1. Voluntary Reporting 2001: An Overview

Introduction

The Energy Policy Act of 1992 (EPACT) directed the U.S. Department of Energy (DOE), with the Energy Information Administration (EIA) as the implementing agency, to develop a program to document voluntary actions that reduce emissions of greenhouse gases or remove greenhouse gases from the atmosphere (see box on page 2).[1] The Voluntary Reporting of Greenhouse Gases Program was developed in cooperation with DOE's Office of Policy and International Affairs and the U.S. Environmental Protection Agency (EPA). In addition to providing recognition for entities that reduce greenhouse gas emissions or sequester carbon voluntarily, the program serves to identify innovative and effective ways of reducing emissions.

This report presents information on the eighth reporting cycle of the Voluntary Reporting Program, which accepted reports including information on emissions, emission reductions, and carbon sequestration activities through 2001. The report is divided into eight chapters. This chapter provides an overview of participation in the Voluntary Reporting Program, a perspective on the composition of activities reported, and a review of some key issues in interpreting and evaluating achievements associated with reported emission mitigation initiatives. Chapters 2 through 6 provide a more detailed review of project-level emission reduction initiatives reported to the program. Chapter 2 examines projects in the electricity sector that reduce carbon dioxide emissions through thermal efficiency improvements or switching to lower emitting fossil fuels. Chapter 3 considers improvements in end-use efficiency and fuel switching in the residential, commercial, industrial, and transportation sectors.

Activities to improve or expand carbon sinks through such activities as reforestation, afforestation, and forest preservation are the subject of Chapter 4. Emission reduction initiatives associated with methane and halogenated substances are examined in Chapters 5 and 6, respectively. Chapter 7 reviews emissions reports from participants who provided data on aggregate entity emissions. Chapter 8 summarizes information on emission reductions and carbon sequestration projects reported in brief on the short form (Form EIA-1605EZ). Appendixes (available on web site *http://www.eia.doe.gov/oiaf/1605/vrrpt/index.html*) provide information on the development and structure of the data collection instrument, a discussion of issues in the interpretation of the data, and tabular summaries of the participating reporters and the information they reported.

The reports submitted to EIA are compiled into a database that can be obtained on CD-ROM by contacting the Voluntary Reporting of Greenhouse Gases Program Communications Center at 1-800-803-5182 or downloaded from EIA's web site at *http://www.eia.doe.gov/oiaf/1605/database.html*.

Benefits of the Voluntary Reporting Program

The Voluntary Reporting Program is unique among the many voluntary programs initiated during the early 1990s in its diversity of project types, participation, and approaches. The Voluntary Reporting Program's database provides abundant examples of the types of concrete actions that organizations can undertake to reduce greenhouse gas emissions. Some of the most important benefits of the Voluntary Reporting Program are:[2]

- The program has served to teach staff at many of the largest corporations in the United States how to estimate greenhouse gas emissions and has educated them on a range of possible measures to limit emissions.
- The program has helped to provide concrete evidence for the evaluation of activities reported to the many government voluntary programs launched since 1993.
- Reporters have been able to learn about innovative emission reduction activities from the experiences of their peers.

[1]Title XVI of the Energy Policy Act, Public Law 102-486 (October 24, 1992), in Section 1605(a) called for an annual report on national aggregate emissions of greenhouse gases. EIA has issued the report—*Emissions of Greenhouse Gases in the United States*—every year since 1993. Section 1605(b) called for the establishment of a database of annual emissions and reductions of emissions reported on a voluntary basis.

[2]Testimony of Jay Hakes, former EIA Administrator, on March 30, 2000, before the Senate Committee on Energy and Natural Resources on Senate Bills S.882 and S.1776 and their potential impacts on EIA's Programs. The full text of the testimony is available on EIA's web site at www.eia.doe.gov/neic/speeches/hrtest3-30-00/testimony3.htm.

- The program has created a "test" database of approaches to emission reductions that can be used to evaluate future policy instruments aimed at limiting emissions.
- The program has helped to illuminate many of the poorly appreciated emissions accounting issues that must be addressed in designing any future approaches to emission limitations.

Who Reported?

Reports for the 2001 data year were received from 228 participants in 25 different industries or services (defined by the two-digit Standard Industrial Classification code), fewer than the 30 different industries represented among 2000 reporters. In comparison, reports for the 1994 data year—the first year of the program—were received from 108 participants in 9 different industries or services (Table 1).

In the early years of the program, reporting was dominated by the electric power sector. In the first reporting year (data year 1994), the 95 submissions from electric power producers represented 88 percent of the 108 reports received (Figure 1). Since then, the program has seen an influx of new participants from outside the electric power sector, representing a diverse set of other industries. In addition, the ongoing restructuring of the electric power industry has been accompanied by several mergers and acquisitions involving reporters to the program, reducing the number of reports received from electricity producers. As a result, only 45 percent of the organizations reporting to the program for data year 2001 were from the electric power sector.

The Energy Policy Act of 1992, Sections 1605(b) and (c)

(b) Voluntary Reporting.—

(1) ISSUANCE OF GUIDELINES.—Not later than 18 months after the date of the enactment of this Act, the Secretary shall, after opportunity for public comment, issue guidelines for the voluntary collection and reporting of information on sources of greenhouse gases. Such guidelines shall establish procedures for the accurate voluntary reporting of information on—

(A) greenhouse gas emissions—

(i) for the baseline period of 1987 through 1990; and

(ii) for subsequent calendar years on an annual basis;

(B) annual reductions of greenhouse gas emissions and carbon fixation achieved through any measures, including fuel switching, forest management practices, tree planting, use of renewable energy, manufacture or use of vehicles with reduced greenhouse gas emissions, appliance efficiency, methane recovery, cogeneration, chlorofluorocarbon capture and replacement, and power plant heat rate improvement;

(C) reductions in greenhouse gas emissions achieved as a result of—

(i) voluntary reductions;

(ii) plant or facility closings; and

(iii) State or Federal requirements; and

(D) an aggregate calculation of greenhouse gas emissions by each reporting entity.

Such guidelines shall also establish procedures for taking into account the differential radiative activity and atmospheric lifetimes of each greenhouse gas.

(2) REPORTING PROCEDURES.—The Administrator of the Energy Information Administration shall develop forms for voluntary reporting under the guidelines established under paragraph (1), and shall make such forms available to entities wishing to report such information. Persons reporting under this subsection shall certify the accuracy of the information reported.

(3) CONFIDENTIALITY.—Trade secret and commercial or financial information that is privileged or confidential shall be protected as provided in section 552(b)(4) of title 5, United States Code.

(4) ESTABLISHMENT OF DATA BASE.—Not later than 18 months after the date of the enactment of this Act, the Secretary through the Administrator of the Energy Information Administration shall establish a data base comprised of information voluntarily reported under this subsection. Such information may be used by the reporting entity to demonstrate achieved reductions of greenhouse gases.

(c) Consultation.—

In carrying out this section, the Secretary shall consult, as appropriate, with the Administrator of the Environmental Protection Agency.

