UNLOCKING THE GLOBAL WARMING TOOLBOX

Key Choices for Carbon Restriction and Sequestration

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CONTENTS

1 OPENING THE TOOLBOX AND WHAT IT OFFERS

Energy is the biggest business in the world, with sales each year of about $2 trillion.[1] As the reader opens this book, the United States will be deciding how, and whether through state governments, the federal government, or both, to regulate global warming and climate change for our, and our children's children's futures. Because CO_2, once emitted, remains warming the atmosphere for a century after its release, none of us reading this book will see those molecules of carbon to their final warming end. Therefore, it is critically important to get the model of implementation right from the beginning. This is a regulatory toolkit holding some of the policy and legal implements necessary to sculpt the carbon future.

This book is different from others in two important dimensions. First, most literature on climate change tracks the latest pending legislation. This book does not follow that script for several deliberate and conscious reasons:

- The Waxman-Markey bill has become the 2009 vehicle for legislative debate, and in the period of a month, in the House of Representatives it changed from 600 pages in length to more than 1,400 pages, as accommodations were made to various interests. It is very different from the Lieberman-Warner bill that was the vehicle for carbon control in the Congress in 2008. What a difference a year makes! The current legislation must pass the Senate and be reconciled in a conference committee before it is operative. Then, because of its billions of dollars of impact

on the economy and amendments that are longer than the original bill itself, it will continue to be amended and fine-tuned even after enactment. It has a long way to go, and is years away from implementation.

- Regulations written by various federal agencies, including the Environmental Protection Agency, the Federal Energy Regulatory Commission, the Department of Agriculture, the Commodity Futures Trading Commission, and others, will dictate the final shape and impact of carbon regulation at the federal level. These are not yet promulgated or in place.
- The Waxman-Markey legislation to implement U.S. carbon regulation will not be effective until 2012 under its own terms, long after this book was published. There will be regular articles in the press about how this program of carbon regulation is maturing prior to its implementation, and that moving target is better captured in articles in the years ahead rather than in this toolbox.

Instead, this book showcases the transcendent and timeless legal and regulatory issues that will continue for years to be worked out both in the United States and in international programs. Second, this book does not rely on any current snapshot of fast-evolving carbon regulation. Instead, this book tunes into the lasting issues to craft successful carbon control. Nonetheless, in this first chapter we examine the basic contours of the upcoming federal U.S. carbon regulation, as this provides context for the future use of the toolkit tools.

This book is very much a toolbox for the future, and not dependent on the carbon plan du jour. This toolbox highlights key climate control issues now confronting the Obama administration's carbon control program, as well as those of the European Union and the Kyoto Protocol. Half of the chapters that follow examine these transcendent issues which will continue to be confronted over the next decade as carbon regulation matures:

- What greenhouse gases to regulate (chapter 2)
- How urgently to implement carbon restrictions (chapter 4)
- Design of a smart grid (chapter 12)
- Leakage of carbon into the control area (chapter 13)
- Preemption of state carbon programs and auction of allowances (chapter 14)

- What to allow as additional offset credits for carbon control (chapter 15)
- The use of renewable power options to control carbon emissions (chapter 16)
- Use of feed-in tariffs as a regulatory technique (chapter 17)
- How to implement renewable energy portfolio requirements (chapter 18)
- The role of forests and biologic sequestration (chapter 20)

In fact, as the reader opens this toolbox, the major European countries will be assessing why their global warming control has resulted in more, rather than less, carbon emissions:

- The Kyoto Protocol has not been successful in achieving its objectives:
  - Reducing developed countries' emissions of CO_2
  - Promoting sufficient renewable power infrastructure in developing countries
  - Reducing world global warming gases sufficiently
- The 23 states in the United States beginning carbon regulation became ensnarled in legal problems:
  - Preventing renewable energy projects from creating tradable offsets
  - Running potentially afoul of constitutional limits on permissible actions
  - Discriminating against power moving at the speed of light in interstate commerce

Simultaneously, the 190 world countries that ratified the international Kyoto Protocol a decade ago are locked in disputes over how, and even whether, that protocol continues at all past 2012. And if so, which countries must shoulder what burden to implement a radical reduction in the use of fire to manipulate the universe. As a world society, for thousands of years, we have utilized fire to supply much of the energy and power on which the world is now constructed. Now with diminishing supplies of traditional fuels and the necessity to quickly implement climate controls on the global temperature, new challenges confront a seven-billion-person world.

