

# Energy primer for environmental professionals



**By Eileen D. Millett**

As we proceed into the 21st century, in order to properly serve corporate clients, environmental professionals must have a basic understanding of the often confusing web of terminology and information that surrounds the energy revolution. Climate change is the new “threat” and “sustainability” is the new watchword for corporate responsibility. Propelled by the specter of impending regulation and control, corporations are scrambling to get a handle on the future compliance landscape.

This fall, Congress is requiring the U.S. Environmental Protection Agency to issue regulations for “mandatory” reporting of greenhouse gas (GHG) emissions for all sectors of the nation’s economy.

Reporting will undoubtedly be the first step in developing limitations for GHG emissions. The European Union already has legislation that requires countries to set carbon emissions limits on certain industries, and a robust trading program in carbon credits to meet those limits is under way. States like New Jersey and New York have already moved forward with their own voluntary initiatives. A cooperative consortium of northeast and mid-Atlantic states has scheduled its first auction of carbon credits this fall. As the pace of initiatives to address global climate change increase, those connected to the environmental arena cannot be fully informed without knowing some energy basics. This article provides that needed introduction.

## **What are the basics?**

### **1. What is climate change?**

Climate change refers to any significant change in measures of climate that include the following elements: temperature, precipitation and wind. Human activity and our dependence on energy sources directly contribute to changes in the earth’s atmosphere and climate.

### **2. What are our current sources of energy?**

Our energy currently comes from three main sources, all of them fossil fuels: coal, oil and

natural gas. These non-renewable sources account for two-thirds of the electricity currently generated in the United States. Just over half the electricity in America is generated by coal, and 30 percent of the carbon dioxide in the atmosphere comes from coal.

### **3. Why should the average consumer be educated about energy issues?**

With increasing energy demands and our over-dependence on fossil fuels, we face the impending depletion of our current energy sources and the increasing demand for alternative energy sources. An even more immediate concern is the recognition that GHG emissions are at the core of climate change.

## 4. What are greenhouse gases?

Greenhouse gases are those present in the atmosphere that allow sunlight to enter freely and strike the earth's surface. Some of this sunlight is reflected back toward space as infrared radiation. The same gases that allow sunlight to enter the atmosphere also absorb this infrared radiation and trap the heat in the atmosphere. This process of warming the earth's surface is commonly referred to as the greenhouse effect. Greenhouse gases, such as carbon dioxide, are essential to maintaining the earth's temperature; however, the excess greenhouse gas in the atmosphere gives rise to global warming.

## 5. What are some alternative sources of energy?

Wind, solar, biomass, nuclear, liquefied natural gas and synthetic fuel are all alternative sources of energy.

Wind power is a promising, clean, cheap and abundant source of energy harnessed by several-hundred windmills operating together in wind farms in open areas with steady winds or simply a single giant windmill.

Solar power is derived from photovoltaic cells that convert sunlight into electricity without the harmful effects of carbon dioxide emissions.

Biomass refers to all the biological material in an area, from trees to algae. It offers an available and renewable local source of energy. Biomass fuels today generate roughly 3 percent of the energy we consume in this country. It has been the largest renewable energy source since 2000.

Nuclear energy/power comes from splitting uranium or plutonium atoms. Generating electricity from nuclear fuels can be a solution for carbon neutrality and an alternative to fossil fuels, because it does not emit carbon

dioxide. Nuclear energy, however, can pose risks to both human health and the environment, owing to the lack of permanent storage areas for waste.

Liquefied natural gas (LNG) is natural gas that has been converted to liquid form in order to transport natural gas to markets. The liquefaction process reduces its volume, making it much more cost-efficient to transport over long distances. Although it requires energy to liquefy and transport it, LNG is still superior to fuel oil or coal because of its lower carbon emissions.

