHG emissions by 15.6 percent and the United Kingdom reduced its GHG emissions by 8.3 percent. Some of the decrease in those two countries may have been due to economic recession that has resulted in lower energy consumption and, therefore, a reduction in greenhouse gas emissions.

To enter into effect, the Kyoto Protocol must be ratified or approved by at least 55 parties to the 1997 United Nations Framework Convention on Climate Change (UNFCCC), including Annex I (industrialized) countries, which represent 55 percent of the total 1990 baseline carbon emissions. As of September 2003, 118 countries have ratified this Protocol, representing 44.2 percent of the total 1990 carbon emissions from Annex I countries.

Table 2

Top Ten Countries Contributing to the Kyoto Protocol's 1990 Baseline Greenhouse Gas (GHG) Emissions (in Gigagrams[1])

Country	Total Annex I CO2 Emissions (%)	All 1990 GHGs (Gigagrams) (without sinks)	All 1999 GHGs (Gigagrams) (without sinks)	Percentage Change 1990–1999	Kyoto[2] Target (%)
United States	36.1	6,048,786	6,726,997	+11.2	–7
Russian Federation	17.4	3,040,062	1,962,441	–35.4	0
Japan	8.5	1,213,262	1,330,555*	+9.7	–6
Germany	7.4	1,208,807	1,019,745	–15.6	–8** (–21)
United Kingdom	4.3	741,489	679,850	–8.3	–8 (–12.5)
Canada	3.3	611,770	692,230	+13.2	–6
Poland	3.0	564,286	402,477	–28.7	–6
Italy	3.1	518,502	541,542	+4.4	–8 (–6.5)
France	2.7	553,778	558,726	+0.9	–8 (0)
Australia	2.1	423,237	484,699	+14.5	+8
All Annex I Countries	100.0	18,147,110	16,982,195	–6.4	–5

[1]Unit used is the **Gigagram** (1,000 tons) of CO_2 equivalents; the category "All GHGs" includes emissions of the six greenhouse gases addressed by the Kyoto Protocol (where reported): carbon dioxide (CO_2), methane (CH4), nitrous oxide (N_20), hydrofluorocarbons (HFCs), perfluourocarbons (PFCs), and sulphur hexafluoride (SF_6). Carbon removals by sinks are excluded.

[2]Kyoto Targets, expressed here as a percentage increase or decrease from 1990 levels, are to be achieved in the five-year period 2008-2012.

*Latest data available is 1994.

**The European Union as a group is committed to –8%; the national rates allocated through an internal E.U. agreement are in parentheses.

Sources: http://unfccc.int/resource/iuckit/fact30.html, accessed September 29, 2003, and http://unfccc.int/resource/kpco2.pdf, accessed September 29, 2003.

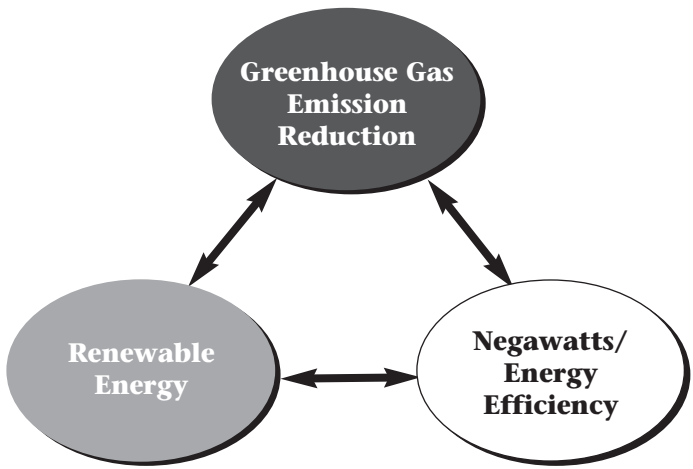
EUROPE TAKES THE LEAD

In 2002, the U.K. emissions trading scheme became the world's first economy-wide greenhouse gas emissions trading scheme. A 2003 Energy White Paper[2] has called for overall GHG emission reductions of 60 percent from the current levels by the year 2050 as well as aiming for 20 percent renewable generation by the year 2020. Also in 2002, Italy launched an Energy Efficiency Certification Trading scheme with mandatory energy savings targets at the national level. This scheme is designed to contribute to the Italian target of emission reductions under the Kyoto Protocol.

In 2005, the European Union will begin implementation of a cap-and-trade Emissions Trading Scheme (ETS) covering carbon dioxide emissions from five specific sectors. Independent of the Kyoto Protocol scheme, it has been designed as a compliance tool for the E.U. to reach its Kyoto target.

THE TRIPLE CONVERGENCE

Figure 1
Triple Convergence



Energy efficiency has its own intrinsic environmental and economic merits. Similarly, generating electricity using renewable resources (such as wind, solar energy, biomass, and landfill methane) provides specific benefits for the environment and fuel diversity. Perhaps of more fundamental importance, energy efficiency and renewable energy help to avoid or reduce the emission of carbon dioxide and other GHGs. Thus, they generate financial credits that are tradeable in the market.