Collectively, every developed nation of the world must refashion its use of power and energy. There is a collective obligation, as every global warming gas molecule, no matter who released it, torques the thermostat of the planet. Unlike other air, water, and land emissions, the impact of greenhouse gases (GHGs) is not distinctly local or regional. It is not coincidental that global warming gases are global. Impact is universal. Therefore, the solution ultimately must also be global.

The dimension of time is not precisely known. Leading scientists warn that there is less than a decade to dramatically reduce GHGs—not to agree on a plan, but actually have a dramatic carbon reduction plan operational and effective. Whether these predictions will prove accurate or not, it is clear that humankind has already significantly affected climate change, and that the pace of the warming effect has accelerated each year. The world is past the time of experimentation, regarding significant changes necessary in the production and use of power in society.

While the chapters that follow take a holistic look at different aspects of, and tools for, global warming policy, it is particularly an issue of power. Electricity has become the signature technology of the 21st century. Access to power separates the "haves" from "have-nots" on the geopolitical map of the globe. A night space satellite photograph of the earth distinguishes this reality, as shown in figure 1–1.

Fig. 1–1. Access to electric power is not distributed evenly across the globe.

Abundant electric power is the cornerstone of the near-term plan of every developing nation in the world. My past 15 years of work as legal advisor to the World Bank and the United Nations Development Programme in developing nations across the globe has made me very

aware of the particular underappreciated choices for increasing power supply in developing nations.[2] The risk of energy policy failure carries profound scientific implications. A full regulatory and legal toolbox is needed at our disposal.

A Quick Overview of the Pending U.S. National Carbon System

Between now and 2012, the Waxman-Markey legislation can become the vehicle for addressing carbon at the federal level during the Obama administration. It is relevant to understand its basic structure as an important element of the future, although each of the tools for the evolving system, as well as for the Kyoto Protocol and the 23 state programs in the United States regulating carbon, appear in the various chapters that follow. Among the primary provisions in its 1,400 pages of text, the Waxman-Markey legislation regulates carbon emissions through a cap-and-trade system, creates a national requirement for the increased use of renewable energy, and promotes a smart grid for transmission of electric power.

The Waxman-Markey carbon program would reduce annual emissions by 3% by 2012 against a 2005 baseline, 17% by 2020, and 83% by 2050. It would do so by regulating emitters of 25,000 tons of carbon dioxide equivalent (CO_2e) global warming chemicals in selected industries, while exempting forestry, agriculture, and other industries from the cap. It would do so by the auction or free allocation of tradable emission allowances, with specific expenditure goals for the billions of dollars expected to be garnered from these auctions annually. The bill was changed from the initial auction of most allowances, to the free allocation of most allowances initially, with the number of free allowances being phase out in favor of greater auction of allowances between 2027 and 2030. Initially, 85% of allowances will be allocated for free to distribution utilities, merchant power generation facilities, steel, iron, paper, cement, refinery, and other competition-sensitive businesses. By 2030, 70% of allowances would be auctioned. The tools to determine the free allocation of hundreds of billions of dollars of free allowances are controversial and dealt with in the chapters that follow.

The formula for allocation of the number of free allowances to industrial emitters of greenhouse gases has become extremely controversial in distributing these hundreds of billions of dollars of free

allowances. Also controversial is whether the formulae for distribution within an industry will be based on industry averages, specific historic emissions of a particular company, volume of sales, or a hybrid combination of those tools. These allowances could be traded, with some specific companies forecast to receive as many as $1 billion annually of surplus free allowances above and beyond what they required, which they could sell. So-called "early reduction" credits can be earned for carbon reductions made between 2001 and 2009. This creates value in previously unmonetized voluntary CO_2 reductions, as discussed in the chapters that follow. For some smaller emitters, the bill would mandate implementation of carbon reduction technology requirements for the emitting sources, but not require obtaining allowances for compliance regarding emissions. State carbon control programs in 23 U.S. states, described in the following chapters, could be preempted for a temporary five-year period. Each of the various tools for such mechanisms of existing world carbon control is examined in the following chapters.

