



POLICY ANALYSIS

The Feasibility of Greenhouse Gas Reporting

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THE FEASIBILITY OF GREENHOUSE GAS REPORTING

This brief assesses the practicality of reporting greenhouse gas (GHG) emissions, as might be required under Title XI in the Energy Policy Act of 2002 (H.R.4), as passed by the Senate. To summarize:

- Most GHG emissions either are already being monitored or could be calculated from readily available information. Title XI would leave to the Administration the decision of whether to require new monitoring, rather than calculation, of GHG emissions.
- Carbon dioxide (CO₂) from the burning of fossil fuel (e.g., coal, oil, and natural gas) accounts for most U.S. GHG emissions. Power plant emissions, which account for 34% of U.S. GHG emissions, are already being reported. Measurement and verification standards could be established to allow other combustion-related CO₂ emissions to be calculated by multiplying the amount of fuel consumed by emission factors.
- Many other sources of GHGs already report to federal and state agencies under both regulatory and voluntary programs, though not in a coordinated or comprehensive manner.
- The GHG emissions associated with the current sales of certain products can be estimated from readily available information. This includes emissions from highway vehicles, which account for 20% of total U.S. GHG emissions.
- Agency guidance would be useful in reducing the complexity associated with certain aspects of reporting, such as the question of who reports for facilities owned or controlled by multiple parties.
- As with other reporting programs, once entities gain experience with GHG reporting, they find ways to reduce costs, improve accuracy, and reduce uncertainty.

Introduction

Over the past several decades, the scientific community has arrived at a consensus that human activities (fossil fuel combustion, some land use practices, and some industrial processes) contribute to global climate change through the emission of greenhouse gases (GHGs). Title XI of the Senate-passed Energy Policy Act of 2002 (H.R.4) would establish a National Greenhouse Gas Database consisting of an inventory and registry of GHG emissions and emission reductions. The gases reported would be carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆), with additional gases included if recommended by the National Academy of Sciences and then added by regulation.¹

¹ For more information on how these gases contribute to global climate change, see Wigley (1999).



Reporting to the database would be voluntary for at least five years. If in that time more than 60 percent of U.S. GHG emissions were being reported, reporting would remain voluntary. Otherwise, mandatory reporting would be “triggered” for the largest GHG emitters.

GHG reporting is expected to have several benefits. Entities would measure and report their GHG emissions in a clear and transparent manner. The resulting data would enhance understanding of GHG emissions and reduction options, and highlight opportunities to reduce energy use and eliminate other types of waste. Disclosure of GHG emissions would also likely provide reporting entities an incentive to reduce emissions voluntarily, as has occurred under programs requiring disclosure of the release of toxic chemicals. This incentive is further enhanced by the opportunity to register verified emission reductions as transferable credits and allow those reductions to “be applied. . . toward a federal requirement. . . imposed on the entity for the purpose of reducing greenhouse gas emissions.” (See Section 1104(c)(3) of Title XI.)

This brief discusses the practicality of two types of reporting under Title XI, in the event that reporting becomes mandatory: reporting of direct entity-wide GHG emissions and reporting of GHG emissions from products. Under Title XI, the agencies responsible for implementation could require reporting on additional emissions categories: examples include indirect emissions from imported electricity, heat, or steam; and process and fugitive emissions. Because the additional categories would be left to the discretion of the agencies and are not defined in the bill, this analysis addresses only the two explicitly defined reporting categories. It should be noted that a requirement to report these additional emissions categories could add significant complexity to a mandatory reporting obligation in certain cases. Consequently, agency guidance to resolve any complexities emerging from these additional reporting categories would be desirable.

Reporting of Direct Entity-Wide Emissions

Section 1105(c)(1) of Title XI would require each entity that participates in the database to report its entity-wide GHG emissions—i.e., the sum of emissions from its facilities and from fleets of more than 20 motor vehicles.