Synthetic fuel is created through a coal-to-liquid fuel process, commonly called clean-coal energy. Known as the Fischer-Tropsch process, it is achieved by heating coal and steam, which in turn produce carbon monoxide and hydrogen gases. These are converted into liquid by passing through a metallic catalyst such as iron or cobalt. Although promising, this coal-to-liquid process is not without fault, as it does emit greenhouse gases.

## 6. Why should we be concerned about our carbon emissions?

Carbon emissions contribute directly to the continuing growth of GHGs in the atmosphere. Concentrations of carbon dioxide in the atmosphere are naturally regulated and recycled by processes collectively known as the carbon cycle. This cycle is described as the movement of carbon between the biosphere, atmosphere, oceans and geosphere, dominated by natural processes such as plant photosynthesis. While these natural processes can absorb some of the anthropogenic carbon dioxide emissions produced each year, the excess of such carbon emissions disturbs the natural regulation of the carbon cycle. The resulting imbalance between carbon emissions and absorption has caused an increase in the ratio of carbon dioxide molecules to

oxygen molecules in the atmosphere, resulting in a net effect of oxygen depletion in the atmosphere.



## Understanding the technical

### 7. How do carbon emissions from coal compare to oil and gas?

Coal accounts for 30 percent of America's carbon dioxide emissions, and the amount in the atmosphere is increasing faster than predicted. Even so, coal still produces less carbon dioxide emissions than oil. Natural gas burns more cleanly and produces less greenhouse gas than both coal and oil.

### 8. What is the carbon content of a fuel? How is carbon dioxide measured?

Whenever a fossil fuel is expended, energy and carbon dioxide are produced. This measure of carbon dioxide is known as the carbon content. Carbon dioxide is measured in metric tons or pounds.

### 9. What is a carbon footprint?

A carbon footprint is a measure of the amount of carbon dioxide and other greenhouse gases emitted through the combustion of fossil fuels as a result of an individual's or a business enterprise's everyday operations. Accordingly, every business, corporation and individual has a carbon footprint.

### 10. What is carbon neutrality?

Carbon neutrality refers to bringing one's net emissions of the greenhouse gas to zero. This can be brought about by

balancing the amount of carbon released with the amount sequestered or impounded. Take the concept of building a coal plant that captures and stores carbon dioxide. Such a plant could have zero emissions because the coal would be turned into gas and processed to produce hydrogen and carbon dioxide. The hydrogen, a pollution-free fuel, would be burned, and the CO<sub>2</sub> pumped underground for permanent storage.

### 11. What is the carbon cap and trade system?

The carbon cap and trade system allows companies to trade pollution credits by seeking to limit carbon emissions through the purchase and sale of allowances in the marketplace. Under this type of system, companies that have reduced emissions beyond the amount limited by a government are awarded permits or pollution credits for allowable carbon dioxide emissions. A carbon trading market — or cap and trade system — works much as any commodities market does, except that traders earn their fees selling a ton of carbon dioxide instead of corn or copper. Those who agree to reduction targets are given credits or permits for allowable carbon dioxide emissions by retrofitting a factory and selling their permits for a profit or continuing to pollute and buying additional units of carbon dioxide on the open market.

### 12. What is RGGI?

The Regional Greenhouse Gas Initiative (RGGI) is an agreement among the governors of 10 northeastern and mid-Atlantic states to reduce carbon dioxide emissions from power plants. The RGGI states are committed to capping and then reducing the amount of carbon dioxide that certain power plants are

allowed to emit, thereby limiting the region's total contribution to atmospheric greenhouse gas levels. Participating states will require each generating facility obtain a RGGI allowance for each ton of carbon emitted; in other words, each ton of carbon dioxide will constitute an allowance. Generators will have to have enough allowances to match the amount of their CO<sub>2</sub> emissions, in a ratio of one allowance per ton of CO<sub>2</sub> emitted. States have several options for deciding how to distribute the carbon allowances. Among them are: distributing the allowances free of charge based on historic emissions, distributing the allowances free of charge based on electricity generation output, and auctioning the allowances to generators and using the auction revenue for some public purpose. The first auction will take place in September and they will occur approximately quarterly thereafter. (New Jersey will participate in the auctions scheduled for September; New York will not be ready to participate until December). It will fight global warming by cutting GHGs from power plants. This will cause older, less-efficient plants with higher emission levels to pay more to comply with RGGI than newer, more-efficient units. If RGGI works as intended, by 2015 carbon dioxide emissions from power plants are expected to be 16 percent lower using 1990 emissions levels as a baseline.