Compliance will be able to be met with *offsets* up to almost one-third of the number of required allowances. Offsets are additional compliance credits created after 2008 by reducing carbon at locations other than the regulated emitters. Thus, entrepreneurs can reduce carbon at a lower-cost location, create and register an offset credit, and then trade that monetized credit to those trying to find the most cost-effective way to cover their carbon emissions in the regulated system. As examined in the chapters that follow, there is significant controversy about the efficacy of offsets, their verification, and where and how these tools can be created and traded.

Regarding renewable energy, the Waxman-Markey legislation would require 6% of retail electricity to come from renewable power sources by 2012, and 20% by 2020. What qualifies as renewable is a controversial subject, as will be explored in chapters that follow. This U.S. system will include an additional requirement to deploy energy efficiency measures to meet 1% of requirements by 2012 and 15% by 2020. These eligible technologies will have to be defined in regulations. Energy efficiency investments constitute an important component of shifting the new electric grid to a more sustainable metric. The almost 30 existing state programs requiring renewable energy in the retail electric portfolios of power sellers will not be preempted by upcoming federal programs. Therefore, there will be differences in renewable and efficiency requirements and what qualifies state by state. These state programs are discussed in the chapters that follow.

Having provided this brief overview of where the U.S. system of carbon regulation is headed for implementation beginning in 2012, the material in this book is not dependent on the eventual shape of still evolving federal programs. Rather, it examines the basic tools and issues accompanying carbon controls both in the U.S. states and worldwide. Europe has five years of experience and history of carbon regulation, and 10 U.S. states even have a year of experience with carbon regulation. It is in this history and experience that the transcendent issues emerge. And from that experience, the tools are fashioned in this toolbox.

The Toolbox Tools

This toolbox focuses on sectors and solutions. Technologies exist in proven application to make an energy transition. It is not a technological conundrum that confronts us—it is the challenge to forge appropriate policy in real time. A transition will require the concerted efforts of policymakers, regulators, industry, nongovernmental organizations (NGOs), and consumers. It truly is global.

This book is a toolbox for those who would regulate carbon and those who would be subject to that regulation. It critiques each of the carbon regulatory schemes in the world at the beginning of the second decade of the 21st century, assessing what is working right and what is malfunctioning with each element. The fissures in the world Kyoto Protocol are analyzed, as are issues with U.S. carbon regulation. Both the emission sources—with a special emphasis on the utility sector—and carbon absorption and conversion by natural forces and forests, are in the toolkit.

The third section of this toolbox focuses on pivotal legal issues of climate change:

- What has gone wrong with the Kyoto Protocol, and how it must be reformed to have any possibility for long-term success
- The new green grid and its implications
- The important issue of border leakage and the U.S. Constitution's Commerce Clause
- Auction of carbon allowances, the U.S. Constitution's Supremacy Clause, and legal preemption

The toolbox is organized into four sections:

1. An analysis of the science and timing of climate change, as well as the critical role of the electric power industry in any viable solution
2. A detailed examination of how carbon regulation is addressed differently in the Kyoto Protocol involving 190 ratifying world nations, the European Union regulation of carbon in 27 developed nations, and the regulation of carbon in 23 U.S. states under four different regulatory systems
3. What has gone legally wrong torquing carbon policy in the Kyoto Protocol, the EU carbon scheme, and U.S. carbon regulation, with particular emphasis on the following:
   - Allowance allocation and carbon auction
   - Leakage of carbon across borders
   - Regulating carbon upstream or downstream in the power industry
   - The role of the new smart grid
   - The new requirement of *additionality* in carbon offset certification
4. The interface of renewable power technologies and carbon control:
   - The role of renewable portfolio standards
   - The alternative of renewable feed-in tariffs
   - The role of forest preservation and natural resources in carbon control
   - The successful world model for development of renewable energy

Cap-and-trade is the regulatory mechanism through which world economies have decided to regulate carbon emissions. Cap-and-trade is the establishment of emissions limits on certain sources, allocation or sale of the legal rights to emit, and the ability of entities to trade for more or less quantity of such allowances. It is the policy alternative to a tax on carbon use or emissions. U.S. Energy Secretary Steven Chu announced that he and President Barack Obama support a simple cap-and-trade system for the United States, which would "integrate" with the systems in the European Union.[3]

But we live in the best of times and in the worst of carbon times. Neither cap-and-trade nor a broad new tax is readily accepted by all stakeholders. The world economic crisis is causing developing areas to second-guess the rate and means of regional GHG reduction. Regional reliance on coal generation has become a sticking point in reducing carbon, both between states and even among differently positioned electric utilities within states.