Table 1. Forms Filed by Standard Industrial Classification, Data Years 1994-2001
(Number of Reports)

SIC Code[a]	Description	Data Year							
		1994	1995	1996	1997	1998	1999	2000(R)	2001
01	Agricultural Production: Crops	0	0	0	0	1	0	0	1
08	Forestry	1	2	1	1	3	3	1	0
12	Coal Mining	1	2	2	1	4	3	4	6
14	Nonmetallic Minerals, Except Fuels	0	0	0	0	1	1	0	0
20	Food and Kindred Products	0	0	0	0	1	2	6	4
22	Textile Mill Products	0	0	0	0	0	1	5	11
23	Apparel and Other Textile Products	0	0	0	0	0	0	1	1
24	Lumber and Wood Products	0	0	0	0	0	0	1	1
25	Furniture and Fixtures	0	0	0	0	0	0	1	1
26	Paper and Allied Products	0	0	0	0	0	1	1	0
27	Printing and Publishing	0	1	0	1	0	1	1	0
28	Chemical and Allied Products	1	3	2	3	8	5	11	9
29	Petroleum Refining and Other Related Industries	0	0	2	3	8	9	8	7
30	Rubber and Miscellaneous Plastic Products	0	0	0	0	0	0	2	2
32	Stone, Clay, Glass, and Concrete Products	0	0	1	4	12	13	7	5
33	Primary Metals Industries	2	2	4	4	5	5	5	11
34	Fabricated Metal Products, Except Machinery and Transportation Equipment	0	2	1	1	3	1	1	1
35	Industrial and Commercial Equipment and Components	0	0	0	0	0	0	1	1
36	Electronic and Other Electrical Equipment	1	1	2	4	4	4	9	8
37	Transportation Equipment	1	1	1	2	3	5	6	6
38	Instruments and Related Products	0	0	0	0	2	0	1	1
39	Miscellaneous Manufacturing Industries	0	1	1	0	2	2	1	1
48	Communications	0	0	0	0	0	1	0	0
49	Electric, Gas, and Sanitary Services	95	121	125	129	138	135	151	143
57	Furniture and Home Furnishings Stores	0	0	0	0	2	1	1	0
65	Real Estate	0	1	1	1	1	1	1	1
67	Holding and Other Investment Offices	0	0	1	1	1	1	1	1
72	Personal Services	0	0	0	0	0	0	1	1
80	Health Services	0	0	0	0	1	0	0	0
82	Educational Services	1	2	2	2	0	2	0	0
86	Membership Organizations	0	0	0	1	1	1	1	0
87	Engineering and Management Services	0	0	2	2	2	1	0	1
88	Private Households	2	1	1	1	1	1	1	1
89	Services Not Elsewhere Classified	0	0	0	1	1	3	2	1
91	Executive, Legislative, and General	0	0	0	0	1	2	2	2
97	National Security and International Affairs	0	0	0	0	0	0	1	0
Total Number of Reporters[b]		**108**	**142**	**150**	**162**	**207**	**207**	**236[c]**	**228**
Number of 2-Digit SIC Codes Represented		**9**	**13**	**16**	**18**	**24**	**26**	**30[c]**	**26**

[a]The Voluntary Reporting of Greenhouse Gases database was designed in 1994-1995, when the Standard Industrial Classification (SIC) system was still in use. For the 2003 data year reporting cycle, EIA will modify the database to use the North American Industry Classification System (NAICS), which was introduced in 1997 by the United States, Canada, and Mexico to provide comparability in statistics about business activity across North America.

[b]Totals may be greater than the sum of reporters in each SIC code, because confidential reporters are excluded from the latter.

[c]Includes 14 late reports for the 2000 data year. The 2001 total will also be revised upward in next year's report with the inclusion of late 2001 reports. As of November 15, 2002, EIA had received 4 late 2001 reports, which are not included in this report's 2001 database.

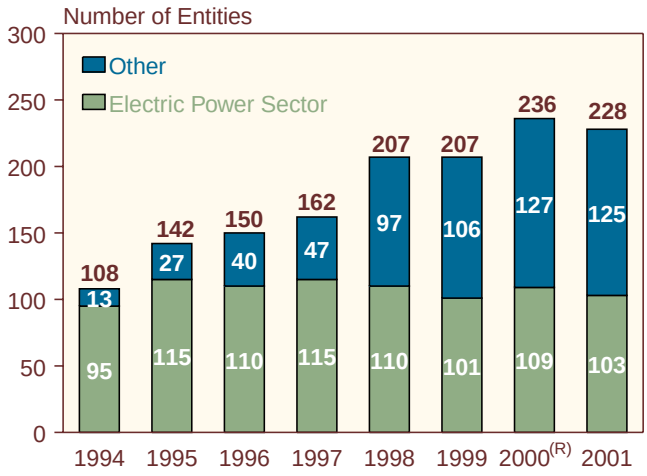
(R) = Revised.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

Although the number of reporters from other individual industries remained relatively small, in many cases, reports were received from key companies in those other industries: for example, General Motors and Ford Motor Company in the automotive products industry; Noranda and an operating division of Alcan in the metals industry; BP, Sunoco, Inc., and ChevronTexaco Corporation in the petroleum industry; Johnson & Johnson and The Dow Chemical Company in the chemicals industry; Rolls Royce in the aerospace industry; Pharmacia & Upjohn Caribe, Inc., in the pharmaceuticals industry; and IBM and Motorola Austin in the electronic equipment industry. A complete listing of all 2001 reporters is provided in Appendix B, Table B1.[3]

Most reporters indicated that their projects were affiliated with one or more government-sponsored voluntary programs. Of the 1,705 projects reported for 2001, 1,041 were affiliated with the Climate Challenge Program, 108 with the Landfill Methane Outreach Program, 57 with the Climate Wise Recognition Program, 37 with the U.S. Initiative on Joint Implementation, 33 with various Energy Star programs (including Energy Star Buildings, Energy Star Computers, and Energy Star Transformers), 17 with the Green Lights Program, 16 with the Natural Gas STAR Program, 9 with the Sulfur Hexafluoride Emissions Reduction Partnership, 9 with the Coalbed Methane Outreach Program, 7 with Compressed Air Challenge, and 6 with WasteWise. Other voluntary programs cited included the Voluntary Aluminum Industrial Partnership, Motor Challenge, Rebuild America, and Steam Challenge. Not all participants in the various voluntary programs provided information to the Voluntary Reporting Program.

Figure 1. Electric Power Sector and Other Entities Submitting Reports to the Voluntary Reporting of Greenhouse Gases Program, Data Years 1994-2001



(R) = revised.

Notes: Electric power sector includes electric utilities and independent power producers. 2000 data year includes 14 late reports that were not included in the totals presented in last year's annual report and database.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

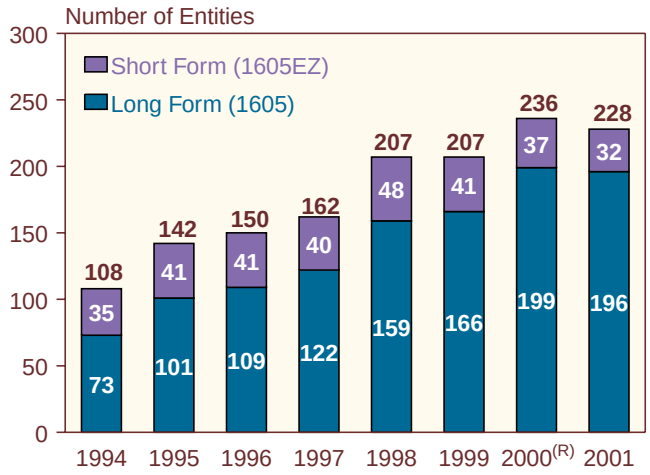
What Was Reported?