In the policy and regulatory worlds, there are different experts and political interests as well as different historical practices and organization cultures for the separate domains of air quality, energy supply, and energy utilization. However, in reality, the connections are ubiquitous, constant, and multifaceted.

Chief among the six GHGs addressed by the Kyoto Protocol, carbon dioxide contributes more than 80 percent to the greenhouse effect. Therefore, the global warming potential of the other gases are denoted by their carbon equivalents.[3] Carbon will become the new rallying symbol and currency, driving the Triple Convergence of the markets for financial credits derived from GHG emission reduction, renewable energy, and energy efficiency.

In launching the **GreenTrading Summit™: Emissions, Renewables & Negawatts**, we have chosen to take the viewpoint of an earthling, a household, and an industrial or commercial operation, rather the viewpoint of policy makers and regulatory entities. While acknowledging the reality of the energy and carbon connections, we also recognize the operational disparities and disconnects that are inherent attributes of any emerging financial market. Very important, from the start, we have underscored the financial benefits of such trading, its potential impact on liquidity, and the convergence of the environmental and capital markets. Going forward, following the "green" will mean following carbon as well, as you will see in chapters 11 and 12.

CONVERGENCE AS A PROCESS

Convergence is a continuous process. On this road, there will be need for agreements on such critical issues as ownership of the new commodities, measurement units, and methods of valuation. To illustrate the current developmental stages and challenges, we have selected the following chapters by authors who (all but one) presented at the Second Annual GreenTrading Summit™ in April 2003 in New York City.

In Chapter 1, Andy Ertel, President of Evolution Markets, addresses the Megatrends in the Environmental Markets five years after the Kyoto Protocol. With the advent of the European Union's Emissions Trading Scheme, Mr. Ertel argues that the global GHG market is poised to take off and could reach a potential market size of U.S. $60 billion a year. He points to signs of the "second wave" as more companies (in addition to the global environmental leaders) come to realize their compliance issues and as corporations begin to recognize that climate change is a business risk that they need to address more comprehensively. At the same time, the Renewable Energy Credit (REC) markets are going from promise to reality due to technology shifts that make renewable power more efficient, reliable, and economical. Mr. Ertel points to the encouraging activity of both RECs and GHG markets at the state and regional levels while he addresses key cross-cutting issues that constrain the growth of these markets.

In Chapter 2, Doug Akerson, President of CQuest Ltd., discusses the development of the next frontier for the environmental markets in the agricultural sector. Agriculture is not only the second largest industry in the world (next to energy), it also is the second largest emitter of GHG emissions. Focusing on the example of anaerobic digestion of manure from confined animal feedlot operations, Mr. Akerson illustrates the use of biogas to produce the commodities of electricity, heat, and RECs. In addition, this process (together with improved waste management practices) produces Emission Reduction Units (ERUs) by avoiding the emission of and sequestering methane and nitrous oxide—both greenhouse gases with high global warming potential. These two gases are released naturally by manure and, unless contained, escape into the atmosphere. The commodities produced can be traded in bundled together or separated for different commodity markets.

In Chapter 3, David Brand, Director of Hancock Natural Resources' New Forest Program in Australia, discusses market-based mechanisms for pricing and trading the environmental services of forests. He describes the emergence of tradable carbon sequestration credits, water quality contracts, and biodiversity or conservation banks. These asset types, together with emerging forms of investment structure, are promising to revolutionize forestry investment. There is growing recognition that forests are a key part of many global environmental challenges; at the same time, forests provide multiple solutions. In these developing market-based mechanisms, investors are finding new ways to add value and improve return on forest

investments as well as manage the risk-return profiles of various assets, depending on investment objectives.

In Chapter 4, Bob Sahadi, Vice President for Product Innovation and Technology at Fannie Mae, explains his institution's motivation for its innovative residential Emissions Trading Initiative (ETI)—making housing more affordable for citizens and less polluting for their communities. Residential housing units account for approximately one-fifth of U.S. fossil fuel consumption. Since energy costs are the second largest household expense (after mortgage or rent), energy efficiency can have a dramatic impact on housing affordability. While GHG emission reductions due to lower or more efficient energy use per residential unit are very small, reductions aggregated across many homes can be substantial. ETI is the first U.S. effort designed to bundle and verify emission reductions from residential efficiency programs. Profits from the sale of these GHG emission reduction credits are returned to Fannie Mae's utility partners for further investment in their residential energy efficiency programs.

In Chapter 5, Jerrel Gustafson, Program Manager of Austin Energy's Residential Energy Efficiency Programs, describes his company's experience partnering in Fannie Mae's ETI. Fannie Mae's turnkey service—verifying claimed emission reductions, bundling tradable emission reduction credits, and negotiating with and selling the credits to buyers—allows the utility to concentrate on continuous energy efficiency improvements in its service territory.

