

Figure 1. Allocation of carbon dioxide equivalent (CO<sub>2</sub>e) by major source.

## The Carbon Denominator as Currency

### Greenhouse Gases, Global Warming and the Changing Face of Compliance

The predominant compliance legislation in the United States stems from the 1990 Clean Air Act (CAA) and focuses exclusively on Hazardous Air Pollutants (HAPs) and the resulting ambient air quality as monitored by a select grouping of criteria pollutants.

Furthermore, with the exception of CO<sub>2</sub>, no other hazardous or criteria pollutant included in the CAA is listed in the currently recognized and internationally regulated grouping of greenhouse gas (GHG) that either the U.S. Environmental Protection Agency (EPA) or any other government agency lists domestically or internationally.

To date, all compliance regulation in

the United States has solely focused on pollution rather than climate change variables such as GHGs. However, many of the pollutants contained by the CAA are considered by current climate change theory to have an "indirect" effect through "terrestrial and/or solar radiation absorption by influencing the formation or destruction of greenhouse gases," as stated in the executive summary of the recent EPA filing in April 2009 proposing mandatory GHG reporting requirements.

The United States chose not to participate in the Kyoto Protocol and is therefore not included in the 37 industrialized countries and the European Community that have agreed to binding targets that reduce GHG emissions against 1990 levels over the period of 2008 to 2012 in each respective country. Less known,

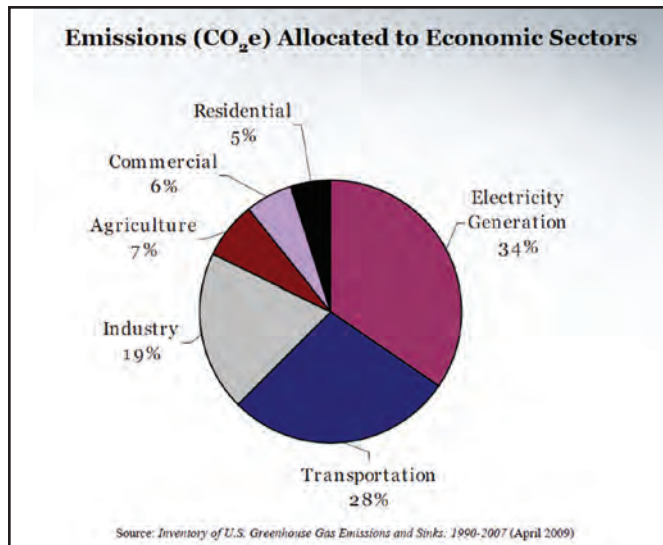
shortly after the inception of the Clean Air Act in 1990, the United States signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The Kyoto Protocol is a key international agreement linked directly to the UNFCCC, and although the United States is not participating currently in the Kyoto Protocol, the U.S. EPA is reporting GHG emissions inventories of the country to the UNFCCC.

There is a fundamental difference between the regulation that exists in the United States under the CAA related to pollution and that which is evolving around GHG emissions and climate change.

Under the CAA, the EPA sets minimum standards for hazardous pollutants that each of the 50 individual states must then promulgate. The EPA and the individual state agencies then monitor air quality to further designate if a particular county within a given state is achieving the minimum air quality standards set by the EPA. Regulation becomes more stringent in any grouping of counties that may be designated non-attainment by the EPA and state monitoring programs. This process of pollution regulation, monitoring and reporting is extremely localized when considering the designation of a non-attainment area within the United States. Furthermore, the process is very specific regarding the connection to monitoring the ambient air to show the causal relationship of the criteria pollutant that is degrading air quality.

While there may be supporting opinions across the globe concerning pollution, in the United States each state is free to meet or exceed the minimum standard set by the EPA, and each state can exercise some self-direction in implementation. An example of this objective and localized effect on pollution control policies can be identified when we view identical equipment operating in different localities within the United States under different regulatory restrictions. The only real centralization of the pollution legislation lies in the minimum mandate the EPA sets

*Brian Kromer is managing director of Infleksion, a firm dedicated to Stationary Markets, and the inventor of the Stationary Model.*



**Figure 2. The EPA allocation of all greenhouse gas (GHG) emissions by economic sectors (2007).**

and the final reporting that each state is required to complete back to the EPA.

Climate change stands in stark contrast to the localized effects of current U.S. national pollution regulations. Rather than localized monitoring within a nation's territorial boundaries, climate change is measured in terms of GHGs and global warming. Although the concept is simple, the connection of GHGs to global warming relies on a very complex model and a newly developing field.