The Voluntary Reporting Program permits three distinct types of reporting:

- Project-level emissions and reductions, defined as the emission reduction consequences of a particular action
- Entity-level emissions and reductions, defined as the emissions and reductions of an entire organization, usually defined as a corporation
- Commitments to take action to reduce emissions in the future.

Of the 228 reports received, 196 (86 percent) were submitted on Form EIA-1605 (Figure 2). The remainder were submitted on Form EIA-1605EZ (the short form), which permits reporting on project-level reductions and sequestration only. The proportion of reporters using the short form has declined from 32 percent in the first year of the program (1994 data year) to 14 percent in the 2001 data reporting cycle. EIA believes that reporters are choosing the long form in order to document their emission reductions more thoroughly. Also, for the same reason several voluntary programs, such as the Landfill

Figure 2. Number of Reports Received by Form Type, Data Years 1994-2001



(R) = revised.

Note: 2000 data year includes 14 late reports that were not included in the totals presented in last year's annual report and database.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

[3]Appendixes for this report are available from web site www.eia.doe.gov/oiaf/1605/vrrpt/index.html.

Methane Outreach Program, require or encourage participants to use the long form.

Most reporters (179 or 79 percent of nonconfidential reporters) reported project-level reductions, and 109 reported entity-level emissions and/or reductions. As these numbers imply, most (61) of the reporters that reported entity-level emissions or reductions also reported at the project level. One hundred eighteen organizations submitted only project-level reports, whereas 48 reported only entity-level information. Eighty-five reporters provided information on their commitments to reduce emissions or increase sequestration in the future.

Sources of greenhouse gas emissions and emission reductions reported to the Voluntary Reporting of Greenhouse Gases Program are characterized as direct, indirect, or unspecified. The unspecified category includes carbon sequestration reported on the long form and all reductions and sequestration reported on the short form. Because of concern about possible double counting (see box on page 6), EIA does not aggregate reported emissions or emission reductions across the three categories.

Project Level

Reporters provided information on a total of 1,705 projects for 2001 (Table 2). Most of these projects (1,495 or 88 percent) were reported on the long form. The total number of projects reported decreased by 384, or 18 percent, compared with the previous reporting cycle.[4] Most of the 1,705 projects reported for 2001 were also among the 2,089 projects reported for 2000, because they continued to yield emission reductions. Projects often yield emission reductions over an extended period of time; for example, an availability improvement project at a nuclear power plant typically involves the adoption of new maintenance and refueling programs that, once in place, are followed over a multi-year period. A project may even involve no new activity. The reforestation of an area in one year can result in the sequestration of carbon in many subsequent years, even if no additional trees are planted. Reporters continue to report the annual emission reductions and carbon sequestration achieved by such long-lived projects on a yearly basis.

Most projects involve actions within the United States; however, some are conducted in foreign countries, designed to test various concepts of joint implementation with other nations (Table 3). Fifty-eight of the 89 foreign projects represent shares in two forestry programs in Belize and Malaysia sponsored by the electric utility industry.

The principal objective of the majority of projects reported for 2001 was to reduce carbon dioxide emissions (Table 2). Most of these projects reduced carbon

Table 2. Distribution of Projects by Reduction Objective, Project Type, and Form Type, Data Year 2001

Reduction Objective and Project Type	Number of Projects			Number of Reporters		
	Long Form	Short Form	Total	Long Form	Short Form	Total
Reducing Carbon Dioxide Emissions	**841**	**146**	**987**	**132**	**36**	**168**
Electricity Generation, Transmission, and Distribution	373	50	423	72	23	95
Cogeneration and Waste Heat Recovery	18	0	18	11	0	11
Energy End Use	329	64	393	66	18	84
Transportation and Offroad Vehicles	53	13	66	31	6	37
Other Projects	68	19	87	40	9	49
Reducing Methane and Nitrous Oxide Emissions	**246**	**47**	**293**	**74**	**6**	**80**
Waste Treatment and Disposal (Methane)	208	45	253	54	4	58
Agriculture (Methane and Nitrous Oxide)	3	0	3	3	0	3
Oil and Natural Gas Systems and Coal Mining (Methane)	35	2	37	20	2	22
Carbon Sequestration	**369**	**14**	**383**	**51**	**12**	**63**
Halogenated Substances	**39**	**3**	**42**	**27**	**2**	**29**
Entity-Level Reporting Only (No Projects)	**NA**	**NA**	**NA**	**48**	**NA**	**48**
Commitment Reporting Only (No Projects or Entity-Level Data)	**NA**	**NA**	**NA**	**0**	**NA**	**0**
Total	**1,495**	**210**	**1,705**	**196**	**32**	**228**

NA = not applicable.

Notes: The total number of reporters is smaller than the sum of the number of reporters for each project type, because most reporters provided information on more than one project. Table excludes projects submitted in confidential reports.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

[4]The total number of projects reported for 2000 has increased from 1,883 to 2,089 due to the receipt of 14 additional reports after the time the database used to prepare the annual report and Public Use Database for 2000 was finalized. See note to Table 3.

Double Reporting of Emission Reductions

Double reporting of emission reductions to the Voluntary Reporting of Greenhouse Gases Program can occur, because the ownership rights for such reductions may be claimed by more than one party. For example, both the manufacturers and owners of more efficient automobiles can claim emission reductions resulting from the operation of those vehicles (see page 18, "Who Owns the Reduction?"). Because the purpose of the Voluntary Reporting Program is to encourage reporting, EIA does not prohibit double reporting; however, EIA does endeavor to identify instances where double reporting may occur.

Reporters are required to distinguish between direct and indirect emissions and emission reductions on Form EIA-1605. Direct emissions are releases of greenhouse gases from sources owned (wholly or in part) or leased by the reporting entity. Indirect emissions are emissions from sources not owned or leased by the reporter that occur as a result of the reporter's activities. The most important indirect emissions are those associated with the consumption of electricity purchased from an electricity generator. Because the distinction between direct and indirect is unambiguous, direct emission reductions reported to the Program should include no double reporting.

The reporting forms do not currently allow the reporter to indicate whether carbon sequestered through forestry projects is direct (occurring on land owned by the reporter) or indirect (occurring on land owned by others). Also, Form EIA-1605EZ does not distinguish between direct and indirect reductions. EIA intends to address these issues in future modifications of its reporting forms. To put this issue in perspective, of total project-level emission reductions for 2001, 70 percent (222 million metric tons carbon dioxide equivalent) are reported as direct emission reductions, 23 percent (71 million metric tons carbon dioxide equivalent) are reported as indirect emission reductions, and 7 percent (23 million metric tons carbon dioxide equivalent) are unspecified, reported as sequestration on the long form or as reductions or sequestration on the short form.

A second mechanism to identify possible double reporting is to require reporters using the long form to identify any other entity or entities that participate in a project reported to the Program. This captures situations where more than one entity is responsible for creating the emission reduction, such as landfill gas projects where the landfill owner, the owner of the power plant that uses the landfill gas, and the purchaser of the resulting power all can, and often do, report all the effects of the project. In the case of the landfill operator, for example, the methane captured at the landfill would be reported as a direct emission reduction, and the possible reduction in central-station fossil fuel power generation would be reported as an indirect emission. In contrast, the operator of the power plant could claim the emission reduction at the power plant as a direct reduction and the reduction in methane emissions at the landfill as an indirect reduction. In general, EIA believes that instances of double reporting of direct emissions are very rare if not nonexistent; however, double counting can be an issue for indirect reductions, because their ownership is not as unambiguous.