### 13. What is ISO and how does it work?

ISO is independent system operator, the electric operator for a given region, that buys and sells electric power on wholesale spot markets. The

New York Independent System Operator (NYISO) is a not-for-profit corporation regulated by the Federal Energy Regulatory Commission. It manages New York's electricity transmission grid — a 10,775-mile network of high-voltage lines that carry electricity throughout the state. NYISO also oversees wholesale electricity markets.

### 14. What is meant by demand response technology?

The demand response technology system is meant to take pressure off the local power grid when it is at capacity in order to manage the nation's taxed power supplies. Utilities and their customers save money by selectively curbing demand when the grid is at capacity. Under this scheme, utility systems pay companies to cede control of their electrical systems during moments of unusually high demand by notifying the operators of demand-response systems that it's time to start shutting down the lights remotely. For example, in a store like Shop & Stop, in times of peak demand, air conditioning and even refrigeration systems can be shut down by a computer in Boston 200 miles away.

### 15. What is meant by sustainability in business?

Sustainability means adopting ethical corporate practices that recognize the need and desire to grow without damaging future generations' prospects. Business operations and goals are thus inseparable from social and environmental considerations, i.e., the failure to account for social and environmental impacts would make business practices unsustainable.

LEED, Leadership in Energy and Environmental Design, is an example of an integrated approach to sustainable development. The LEED Green Building Rating System is a third-party certification process, and the nationally accepted benchmark for the design, construction and operation of high-performance green buildings.



## Most recent cases/laws and its impacts

### 16. What was the Supreme Court's ruling against the EPA in a case involving regulating carbon dioxide?

On April 2, 2007, the U.S. Supreme Court rejected the EPA's argument that it had no authority to control GHG emissions from cars and trucks under the Clean Air Act. The court ruled the EPA has the statutory authority to regulate the emission of GHGs from new motor vehicles because the Clean Air Act's broad definition of "air pollutant" includes greenhouse gases. Environmental groups and states that had petitioned the EPA to control emissions from cars and trucks hope this decision will further the goal of curbing GHG pollution. On the flip side, the auto industry and some of its backers are disappointed by the outcome, but may now find new affection for proposals in Congress for a cap-and-trade system to aid emissions control. This ruling once again reminded Congress of the need to enact comprehensive climate legislation and

encourages states to set their own emissions standards that require a waiver from the EPA.

### 17. Has there been any movement on a national greenhouse gas cap and trade program?

By virtue of a new congressional directive, the EPA is now required to issue regulations for mandatory reporting of GHG emissions above appropriate thresholds in all sectors of the U.S. economy. It must issue a proposed rule by September and a final rule by June 2009. Under current law, only steam-generating electric utilities are subject to any form of mandatory GHG reporting at the federal level. Under this new mandate by Congress, it appears that tens of thousands of all types of facilities and other sources may be regulated, as the mandate is to reach "all sectors" of the economy.

### 18. Why did California seek a waiver from the EPA?

On May 21, 2005, California requested a waiver of pre-emption from the EPA under the Clean Air Act. Under the law, California has the right to set its own vehicle emission standards upon receipt of an EPA waiver that would allow the state to write tougher standards for GHG emissions from cars and trucks than those mandated by federal law. California's emissions standards would have forced automakers to cut GHG emissions 30 percent in cars, trucks and sport utility vehicles by 2016. The EPA denied California's request last December, after having granted the state more than 50 previous waivers.