Auction of allowances is controversial. At issue is whether allowances to emit carbon should be auctioned to highest bidders or allocated to carbon sources without charge,: If allowances to the power sector are allocated, should the allocation metric be determined by historic emissions (which reflects the historic carbon intensity of particular fuels at each source), gross power sales (which ignores the composition of the carbon intensity of generation at each source), or gross revenues from power sales (which could reflect differences among traditionally regulated and restructured utilities, as well as investor-owned or public utilities)?

Stakeholders have threatened or already initiated suits against early adopting East Coast Regional Greenhouse Gas Initiative (RGGI) states, California, and the European Union regarding these brewing disputes. Disputes have occurred between sovereign states and within states, pitting electric utilities and power suppliers against each other. In the 10 U.S. East Coast RGGI states, a suit by Indeck-Corinth against New York's RGGI program was settled by New York, giving the plaintiffs everything they sought in order to prevent the court from reaching the issue of whether RGGI was legal in New York. Ultimately, electricity is more than just the technology of power. Electricity is the signature energy form of the 21st century global economy.

Even where there appears unanimity on climate change, there is less consensus than at first meets the eye. The European Union Emission Trading Scheme (EU-ETS), operating since 2005, includes 85% of all world countries now regulating their carbon emissions. Chapter 6 reveals the pattern of recently escalating EU disputes, which is a prologue for similar schisms that will appear and mature as the United States attempts to craft effective carbon regulation.

Moreover, in times of economic recession, there is worldwide pressure for the carbon regulatory system to morph into a revenue-raising scheme through auction of emission allowances, in contrast to all prior cap-and-trade emission control systems in the world. Contraposed to this element is the possible ecological *tipping point* forecast within approximately five years. The failure of aggressive global warming policy could tip

the world into potentially catastrophic and irreversible consequences from warming.

The policy and regulatory choices made now will sculpt the world response on what has been called the environmental challenge of this century. There is cause for both great optimism, as well as concern. The technologies exist today to change the power generation base. However, since the concept of global warming control was agreed among world powers in 1992, little has been achieved amid a four-fold increase in the rate of global warming gases pouring into the atmosphere.

It is time to examine and choose the correct tools, and get about serious business on climate change. The toolbox opens in the next chapters. Roll up your sleeves and open the part of the toolbox of most interest.

Notes

1 United Nations Conference on Trade and Development. 2001. *Energy Services in International Trade: Development Implications*. TD/B/COM.1/EM.16/2, June 18, sec. 3.

2 Ferrey, Steven and Anil Cabraal. 2006. *Renewable Power in Developing Countries: Winning the War on Global Warming*. Tulsa: PennWell.

3 Carbon Control News. 2008. New DOE Secretary Backs Cap-and-Trade. *carboncontrolnews.com*. January 13.

The Role of Renewable Power

Electric power demand is continuing to increase. At current rates of energy development, energy-related CO_2 emissions in 2050 would be 250% of their current levels under the existent pattern.[6] Unprecedented deployment of renewable energy generation alternatives will be required to alter this trend. The technology exists to accomplish this. The amount of solar radiation reflecting off the Earth is about 1,000 times the Earth's commercial energy use. In fact, no nation uses more energy than the energy content contained in the sunlight that strikes existing buildings every day.[7] The solar energy that falls on roads in the United States each year contains roughly as much energy content as all the fossil fuel consumed in the world during that same year. The estimated U.S. roof area of buildings is almost 70 billion square feet, which could accommodate 710,000 megawatts (MW) of solar photovoltaic (PV), equivalent to peak demand in the United States.