Because of the concern that double reporting could result in double counting of emission reductions, EIA has discontinued reporting the direct, indirect, and unspecified reductions reported to the Program, in order to avoid giving the impression that the totals represent the cumulative effects of U.S.-sponsored projects on worldwide emissions of greenhouse gases. Emissions, emission reductions, and sequestration are disaggregated into the following categories: direct, indirect, and unspecified reductions and sequestration. Unspecified reductions and sequestration include sequestration reported on Form EIA-1605 and reductions and sequestration reported on Form EIA-1605EZ. As in the past, EIA does not combine reductions reported at the project level with those reported at the entity level, because the reported reductions represent the results of different approaches to estimating changes in greenhouse gas emissions.

EIA does not verify greenhouse gas emission reductions reported by participants, nor does it grant a property right associated with the claimed reductions. EIA does, however, conduct a four-step desk review to see that the data submissions are comprehensive, arithmetically accurate, internally consistent, plausible, and consistent with Program guidelines. The four steps of the desk review are (1) an analyst's review, (2) electronic edit checks incorporated into the reporting software to screen for errors, (3) manual checks of the methodologies employed, and (4) followup with reporters as needed to clarify any other issues. The Program requires the participants themselves to certify that the information reported is accurate to the best of their knowledge and belief; thus, the reporters are ultimately responsible for the accuracy of the reports submitted to the Voluntary Reporting Program.

dioxide either by reducing fossil fuel consumption or by switching to lower emitting sources of energy. Many also achieved small reductions in emissions of other gases. A total of 900 projects involved either efficiency improvements and switching to lower emitting energy sources in the electric power industry or energy end use measures affecting stationary or mobile combustion sources. Projects that also primarily reduced carbon dioxide emissions included the 87 "other" emission reduction projects, most of which involved either the reuse of fly ash as a cement substitute in concrete or the recycling of waste materials.

Projects that primarily affected carbon dioxide emissions accounted for reported direct reductions of 187 million metric tons carbon dioxide equivalent, representing 84 percent of the total direct reductions reported for 2001 on a carbon dioxide equivalent basis (Table 4). In addition, indirect reductions totaling 31 million metric tons carbon dioxide equivalent were also reported for the projects that reduced carbon dioxide emissions. A further 11 million metric tons carbon dioxide equivalent of unspecified reductions were reported on the short form, where the reporter is not asked to specify whether reductions or sequestration are direct or indirect.

Almost all of the 383 carbon sequestration projects reported on either the long form or the short form increased the amount of carbon stored in sinks through various forestry measures, including afforestation, reforestation, urban forestry, forest preservation, and modified forest management techniques. These activities accounted for 22 percent of the projects reported for 2001; however, 243 of the reported carbon sequestration projects represented shares in 9 projects conducted by the UtiliTree Carbon Company reported by 27 participating electric utilities. The sequestration reported for carbon sequestration projects for 2001 totaled 8 million metric tons of carbon dioxide on the long form and 9,088 metric tons of carbon dioxide on the short form. Direct emission reductions totaling 1,114 metric tons of carbon dioxide were also reported for a few projects where changes in forest management practices reduced fuel consumption.

A variety of efforts to reduce emissions of gases with high global warming potentials (GWPs) were also reported (see box on page 9). Two hundred ninety-three of the reported projects (17 percent) reduced methane and nitrous oxide emissions from waste management systems, animal husbandry operations, oil and gas systems, or coal mines. The 38 million metric tons carbon dioxide equivalent of direct methane reductions reported were offset by reported increases in carbon dioxide and nitrous oxide emissions totaling 10 million metric tons carbon dioxide equivalent. The carbon dioxide equivalent of the net reduction in direct emissions for projects that reduced methane and nitrous oxide emissions was 29 million metric tons, which represents 13 percent of the total direct reductions reported for 2001. Indirect reductions reported for projects that reduced methane and nitrous oxide emissions totaled

Table 3. Geographic Scope of Reports Received and Location of Emission Reduction Projects, Data Years 1994-2001

	Reports Received					Projects Reported			
	U.S. Only					U.S. Only			
Year	Long Form	Short Form	Foreign Only	Both U.S. and Foreign	Total[a]	Long Form	Short Form	Foreign Only	Total[a]
1994	65	34	2	4	**108**	500	125	9	**634**
1995	82	40	2	16	**142**	760	164	36	**960**
1996	83	41	1	24	**150**	828	179	33	**1,040**
1997	90	40	1	31	**162**	1,017	201	70	**1,288**
1998	118	47	1	40	**207**	1,212	252	85	**1,549**
1998	125	39	4	37	**207**	1,397	237	87	**1,721**
2000(R) . .	153	36	1	45	**236**	1,761	229	99	**2,089**
2001	153	32	1	41	**228**	1,405	210	90	**1,705**

[a]Totals are greater than the sum of the components because the latter exclude information from confidential reports.

(R) = revised

Notes: The number of report received for 2000 was revised to reflect the receipt of 14 reports after the finalization of the Public Use Database for last year's annual report. For 2000, additional reports were received from Branson Ultrasonics Corporation; CDX Gas, Inc.; City Utilities of Springfield; DuPont Company; Eaton Corporation – Commercial Controls Division; GeoMet, Inc.; Kansas City Power & Light Company; Naval Air Engineering Station Lakehurst; Pratt & Whitney, Middletown; Rochester Gas and Electric Corporation; Sikorsky Aircraft Corporation; Tacoma Public Utilities; Vermont Yankee Nuclear Power Corp.; and Waste Management, Inc. The number of projects reported for 2000 has also been revised to reflect the projects included in those reports. Table excludes projects submitted in confidential reports.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

Table 4. Summary of Reported Project-Level Emission Reductions and Carbon Sequestration by Reduction Objective and Gas, Data Year 2001
(Metric Tons Carbon Dioxide Equivalent)

Gas	Reductions by Project Objective				Total Reductions
	Reduce Carbon Dioxide Emissions	Reduce Methane and Nitrous Oxide Emissions	Increase Carbon Sequestration	Reduce Emissions of Halogenated Substances	
Direct					
Carbon Dioxide	168,720,281	-9,703,805[a]	1,114	—	159,017,590
Methane	17,742,665	38,303,714	—	—	56,046,379
Nitrous Oxide	714,989	-3,357[a]	—	—	711,633
HFCs	—	—	—	—	0
PFCs	1,895	—	—	3,604,919	3,606,813
SF_6	—	—	—	2,475,144	2,475,144
Total Direct	**187,179,830**	**28,596,552**	**1,114**	**6,080,062**	**221,857,559**
Indirect					
Carbon Dioxide	31,245,606	16,383,708	—	—	47,629,315
Methane	115,719	23,100,478	—	—	23,216,197
Nitrous Oxide	65,146	89,419	—	—	154,566
HFCs	—	—	—	—	0
PFCs	34,319	—	—	—	34,319
SF_6	—	—	—	81	81
Total Indirect	**31,460,791**	**39,573,605**	**—**	**81**	**71,034,477**
Sequestration					
Carbon Dioxide	—	—	7,956,823	—	7,956,823
Methane	—	—	—	—	—
Nitrous Oxide	—	—	—	—	—
HFCs	—	—	—	—	—
PFCs	—	—	—	—	—
SF_6	—	—	—	—	—
Total Sequestration	**—**	**—**	**7,956,823**	**0**	**7,956,823**
Unspecified[b]					
Carbon Dioxide	10,832,093	13,866	9,088	—	10,855,046
Methane	19,596	3,940,752	—	—	3,960,348
Nitrous Oxide	—	—	—	—	—
HFCs	—	—	—	—	—
PFCs	—	—	—	4,046	4,046
SF_6	12,980	—	—	7,281	20,261
Total Unspecified	**10,864,669**	**3,954,618**	**9,088**	**11,327**	**14,839,701**

[a]Negative reductions represent increases in emissions.