Facility-level measurement of GHG emissions should be straightforward. Many companies already report facility-level GHG emissions to federal and state agencies² under a variety of regulatory and voluntary programs that have not proved to be excessively costly or burdensome. GHG emissions could be estimated through the use of emission factors and fuel or process inputs, or directly monitored. Unlike current reporting for many pollutants, the measurement and verification standards to be set by the

² Wisconsin has required all facilities releasing more than 100,000 tons of CO₂ annually to report since 1993. Many smaller facilities have reported voluntarily, including a wide range of industries and some smaller sources, such as a pizza company and medical facilities. Rabe (Forthcoming).

implementing agencies under Section 1106 need not require the monitoring of GHG emissions.

CO₂ Emissions from Combustion Processes

Most direct CO₂ emissions result from the combustion of fossil fuels for heat, transportation, or electricity generation. Most electric power plants already report their CO₂ emissions to the Environmental Protection Agency (EPA), representing 34 percent of total U.S. GHG emissions.³ In addition, some 20,000 manufacturing establishments regularly report fossil fuel usage to the U.S. Census Bureau. Emissions of CO₂ resulting from the use of fossil fuels to produce heat and power can be determined easily and accurately. During combustion of fossil fuels for energy, over 99 percent of the carbon in the fuel is converted to CO₂.⁴ To calculate emissions, all that is required is to know the amount of each fossil fuel used, and the appropriate emission and conversion factors.⁵

Non-Combustion-related CO₂ and other GHG Emissions

For non-CO₂ GHG emissions⁶ and other industrial sources of CO₂, an understanding of the emission pathway and relevant material inputs is required. However, many industrial sources of these gases already report under a variety of programs. Deep underground coal mines whose ventilation systems emit detectable levels of CH₄ (greater than 50 ppm) have their emissions monitored and recorded by the Mine Safety and Health Administration, covering almost 100 percent of these emissions (EPA, 2002). Similarly, 8 of the 9 aluminum producers report their PFC emissions and 45 percent of electric power producers report their SF₆ emissions to EPA under voluntary programs. In addition, over 90 percent of SF₆ emissions from the magnesium industry, and over 70 percent of PFC emissions from the semi-conductor manufacturing industry are already reported to trade groups that aggregate the information and provide it to EPA.⁷

A multi-stakeholder collaboration led by World Resources Institute (WRI) and the World Business Council on Sustainable Development (WBCSD) has developed a free, comprehensive, and publicly available protocol to assist entities in determining their GHG emissions. The protocol includes easy-to-use calculation tools (WRI and WBCSD, 2002) for facility-level emissions that consist of downloadable spreadsheets and accompanying instructions. These tools automate the calculation of facility-level GHG

³ The reporting of CO₂ is required under Section 821 of the Clean Air Act Amendments of 1990.

⁴ EPA (2002), Annex 1 (Table A14), pp. 233-250.

⁵ Tables of emission factors and useful conversion formulas are given in EPA (2002) and EIA (2001).

⁶ Non-CO₂ emissions can be quickly converted from a mass to a CO₂E basis using internationally defined global warming potentials or GWPs (IPCC, 1996).

⁷ National voluntary climate protection programs that involve GHG emissions reporting include: the SF₆ Emissions Reduction Partnership for the Magnesium Industry; the SF₆ Emissions Reduction Partnership for Electric Power Systems; the Voluntary Aluminum Industrial Partnership (emissions of PFCs); the PFC Reduction/Climate Partnership (emissions of PFCs, SF₆, HFC-23, and NF₃); and the HCFC-22 Producers Partnership Program (HFC-23).



emissions, enabling any facility to determine its GHG emissions using readily available and familiar information on material inputs, outputs, and processes.

Table 1 lists major sources of U.S. GHG emissions by gas and sector.