Even though the United States is not a signatory to the Kyoto Protocol, the EPA reports GHG emission data to the United Nations (U.N.). The United Nations subordinates the process to a global collective, as all countries of the planet own and share the consequence of climate change.

The terminology the UNFCCC has chosen to describe changing climate patterns is "anthropogenic," as defined in EPA's 441-page report provided to the United Nations, entitled *Inventories of U.S. Greenhouse Gases and Sinks: 1990-2007*, states that "anthropogenic" refers to "greenhouse gas emissions and removals that are a direct result of human activities or are the result of natural processes that have been affected by human activities (IPCC/UNEP/OECD/IEA 1997)." Furthermore, the GHGs produced by all "human activity" are stated as the direct cause of global warming by the U.N. collective, and said to be the reason action is

needed to avoid irreversible and catastrophic climatic change.

The U.S. EPA-proposed ruling filed in April 2009 targeting mandatory reporting requirements in the United States for GHG emissions will follow Intergovernmental Panel on Climate Change (IPCC) guidelines. IPCC is one of the "imple-

menting agencies" of the United Nations, specifically for the UNFCCC. Furthermore, the proposed EPA GHG ruling utilizes the internationally recognized standard for carbon dioxide equivalency (CO<sub>2</sub>e) as the measure and not CO<sub>2</sub> as would be found in the original pollution regulations of the CAA.

There are basically six GHG categories covered by the Kyoto Protocol, the UNFCCC and the IPCC, three of which are synthetic. The six include carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) with the synthetic GHGs being a range of perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF<sub>6</sub>).

Using CO<sub>2</sub>e or carbon dioxide equivalency allows all six categories of GHGs to be represented in terms of CO<sub>2</sub>. Therefore, the defined target of 25 000 metric tons of CO<sub>2</sub>e in the EPA proposal of April 2009 equates to much less methane (CH<sub>4</sub>), as an example, since it has a global warming potential (GWP) of 21 compared to CO<sub>2</sub>, which is the baseline of GWP and assigned a value of 1. The United Nations and its IPCC affiliate rate all the GHGs in terms of GWP in order for carbon dioxide to become the common denominator. Often, GWP is shortened to "carbon" in the media and political arena.

So, effectively, each of the six GHG categories has a distinct GWP, with CO<sub>2</sub> being the lowest at a unit value of one.

The other GHGs have the following CO<sub>2</sub>e GWP values: nitrous oxide (N<sub>2</sub>O) GWP=271, methane (CH<sub>4</sub>) GWP=21, perfluorocarbons (PFCs) GWP=6000 to 9000, hydrofluorocarbons (HFCs) GWP=1000 to 10 000 and sulfur hexafluoride (SF<sub>6</sub>) GWP=23 900.

Under this system, it is clear that GHG emissions utilize a common denominator based on a "global warming potential" in the form of "CO<sub>2</sub>e" — as ultimately all GHG emissions are stated in equivalent terms of their exact relationship to CO<sub>2</sub> under the IPCC internationally recognized standard unit.

Ironically, it was the same administration in the United States that avoided the Kyoto Protocol, but signed the Omnibus Appropriations on Dec. 26, 2007, which are the exact appropriations that are driving the EPA mandate for GHG emissions reporting. Figure 1 is reproduced directly from the recent EPA report to the UNFCCC on GHG emissions in the United States. This summary of the leading contributors of GHG emissions in the United States, with CO<sub>2</sub> being so dominant, explains the rationale of equating all GHG emissions in terms of their CO<sub>2</sub>e. Figure 2, also reprinted from the EPA report, shows the economic sectors that the EPA attributes all GHG emissions to in the United States.

Carbon, or CO<sub>2</sub>e, is the basis for international, equivalent regulation of all industrialized nations, and it will form the basis for an emerging new currency based on climate change contributions in the form of either a "carbon-based" tax or a "cap and trade" system.

Regardless of the final form of climate change reporting and regulation, the inevitability that they will be adopted appears irrevocable and certain. As the carbon denominator continues to cross cultural and political systems under the auspice of a new global collective in the U.N., it is more a question of when and how rather than if.

Regardless of its merits, the global warming argument has long been decided in the court of public opinion. Most likely, it is that same public who will ultimately absorb the burden of regulation in the form of higher costs. ☛