[b]Unspecified emission reductions represent quantities reported on the short form (Form EIA-1605EZ), where reporters are not asked to distinguish between direct and indirect emission reductions or sequestration.

Notes: CFCs, HCFCs, and methyl chloroform are not included in the totals because of the uncertainty associated with estimates of net global warming potential for these gases. Their direct warming effects (radiative forcing) are offset by indirect cooling effects (destruction of stratospheric ozone, another greenhouse gas). Direct, indirect, and unspecified emission reductions and sequestration have not been totaled to avoid double counting of reductions or sequestration that have been reported by more than one entity.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

40 million metric tons carbon dioxide equivalent, and unspecified reductions and sequestration reported on the short form contributed emission reductions equal to another 4 million metric tons carbon dioxide equivalent.

Forty-two projects reduced emissions of halogenated substances, including perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6). Unlike previous years, no offsetting increases in emissions of hydrofluorocarbons (HFCs)—which are used as substitutes for chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) being phased out under the Montreal Protocol—were reported for 2001. Direct reductions of PFC and SF_6 emissions totaled 6 million metric tons carbon dioxide equivalent, representing almost all the PFC and SF_6 emission reductions reported for 2001. Reductions of other gases, including carbon monoxide (CO), nonmethane volatile organic compounds (NMVOCs), CFCs, and HCFCs, were reported, but these gases do not have reliable GWPs and are not included in the carbon dioxide equivalent data presented in this report (see box below).

Direct emission reductions reported for 2001 increased by 5 percent over the reductions reported for 2000, to 222 million metric tons carbon dioxide equivalent (Table 5), and have more than tripled since the first year of the program (data year 1994). Reported direct reductions of carbon dioxide emissions increased by 10 percent, to 159 million metric tons carbon dioxide equivalent. Large increases in direct reductions of SF_6 and nitrous oxide were also reported for 2001. Reported direct reductions of SF_6 and nitrous oxide increased by 76 percent and 523 percent, respectively, over the levels reported for 2000. Reported reductions of indirect emissions increased by 14 percent, to 71 million metric tons carbon dioxide equivalent.

The sequestration reported peaked at 12 million metric tons for 1998 and has fallen below 10 million metric tons carbon dioxide for the two following years. This decline was caused by the decline in, or nonrecurrence of, sequestration reported for several large forest preservation initiatives. These projects avoided carbon releases associated with logging over the time period that the forests would have been harvested, which were reported as increased carbon sequestration over the same time period. Also, American Forests, which reported sequestration for 164 reforestation projects for 2000, did not submit a report for 2001. Unspecified reductions, which include reductions and sequestration reported on the

Comparison of Global Warming Potentials from the Second and Third Assessment Reports of the Intergovernmental Panel on Climate Change

Global warming potentials (GWPs) are used to compare the abilities of different greenhouse gases to trap heat in the atmosphere. GWPs are based on the radiative efficiency (heat-absorbing ability) of each gas relative to that of carbon dioxide (CO_2), as well as the decay rate of each gas (the amount removed from the atmosphere over a given number of years) relative to that of CO_2. The GWP provides a construct for converting emissions of various gases into a common measure, which allows climate analysts to aggregate the radiative impacts of various greenhouse gases into a uniform measure denominated in carbon or carbon dioxide equivalents.

The generally accepted authority on GWPs is the Intergovernmental Panel on Climate Change (IPCC). In 2001, the IPCC updated its estimates of GWPs for key greenhouse gases. The table at the right compares the GWPs published in 1996 in the IPCC's Second Assessment Report[a] and those published in 2001 in the IPCC's Third Assessment Report.[b]

Beginning with the information reported to the Voluntary reporting of Greenhouse Gases Program for 2000, EIA has used the IPCC's revised GWPs to calculate carbon dioxide equivalents in summarizing the results.

Comparison of 100-Year GWP Estimates from the IPCC's Second (1996) and Third (2001) Assessment Reports

Gas	1996 IPCC GWP	2001 IPCC GWP
Methane	21	23
Nitrous Oxide	310	296
HFC-23	11,700	12,000
HFC-125	2,800	3,400
HFC-134a	1,300	1,300
HFC-143a	3,800	4,300
HFC-152a	140	120
HFC-227ea	2,900	3,500
HFC-236fa	6,300	9,400
Perfluoromethane (CF_4)	6,500	5,700
Perfluoroethane (C_2F_6)	9,200	11,900
Sulfur Hexafluoride (SF_6)	23,900	22,200

[a]Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996).

[b]Intergovernmental Panel on Climate Change, *Climate Change 2001: The Scientific Basis. Summary for Policymakers* (Cambridge, UK: Cambridge University Press, 2001).

Table 5. Summary of Reported Project-Level Emission Reductions and Carbon Sequestration by Gas, Data Years 1994-2001
(Metric Tons Carbon Dioxide Equivalent)

Year	Carbon Dioxide	Methane	Nitrous Oxide	HFCs	PFCs	Sulfur Hexafluoride	Total
Direct							
1994 . . .	58,413,709	576,808	339,485	-29	3,199,649	83,579	**62,613,201**
1995 . . .	85,419,479	194,350	-438,673	-43	2,962,416	186,382	**88,323,910**
1996 . . .	77,601,577	9,411,042	-423,599	15,193	3,345,811	-69,985	**89,880,039**
1997 . . .	82,269,887	8,705,355	86,294	-42	3,318,600	516,732	**94,896,824**
1998 . . .	112,038,605	31,720,732	109,560	-1,738	3,504,380	624,786	**147,996,326**
1999 . . .	115,366,719	35,994,030	62,111	-1,738	3,425,480	595,379	**155,441,981**
2000(R) . .	144,096,233	61,945,794	114,198	—	3,233,612	1,407,347	**210,797,186**
2001 . . .	159,017,590	56,046,379	711,633	—	3,606,813	2,475,144	**221,857,559**
Indirect							
1994 . . .	2,994,405	2,360,734	2,243	—	—	—	**5,357,381**
1995 . . .	27,063,660	24,777,246	630,358	—	—	7,653	**52,478,917**
1996 . . .	26,207,709	26,612,114	616,075	—	—	—	**53,435,898**
1997 . . .	25,848,951	11,630,239	102,639	—	3,631	81	**37,585,541**
1998 . . .	27,968,865	15,152,664	105,598	—	6,068	81	**43,233,274**
1999 . . .	37,233,635	19,027,769	270,531	—	5,856	81	**56,537,872**
2000(R) . .	41,276,444	20,641,700	115,689	—	35,459	81	**62,069,372**
2001 . . .	47,629,315	23,216,197	154,566	—	34,319	81	**71,034,477**
Sequestration							
1994 . . .	746,545	—	—	—	—	—	**746,545**
1995 . . .	1,190,754	—	—	—	—	—	**1,190,754**
1996 . . .	8,676,591	—	—	—	—	—	**8,676,591**
1997 . . .	9,849,807	—	—	—	—	—	**9,849,807**
1998 . . .	12,490,927	—	—	—	—	—	**12,490,927**
1999 . . .	9,623,599	—	—	—	—	—	**9,623,599**
2000(R) . .	9,011,117	—	—	—	—	—	**9,011,117**
2001 . . .	7,956,823	—	—	—	—	—	**7,956,823**
Unspecified[a]							
1994 . . .	3,721,047	564,022	—	—	—	—	**4,285,069**
1995 . . .	4,959,366	1,162,752	—	—	—	—	**6,112,117**
1996 . . .	4,436,523	1,232,174	—	—	—	—	**5,668,697**
1997 . . .	6,688,175	1,825,383	—	—	123,049	—	**8,636,607**
1998 . . .	16,499,427	2,918,818	—	—	—	—	**19,418,245**
1999 . . .	9,607,428	3,273,878	—	—	—	4,783	**12,886,089**
2000(R) . .	9,125,506	3,127,762	—	—	—	20,744	**12,274,012**
2001 . . .	10,855,046	3,960,348	—	—	4,046	20,261	**14,839,701**

(R) = revised.