In Chapter 6, Ed Holt, President of Ed Holt & Associates, provides a comprehensive picture of the state of the U.S. market for Renewable Energy Certificates (RECs). He discusses the rationale for RECs, various forms of RECs in the wholesale and retail markets, utility green pricing programs, green power products in states with competitive electricity markets, and the participants in the REC markets. Central to the integrity of these markets is the verification of REC ownership. Such ownership is tracked by different systems, which are subject to the rules and particularities of different jurisdictions. In explaining key design elements of such tracking systems, Mr. Holt highlights critical issues that must be addressed in order for the REC markets to become liquid and seamless. In addition, he explores the frontier question of whether and how RECs can be used in emission reduction programs and markets.

In Chapter 7, Marc Chupka, a senior advisor at The Brattle Group, examines the economics underlying REC supply and demand in order to evaluate the view that a Renewable Portfolio Standard (RPS) policy can

improve the operation of electricity markets by enhancing the stability of fuel costs. Typically, a RPS requires retail electricity providers to purchase a set percentage of their utility sales from renewable generating sources. Mr. Chupka points to the need to consider RPS implementation details that might lead to severe REC price volatility. From his analysis, he concludes that a reasonable degree of intertemporal flexibility (such as allowing "banking" and "borrowing") would dampen REC price volatility and promote a rational investment climate for increasing renewable generation capacity.

In Chapter 8, Jonathan Saiger, President of The Saiger Company, discusses the use of green credits (renewable energy credits, GHG emission reduction credits, and other environmental instruments) in limited recourse project financing of facilities. Lenders and investors want to understand the financial credit issues presented by using green credits as a revenue stream in project financing; also, they need to be comfortable that there is adequate mitigation of the risks associated with such a revenue stream. Mr. Saiger explains the components in a typical credit analysis for certified green credits and factors that should be considered when borrowing against such credits. Such "green finance" will be the wave of the future in energy project finance.

In Chapter 9, Martin Whittaker, a managing director at Innovest Strategic Value Advisors, summarizes the responses of *Financial Times* 500 companies (businesses with the world's largest market capitalization) to international policy measures aimed at cutting GHG emissions and to increasingly severe weather events. Mr. Whittaker is an author of a 2003 report from the Carbon Disclosure Project that surveyed FT500 top management on behalf of 35 institutional investors (representing assets of more than U.S. $4.5 trillion). This report finds that investors failing to take account of climate change and carbon finance issues in their asset allocation and equity valuations are exposed to potentially significant risks, and that corporate performance will increasingly be impacted by regulations and climate change itself. While many FT500 firms have recognized the need to act in response to climate change, the report finds a significant "information deficit" among financial service companies, particularly U.S.-based investors. It identifies this "information deficit" as a significant concern from a fiduciary perspective.

In Chapter 10, Nedia Miller, an energy derivatives strategist and Options Principal at Miller CTA (member of NYMEX), provides an overview of the current trading tools and financial instruments in the energy-related

emerging markets. Focusing on the GHG emissions trading market and the renewable energy certificate markets, she describes the use of options, and points out the overlap between trading tools and financial instruments in these embryonic markets.

In Chapter 11, Guy Battle who founded and is a Director of the environmental and engineering consultancy Battle McCarthy, explains that the building sector accounts for over 50 percent of the world's energy consumption and resultant carbon dioxide production. He describes the lessons of the University Carbon Club, which has aggregated carbon emission reductions from a number of small producers and traded the block of emission reduction credits in the U.K. Emissions Trading Scheme. Using various design examples, he illustrates the benefits of "low-carbon" or "negative-carbon" facilities for building developers, owners, occupants, and the environment. Mr. Battle argues that, for the first time ever, the environment has a real dollar value and that the financial markets must engage the biggest carbon producer—the building industry—to develop a rigorous trading system. Carbon is the New Gold!

Finally, in Chapter 12, Peter Fusaro and Marion Yuen sketch out new emerging-market scenarios for what is the shape of environmental trading to come.

The **Third Annual GreenTrading Summit™: Emissions, Renewables & Negawatts** (scheduled for March 22, 23, and 24, 2004, in New York City) will be a forum for leading practitioners to explore and advance the frontier trading issues in these areas. We will continue to facilitate the discussion on the triple convergence of trading these classes of commodities as well as the natural convergence of such trading with the financial markets. To register for the 2004 GreenTrading Summit™, please use the conference registration form at end of this book. For conference updates, please visit http://www.greentradingsummit.com.

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[1] Amory Lovins is CEO of Rocky Mountain Institute (http:/www.rmi.org).

[2] The Energy White Paper, "Our Energy Future—Creating a Low Carbon Economy," was released by British Prime Minister Tony Blair in February 2003.

[3] Intergovernmental Panel on Climate Change.

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