The GHG mix of electric energy sources is within legal control by government policy and incentives. Less renewable energy—by an order of magnitude compared to fossil fuels—is utilized. Total installed capacity of renewable energy power generation, excluding large hydropower, was 142 gigawatts (GW) worldwide, of which 58 GW was in developing countries (see table 3–1). While this installed capacity is but a tiny fraction of the 3,700 GW of total electricity generation capacity, installations of some technologies such as wind and solar photovoltaics are growing at over 25% per year, albeit from a small base. Still, the renewable energy used by humankind on the earth equals only about 0.01% of the total solar energy reaching the earth.[8]

These renewable resources are widely disseminated across the globe. While many nations—particularly developing nations—have no significant fossil fuel reserves of oil, coal, or natural gas, every nation has significant renewable energy in some form (e.g., hydropower, sunlight, wind, agricultural biomass waste, wood, ocean wave power, etc.). This allows for energy independence and provides a resource for domestic economic development. While the commercial and national interests involved in fossil fuel is extremely concentrated, solar energy interests and flows are much more decentralized and diverse. Whether or not governments will divert the fossil fuel vector toward renewable or other low-carbon electric energy deployment, and do so in time to avert global warming, is in part a function of whether there is a clear roadmap on how to navigate the carbon-concerned future of development.

The energy needs of countries outside the OECD will require an investment of some $2 trillion to install approximately 1,900 gigawatts of new electric generating capacity by 2025.[15] The International Energy Agency projected that it will require an investment of $16 trillion by 2030 to meet the world's energy requirements, with $5 trillion of that amount allocated to electric power production, primarily in Asia, Latin America, and Africa.[16] It is expected that global energy use will double by 2040 and triple by 2060, creating a tremendous demand on existing fuel sources.

In a world where burning fossil fuels is the dominant electric energy signature, intensified use of electric power foretells a direct increase in carbon emissions. Some projections estimate that by 2030, China's GHG emissions will quadruple and Asia alone will emit 60% of the world's carbon emissions.[17] To cope with the increased electrification that accompanies the substantial increase in per capita energy use that will occur in developing nations in the next decades, the world may have to achieve a reduction of CO_2 of up to 50% during the 21st century. While increased energy intensity in developing nations may be difficult to control, the future is directly dependent on whether fossil fuels or renewable technologies are chosen now to generate power to meet this new, more intensive electricity demand.

Choice of technology

Thus, the third and the only one of the inputs in the global warming equation that can be influenced dramatically now by policymakers is the choice of technology for electrification and development. There is a policy choice involved between conventional and alternative resources. It is not an either-or choice. There is no small choice of energy infrastructure in shaping the carbon intensity of power production. The balance chosen between conventional and alternative electric resources has immense implications for the emission of greenhouse gases.

The choices for many developing countries are challenging. We stand at a crossroad in time because in the next two decades, there will be a massive electrification of developing nations. During the next decade, developing nations are choosing whether to deploy conventional fossil-fired or sustainable renewable options to generate electricity. Once installed, those facilities will remain in place, contributing to global warming or not, often for 40 years and in many cases longer. These choices in energy technology made now certainly will be the signature of our carbon footprint during the crucial period of the next half-century, during which we may pass the point of no return in terms of global warming.

The CDM apparatus emerged as a last-minute compromise creation at the 1997 Kyoto Conference. It is patterned on the U.S. sulfur dioxide (SO_2) trading experience. The requirement for CDM CERs also includes the certification by the host developing nation that the project supports its goals for sustainable development. Sustainable development has been defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[6] Long-term renewable energy developments clearly satisfy this definition, while many of the other CDM projects that have created CERs may be more questionable. CERs (other than for afforestation) have a 7-year lifetime, with the possibility of two renewals, for a total of 21 years, or, in the alternative, one 10-year lifetime. Some CERs related to forestry projects are deemed temporary for a period up to 60 years, subject to verification on a recurring 5-year basis that burning or logging do not later release carbon from the forest.[7]

CDM projects must be approved by regulatory agencies under the Kyoto Protocol established by the host country. These agencies are known as Designated National Authorities (DNAs). CDM registered projects by host country DNAs are shown in figure 5–1. The Kyoto Protocol process