[a]Unspecified emission reductions represent quantities reported on the short form (Form EIA-1605EZ), which does not distinguish between direct and indirect emission reductions or sequestration.

Notes: Reductions of CFCs, HCFCs, and methyl chloroform are not included in the totals because of the uncertainty associated with estimates of their net global warming potential. Their direct warming effects (positive radiative forcing) are offset by indirect cooling effects (destruction of stratospheric ozone, another greenhouse gas). Totals may not equal sum of components due to independent rounding. Direct, indirect, and unspecified emission reductions and sequestration have not been totaled, in order to avoid double counting of reductions or sequestration that have may been reported by more than one entity. Negative reductions represent increases in emissions.

Source: Energy Information Administration, Forms EIA-1605 and EIA-1605EZ.

short form, increased to 15 million metric tons carbon dioxide equivalent in 2001.

Project-Level Reference Cases

Beginning with last year's annual report, EIA has begun dividing project-level data according to the reference case employed in calculating reported project-specific emission reductions. A "reference case" is an emissions or sequestration level against which actual emissions are compared to estimate emission reductions. In a "basic" reference case, actual historical emissions (or sequestration) in a specific year, or an average of a range of years, are used as the reference case. In a "modified" reference case, an estimate is made of what emissions or sequestration would have been in the absence of the project, and that estimate serves as the reference case.

The use of modified reference cases was reported for estimating reductions for 90 percent of the projects reported for 2001 on Form EIA-1605 (Table 6). A modified reference case is generally preferred for project-level analysis, because this approach attempts to isolate the effect of the action taken by the reporter from other factors that may have affected the reporter's emissions since the action was taken. The use of basic reference cases for 2001 was greatest for projects that reported reducing emissions of halogenated substances (56 percent of those projects), because the techniques for evaluating reductions for the projects are particularly suited to the use of a basic reference case. Emissions are determined using inventory management data, with emissions of a particular substance being equal to the amount purchased during the year to replace quantities emitted. Reductions can be calculated by subtracting the emissions in the years after emission abatement measures have been instituted from the emissions in the year before the measures were instituted.

In terms of emission reductions and sequestration reported for 2001, 184 million metric tons carbon dioxide equivalent of direct emissions (83 percent of total direct reductions), 60 million metric tons carbon dioxide equivalent of indirect emissions (84 percent of total indirect reductions), and 7 million metric tons carbon dioxide equivalent of sequestration (93 percent of total sequestration reductions) were reported as having been estimated using modified reference cases (Table 7). The project type categories where significant proportions of the reported direct reductions were estimated using basic reference cases were halogenated substances (90 percent) and transportation (81 percent). In addition, 55 percent of the reported indirect reductions for electricity generation transmission and distribution projects were calculated using basic reference cases, because several electric utilities reported nuclear-power-related projects that resulted in large reductions in power purchases and used basic reference cases to calculate the resulting indirect emission reductions.

Table 6. Number of Projects Reported on Form EIA-1605 by Reduction Objective, Project Type, and Reference Case Employed, Data Year 2001
(Number of Projects)

Reduction Objective and Project Type	Type of Reference Case				Total Number of Projects
	Modified		Basic		
	Number of Projects	Percent	Number of Projects	Percent	
Reducing Carbon Dioxide Emissions	**737**	**88**	**102**	**12**	**839**
Electricity Generation, Transmission, and Distribution	335	90	37	10	372
Cogeneration and Waste Heat Recovery	18	100	0	0	18
Energy End Use	279	85	50	15	329
Transportation and Offroad Vehicles	48	91	5	9	53
Other Projects	57	85	10	15	67
Reducing Methane and Nitrous Oxide Emissions	**239**	**97**	**7**	**3**	**246**
Waste Treatment and Disposal (Methane)	203	98	5	2	208
Agriculture (Methane and Nitrous Oxide)	3	100	0	0	3
Oil and Natural Gas Systems and Coal Mining (Methane)	33	94	2	6	35
Carbon Sequestration	**347**	**94**	**22**	**6**	**369**
Halogenated Substances	**17**	**44**	**22**	**56**	**39**
Total	**1,340**	**90**	**153**	**10**	**1,493**

Notes: Excludes projects reported on the short form (Form EIA-1605EZ), which does not collect information on the reference case employed. Excludes two projects reported on the long form (Form EIA-1605) for which no reference case was specified because reductions were not estimated. Excludes projects submitted in confidential reports.
Source: Energy Information Administration, Forms EIA-1605.

Entity Level

Most of the 109 reporters providing entity-level information included data on emissions as well as emission reductions or sequestration. Three reporters provided entity-level data on emissions only, and another five reporters provided entity-level data on emission reductions or sequestration only.

Total entity-level direct emissions of carbon dioxide reported for 2001 were 877 million metric tons, which represents a 15-percent increase from the 1,029 million metric tons reported for 2000. Reported direct emissions of other gases, including methane, nitrous oxide, HFCs, PFCs, and SF_6, totaled 26.2 million metric tons carbon dioxide equivalent for 2001. Total entity-level direct emissions of these gases reported for 2001 were 33 percent lower than those reported for 2000. Total direct and indirect emissions reported at the entity level for each data year from 1994 to 2000 are summarized in Table 8.

Total direct emission reductions reported at the entity level have declined by 18 percent this year, from 206.7 million metric tons carbon dioxide equivalent for 2000 to 169.2 million metric tons carbon dioxide equivalent for 2001. In 2001, 104.9 million metric tons carbon dioxide equivalent (62 percent) of the reported direct reductions were estimated using modified reference cases, and 38 percent were estimated with basic reference cases.

Reported entity-level indirect emission reductions for 2001 totaled 28.4 million metric tons carbon dioxide equivalent. Reported indirect reductions of 35.7 million metric tons carbon dioxide equivalent calculated with modified reference cases were offset by -7.3 million metric tons carbon dioxide equivalent of indirect reductions (i.e., net emission increase) calculated with basic reference cases. Entity-level sequestration reported for 2001 totaled 7.5 million metric tons carbon dioxide equivalent, the same as the total reported for 2000.

Commitments

Eighty-five entities reported formal commitments to reduce future emissions, to take action to reduce emissions in the future, or to provide financial support for activities related to greenhouse gas reductions.[5] More than one-third (34 percent) of these entities are electricity generators participating in the Climate Challenge Program (Figure 3). Other voluntary programs represented among the commitments reported for 2001 included Climate Wise, the Voluntary Aluminum Industrial Program, the U.S. Initiative on Joint Implementation, the Green Lights Program, the Landfill Methane Outreach Program, the Coalbed Methane Outreach Program, Motor Challenge, and the Sulfur Hexafluoride Emissions Reduction Partnership for Electric Power Systems.