## 19. How did a federal court rule on the Bush administration's fuel economy standards?

On Nov. 15, 2007, the 9th U.S. Circuit Court of Appeals in San Francisco rejected the Bush administration's year-old fuel economy standards for 2008-2011 model year vehicles. Under these standards, the average fuel economy of light trucks was to rise to 23.5 miles per gallon in 2010, up from the current 22.5 miles per gallon, but still well below the current standard for passenger cars of 27.5 miles per gallon. The court directed the Transportation Department to produce new rules, taking into account the value of reducing GHG emissions. Stricter rules would increase costs for manufacturers and therefore increase the price of vehicles.

## 20. How many states have laws that require utilities to obtain a certain quota of the power they sell from renewable resources?

Twenty-five states have laws that require utilities to obtain a certain quota of the power they sell from renewable resources.

## 21. How can energy alternatives like solar, wind and nuclear biomass compete with coal or natural gas?

Congress can put a price tag on GHG emissions and allow energy alternatives like solar, wind and nuclear biomass to compete with coal or natural gas by requiring industries to pay for carbon emissions.

## 22. What are CAFE standards?

CAFE, or corporate average fuel economy, standards are proposed federal regulations intended to improve the average fuel economy of cars and

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light trucks sold in the United States. These federal regulations are intended to improve the average fuel economy by forcing automobile manufacturers to raise fuel efficiency on all cars by setting composite mileage goals and to speed their development of lighter, more fuel-efficient vehicles.

## 23. What is the proposed new federal energy legislation?

The Energy Independence and Security Act is proposed federal energy legislation that will raise fuel economy standards of cars, light trucks and sport utility vehicles sold in the United States. It specifically requires automakers to meet a 35-mile-per-gallon fleet-wide standard, a 10-mile-per-gallon increase over current levels, by 2020. Although the new law does not address carbon dioxide emissions, it is inferred that those would be reduced as cars were forced to become more fuel-efficient. Full implementation of this compromise will save approximately 1.1 million barrels of oil a day in 2020. That's half of what the United

States currently imports from the entire Persian Gulf. As a result, American consumers will save \$22 billion in 2020 — after paying the cost of the necessary fuel economy technology. This new energy legislation requires automakers to raise CAFE standards so that cars and trucks are capable of achieving an average of 35 miles per gallon by model year 2020.

## 24. What is Ceres and how is it related to INCR?

Ceres is a national network of investors, environmental organizations and other public-interest groups working with companies and investors to address sustainability challenges such as global climate change. It coordinates the Investor Network on Climate Risk (INCR), a group of leading institutional investors, which embodied a 10-point action plan calling on U.S. companies, Wall Street firms and the Securities and Exchange Commission to intensify efforts to provide investors with comprehensive analysis and disclosure about the financial risks and opportunities presented by climate change.

## 25. What does the ratification of the Kyoto Protocol by the European Union (EU) mean for the United States?

In 1997, the EU signed the Kyoto Protocol requiring that only industrialized nations reduce their production of GHG beginning in 2008. By doing so, the EU and all its member states reaffirmed their commitment to pursuing multilateral solutions to issues of global concern. The EU continues to urge the United States to participate in the global framework for addressing climate change. By failing to adopt a significant

international agreement for the reduction of GHGs, the United States may arguably have an advantage over European companies that are subject to its compulsory constraints, but in reality the United States is impeding any progress toward a successful global solution.

Governments should not only be encouraging corporations to acknowledge that they bear responsibility for energy consumption; that same message should be relayed to individuals. Currently, market forces and individual states are filling the leadership vacuum. Increasingly, states are recognizing the need to set requirements for renewable power. This could be a response to recognizing the global warming phenomena or it could simply be a common-sense recognition of dwindling energy supplies. ☉



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