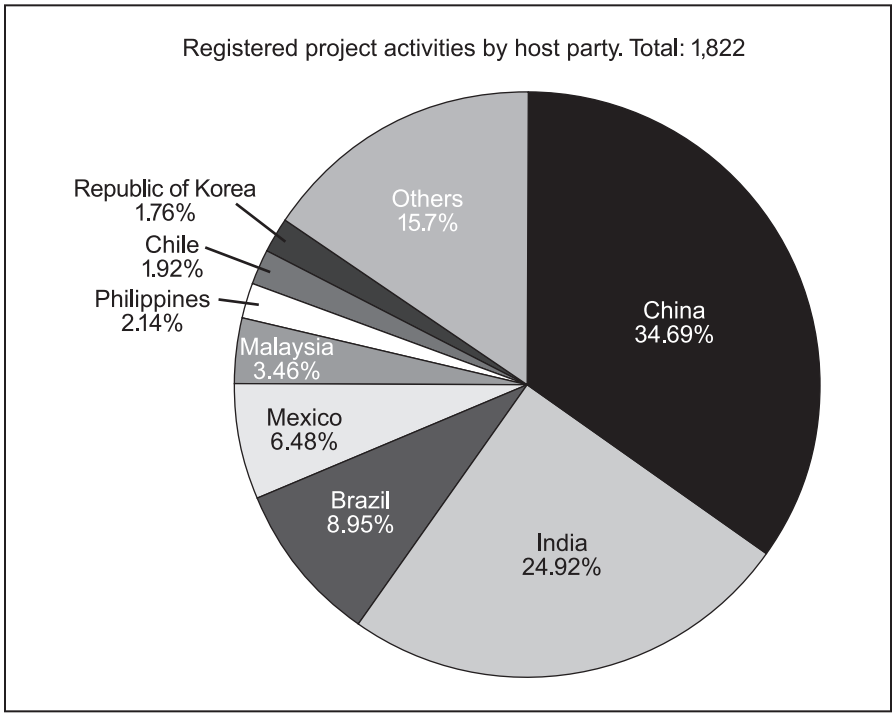

Fig. 5–1. Registered CDM projects with Designated National Authorities by country

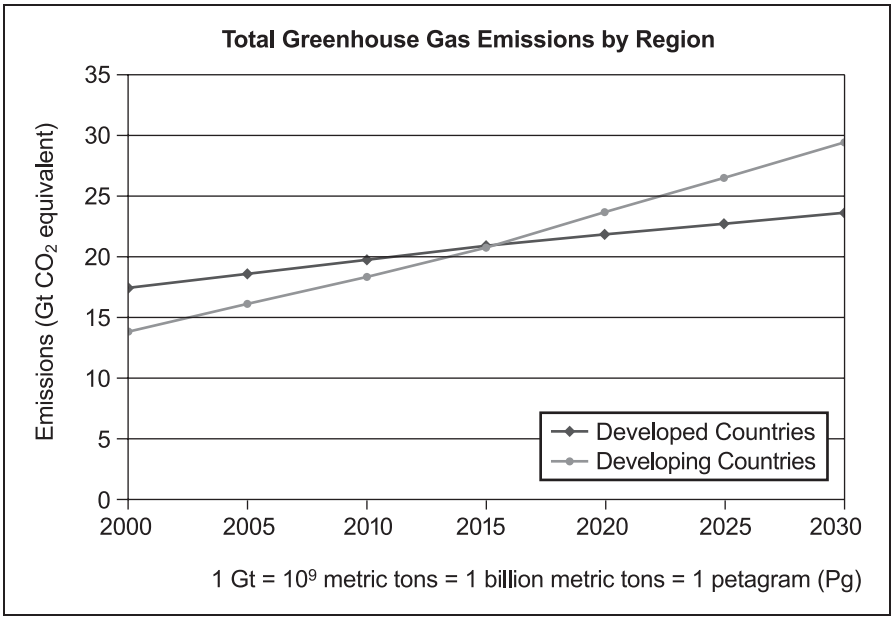

Fig. 6–1. Regional GHG emissions between developed and undeveloped countries

Tensions within the European Union Compared to Plans in the United States

Despite Kyoto and its binding requirements on EU countries, European GHG emissions in industrialized European countries are increasing.[17] Many EU countries are forecast to miss their Kyoto targets, with the exception of two former Soviet countries. Only Russia and Poland among the developed countries covered by the Kyoto Protocol are expected to satisfy their 2010 targets, and this is because of the post-Soviet Union economic collapse in those countries which has shuttered many existing CO_2 emission sources.

Most excess Kyoto allocated emission allowances are held by Russia and Ukraine. These are expected to be in excess of 100 million metric tons of CO_2 equivalent per year.[18] These excess emission allowances are approximately 33% of the validated Clean Development Mechanism emissions reductions as of May 1, 2007. They account for almost one-half the number of CERs expected to be issued assuming a validation estimate error of 27%. Aside from EU countries, Canada and Japan are