Table 7. Reported Emission Reductions and Sequestration for Projects Reported on Form EIA-1605 by Reduction Objective, Project Type, Source, and Reference Case Employed, Data Year 2001
(Metric Tons Carbon Dioxide Equivalent)

Reduction Objective and Project Type	Direct Reductions		Indirect Reductions		Sequestration	
	Modified	Basic	Modified	Basic	Modified	Basic
Reducing Carbon Dioxide Emissions	**154,982,618**	**32,197,213**	**21,770,401**	**9,690,390**	**0**	**0**
Electricity Generation, Transmission, and Distribution	115,529,789	31,540,675	7,490,690	8,996,412	0	0
Cogeneration and Waste Heat Recovery	2,596,231	0	1,120,865	0	0	0
Energy End Use	18,819,086	620,054	7,466,440	134,316	0	0
Transportation and Offroad Vehicles	8,511	36,484	86,152	1,871	0	0
Other Projects	18,029,000	0	5,606,255	557,790	0	0
Reducing Methane and Nitrous Oxide Emissions	**28,184,515**	**412,038**	**38,125,541**	**1,448,065**	**0**	**0**
Waste Treatment and Disposal (Methane)	13,065,760	401,981	38,084,338	1,448,065	0	0
Agriculture (Methane and Nitrous Oxide)	148	0	22,478	0	0	0
Oil and Natural Gas Systems and Coal Mining (Methane)	15,118,607	10,057	18,724	0	0	0
Carbon Sequestration	**1,114**	**0**	**0**	**0**	**7,423,920**	**532,904**
Halogenated Substances	**631,268**	**5,448,794**	**81**	**0**	**0**	**0**
Total	**183,799,514**	**38,058,045**	**59,896,022**	**11,138,454**	**7,423,920**	**532,904**

Note: Excludes reductions and sequestration for projects reported on the short form (Form EIA-1605EZ), which does not collect information on the reference case employed. Excludes projects submitted in confidential reports.
Source: Energy Information Administration, Form EIA-1605.

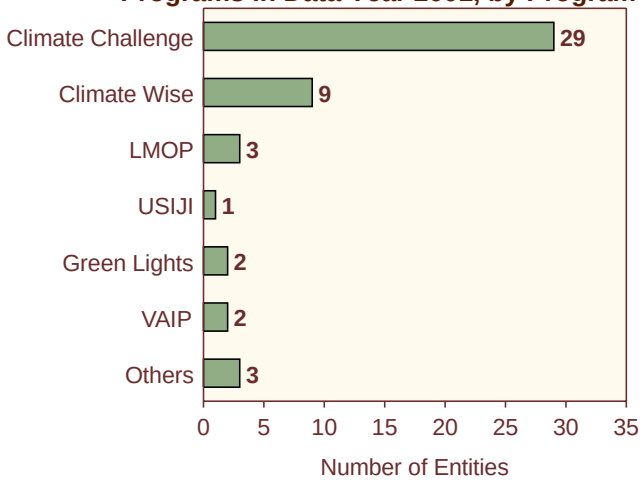
[5]Fifty companies reported formal commitments in one or more of the entity-level, project-level, or financial categories accommodated by Form EIA-1605. Thirty-five companies provided descriptions of future activities only in the Additional Information section of Schedule IV.

There are three forms of future commitment in the Voluntary Reporting Program: entity commitments, financial commitments, and project commitments. Entity and project commitments roughly parallel the entity and project aspects of emissions reporting: an entity commitment is a commitment to reduce the emissions of an entire organization; a project commitment is a commitment to take a particular action that will have the effect of reducing the reporter's emissions through a specific project. A financial commitment is a pledge to spend a particular sum of money on activities related to emission reductions, without a specific promise as to the emissions consequences of the expenditure.

Twenty-five firms made 32 specific promises to reduce, avoid, or sequester future emissions at the entity level. Some of these entity-level commitments were to reduce emissions below a specific baseline, others to limit the growth of emissions per unit of output, and others to limit emissions by a specific amount relative to a baseline emissions growth trend. In their reports for 2001, companies committed to reducing future entity-level emissions by a total of 94.4 million metric tons carbon dioxide equivalent. Almost one-half (44 percent) of entity-level emission reduction commitments were for the year 2000, with an additional 31 percent falling within the 2001 to 2005 time horizon.

Twenty-nine companies reported on commitments to undertake 182 individual emission reduction projects. Some of the commitments were linked to future results from projects already underway and forming part of the reporters' submissions. Others were for projects not yet begun. Reporters indicated that the projects were expected to reduce future emissions by 151 million metric tons carbon dioxide equivalent, most of which (90 million metric tons carbon dioxide equivalent, or 60 percent) would be reductions of methane. Twenty-one firms made financial commitments. The total amount of funds promised was $51.2 million, of which $7.1 million was reported to have been expended in 2001.

Figure 3. Number of Entities Reporting Commitments Associated with Voluntary Programs in Data Year 2001, by Program



Notes: LMOP = Landfill Methane Outreach Program, USIJI = United States Initiative on Joint Implementation, VAIP = Voluntary Aluminum Industry Partnership. Others include Coalbed Methane Outreach Program, Cool Communities Program, Motor Challenge Program, and Sulfur Hexafluoride Emissions Reduction Partnership for Electric Power Systems. The sum of entities reporting commitments associated with each program exceeds the total number of entities reporting commitments because several entities reported commitments associated with more than one program.

Source: Energy Information Administration, Form EIA-1605.

Table 8. Number of Entities Reporting at the Entity Level, Reported Emissions by Source, Emission Reductions by Source and Type of Reference Case Employed, and Sequestration, Data Years 1994-2001

(Million Metric Tons Carbon Dioxide Equivalent)

Year	Number of Entities Reporting	Emissions		Emission Reductions by Type of Reference Case						Sequestration
				Direct			Indirect			
		Direct	Indirect	Modified	Basic	Total	Modified	Basic	Total	
1994	39	752.7	494.9	38.2	22.6	60.8	1.6	1.2	2.8	0.5
1995	50	875.8	499.6	56.0	39.3	95.3	46.0	2.7	48.6	0.8
1996	55	1,183.1	461.5	65.4	44.6	110.0	42.9	5.7	48.6	7.9
1997	60	1,006.6	525.8	73.7	20.3	94.0	24.8	3.4	28.2	7.1
1998	76	1,110.7	473.5	105.8	22.6	128.4	28.3	13.2	41.6	11.2
1999	83	967.9	481.0	114.7	35.3	150.0	30.3	8.4	38.7	8.4
2000(R) . .	109	1,068.2	111.7	123.6	83.0	206.7	34.8	-7.8	27.0	7.5
2001	109	902.9	146.7	104.9	64.3	169.2	35.7	-7.3	28.4	7.5

(R) = revised.

Notes: 2000 data year includes late reports that were not included in the number of entities submitting 2000 data reports in time to be included in last year's annual report and database. Negative reductions represent increases in emissions.

Source: Energy Information Administration, Form EIA-1605.