**Table 1: Major Sources of GHG Emissions by Gas and Sector:
Total Emissions and Percentage of U.S. Total**

| GHG and Sector | 2000 Emissions ⁸ (Mt CO ₂ E) | % of U.S. Total |
|--|---|-----------------|
| CO₂ | 5,840 | 83.4% |
| Fossil Fuel Combustion | 5,623 | 80.3% |
| Electricity Production | 2367 | 33.8% |
| Transportation | 1796 | 25.6% |
| Industrial (exclusive of electricity) | 835 | 11.9% |
| Residential (exclusive of electricity) | 381 | 5.4% |
| Commercial (exclusive of electricity) | 245 | 3.5% |
| Iron and Steel Production | 66 | 1.1% |
| Cement Manufacture | 41 | 0.7% |
| CH₄ | 615 | 8.8% |
| Landfills | 204 | 2.9% |
| Natural Gas Systems | 116 | 1.7% |
| Coal Mining | 61 | 0.9% |
| N₂O | 425 | 6.1% |
| Mobile Sources | 58 | 0.8% |
| HFCs, PFCs, and SF₆ | 121 | 1.9% |
| Ozone Depleting Gas Substitution | 58 | 1.7% |
| HCFC-22 Production | 30 | 0.8% |

Note: Only source categories that contribute at least .5% to total U.S. GHG emissions are shown. Agricultural sources of GHG emissions are not shown as they are excluded from reporting under Title XI of the Senate-passed Energy Policy Act of 2002 (H.R.4).
Source: EPA, 2002.

⁸ Offsets from sinks are not included.

Reporting of GHG Emissions From Products

Section 1105(c)(1) of Title XI also would require each entity that participates in the database to provide an estimate of GHG emissions from fossil fuel combusted by products manufactured or sold by the reporting entity in the previous calendar year.

This reporting would be easier for some products than for others. Estimating the GHG emissions of motor vehicles sold in the United States, for example, would be relatively easy, and reports on emissions from vehicles sold would contribute extremely useful information to the database. Emissions from the transportation sector are responsible for 26 percent of U.S. emissions and are rising more rapidly than those of any other sector. Lifetime vehicle emissions could be calculated from readily available information about mileage per gallon of fuel and average miles traveled per year for each new vehicle sold in the United States. This calculation would be made even easier if the implementing agencies provided guidance on estimation methodology and emission factors.

Similarly, reporting could be straightforward for new products sold in the United States for which the Department of Energy (DOE) has established efficiency standards. The DOE standards could form the basis for reporting guidance and allow emissions from these products to be included in a reporting mechanism.

Other products that combust significant quantities of fossil fuels include industrial heat boilers and other products with internal combustion engines. Reporting for these and other products' emissions would be somewhat more complex, and agency guidance would be desirable.

The Benefits of Experience

As with other reporting programs, once entities gain experience with GHG reporting, they find ways to minimize costs, improve accuracy, and reduce uncertainty. Also, to the extent that GHG emission credits become more valuable in the private market, entities will have an incentive to invest in more accurate estimates. Because of the current experience in estimating CO₂ emissions from combustion, uncertainties related to these measurements are fairly well defined in many cases. However, the uncertainty and accuracy of other industrial GHG emission estimates vary by gas and source. Uncertainties may stem from poor models of emission processes, ranges or uncertainties in emission factors, and uncertainties in input data.

While entity-wide emissions can be calculated through the aggregation of facility-level emissions, some large companies might have to resolve complex issues such as those arising from divestitures, acquisitions, and multi-party ownership and control of facilities. Should reporting become mandatory, additional costs could arise in association with an entity's internal process for ensuring compliance; however, the costs associated with these challenges should decline with experience, and agency guidance could be helpful in minimizing reporting burdens.

Conclusions

Reporting of GHG emissions in Title XI of the Senate-passed Energy Policy Act of 2002 (H.R. 4) would be based on the aggregation of facility-level emissions to the entity level and reporting of combustion-related CO₂ emissions from products. Monitoring would not necessarily be required. For facilities not electing to monitor, direct facility-level GHG emissions could generally be established with readily available data and calculation tools. Moving from facility-level to entity-wide reporting and reporting of product emissions could be facilitated by agency guidance. Such guidance would be consistent with current bill provisions calling for agencies to minimize measurement and reporting costs for entities.

For further reading regarding: the emerging international GHG trading market, see Rosenzweig, et al. (2002); GHG inventory issues, see Loreti, et al. (2000); and GHG verification issues, see Loreti, et al. (2001). For information about how six major U.S. companies (ABB, Entergy, IBM, Shell, Toyota, and United Technologies) have developed emissions inventories and adopted emissions reduction targets, see Margolick and Russell (2001).

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