Status of Policy Initiatives

Several policy initiatives were introduced in the United States over the past year to address the issue of global climate change. In 2002, the White House announced the Global Climate Change Initiative, the Department of Energy began work on the development of an enhanced 1605(b) Voluntary Reporting of Greenhouse Gases Program, the Congress worked to enact new, comprehensive energy legislation, and States and other organizations continued to develop innovative greenhouse gas registry and trading programs. The developments described here occurred in 2002 and would not have affected the reported emissions and emission reductions data for activities in 2001 discussed in this report; however, each of these policy efforts may play a significant role in the future development of the enhanced Voluntary Reporting of Greenhouse Gases Program.

U.S. Climate Change Initiative

On February 14, 2002, President George W. Bush announced the Administration's Global Climate Change Initiative, which includes new emission intensity reduction goals, incentives for clean technology development, added support for scientific research, expanded collaboration with foreign governments on climate change, and the development of a framework for the enhancement of the Voluntary Reporting of Greenhouse Gases Program.

A primary goal of the Global Climate Change Initiative is to slow the growth rate of greenhouse gas emissions while sustaining economic growth, using market mechanisms and energy technology development. In the proposal, the President established a national goal of reducing the greenhouse gas intensity of the U.S. economy by 18 percent over the next 10 years. Emissions intensity is a measure of the ratio of greenhouse gas emissions to economic output (gross domestic product). To achieve the goal, the Initiative focuses on fossil fuel energy conservation, methane recovery, and carbon sequestration in the short term and development of advanced energy technologies in the longer term.

Key domestic and international elements of the Global Climate Change Initiative include:

- **Domestic climate change initiatives:**
  - Enhancement of the 1605(b) Voluntary Reporting of Greenhouse Gases Program
  - Significantly expanded funding for basic scientific research and advanced technology development
  - Tax incentives, such as credits for renewable energy, cogeneration, and new technology
  - Challenges for business to undertake voluntary initiatives and commit to greenhouse gas intensity goals, such as through recent agreements with the semiconductor and aluminum industries
  - Transportation programs, including technology research and development and fuel economy standards
  - Carbon sequestration programs, which include increased funding for U.S. Department of Agriculture conservation programs under the Farm Bill to enhance the natural storage of carbon, promote the development of targeted incentives for forestry and agriculture projects to increase carbon sequestration, and establish accounting rules and guidelines for crediting sequestration projects
- **International climate change initiatives:**
  - Investments in climate observation systems in developing countries
  - Funding for "debt-for-nature" forest conservation programs
  - Use of economic incentives to encourage developing countries to participate in climate change initiatives
  - Expanding technology transfer and capacity building in the developing world
  - Joint research with Japan, Italy, and Central America.

The Global Climate Change Initiative includes a future progress check: the U.S. Government, in 2012, will evaluate whether its greenhouse gas emissions reduction progress is sufficient and whether scientific understanding at that time will justify further action. If further action is deemed necessary, the Initiative proposes to accelerate technology development and deployment using additional market-based mechanisms, voluntary measures, and incentive programs.

Enhanced 1605(b) Voluntary Emissions Reduction Registry

Pursuant to a key objective of the Global Climate Change Initiative, the Department of Energy is working to improve and expand the 1605(b) Voluntary Reporting of Greenhouse Gases Program. The primary goal is to create a credible and transparent program to report real reductions that support the national greenhouse gas intensity goal. In addition, the enhanced 1605(b) Program will allow businesses and individuals to record their reductions and ensure that those reporters are not penalized under a future climate policy. The objective of improving the registry and providing transferable credits for reductions is to help motivate firms to take cost-effective, voluntary actions to reduce greenhouse gas emissions, which would, in part, aid in the achievement of the Global Climate Change Initiative greenhouse gas intensity goal.

Since February 2002, when the President announced the new initiative, an interagency working group has undertaken several actions to improve the Voluntary reporting Program, including outreach efforts, solicitation of public comments, and review of the existing program. On July 8, 2002, the Secretary of Energy, joined by the Secretary of Commerce, the Secretary of Agriculture, and the EPA Administrator, submitted recommendations to the White House that will guide the process over the coming months to improve and expand the Voluntary Reporting Program.

Specifically, the Secretaries and Administrator recommended the following improvements:

- Develop fair, objective, and practical methods for reporting baselines, reporting boundaries, calculating real results, and awarding transferable credits for actions that lead to real reductions
- Standardize widely accepted, transparent accounting methods
- Support independent verification of registry reports
- Encourage reporters to report greenhouse gas intensity (emissions per unit of output) as well as emissions or emission reductions
- Encourage corporate or entity-wide reporting
- Provide credits for actions to remove carbon dioxide from the atmosphere (e.g., sequestration activities) as well as for actions to reduce emissions
- Develop a process for evaluating the extent to which past reductions may qualify for credits
- Ensure that the Voluntary Reporting Program will be an effective tool to assist in reaching the goal of an 18-percent reduction in greenhouse gas intensity
- Factor in international strategies as well as State-level efforts
- Minimize transactions costs for reporters and administrative costs for the Government, where possible, without compromising the recommendations above.

The recommendations highlight the need to create standardized, widely accepted, transparent accounting methods, support independent verification of registry reports, and ensure that companies that make real reductions are awarded credit under a future climate change policy. The Secretaries and the Administrator proposed a process, to culminate in new guidelines by January 2004 (for reporting 2003 data), that includes: several stakeholder workshops; sufficient time to update technical guidelines based on analysis and workshops; public comment periods to review the revised guidelines; and development of reporting forms, software, and a public-use database.

Federal Legislation on Voluntary Greenhouse Gas Reporting

An effort to pass the Energy Policy Act of 2002 ended in November at the close of the 107th Congress because of differences on many issues in the bill, including electric power industry restructuring, corporate average fuel economy (CAFE) standards, drilling in the Arctic National Wildlife Refuge, and mandated use of alternative fuels. The 108th Congress is expected to revisit the energy policy issues in 2003.

The Energy Policy Act of 2002 called for the establishment of a national greenhouse gas inventory, reductions registry, and database. The comprehensive energy bill, which had remained in conference from June through November, was the product of the House energy bill (H.R. 4) introduced in 2001 and amendments to include text from the Senate energy bill (S. 517) reintroduced by Senators Daschle and Bingaman in March 2002.

Title XI of the Energy Policy Act of 2002 contains the voluntary greenhouse gas reporting provisions that call for an enhanced Voluntary Reporting Program and incentives for emission reductions. Title XI text was taken from S. 517, because H.R. 4, as introduced in the House, did not contain any greenhouse gas registry provisions. In April 2002, before the Title XI language from the S. 517 was merged into H.R. 4, Representative Olver introduced H.R. 4611, "The National Greenhouse Gas Emissions Inventory Act of 2002," containing provisions that responded to the President's climate change proposal. Both S. 517 and H.R. 4611, using much of the same language, would have established greenhouse gas registries. Both bills would have required mandatory reporting for entities exceeding an emissions threshold to be determined (e.g., 10,000 metric tons carbon dioxide equivalent per year). In addition, both allowed voluntary reporting of emissions reductions but did not required third-party verification. One difference was that H.R. 4611 specified one of the purposes of the mandatory greenhouse gas inventory, registry, and information system as being to avoid penalizing early action to reduce emissions. S. 517 did not acknowledge this purpose.

Other U.S., State, and International Greenhouse Gas Registry Programs

Voluntary greenhouse gas emissions reporting programs and other State initiatives, such as emissions targets, emissions inventorying and monitoring, and emissions mitigation strategies, are gaining momentum as States investigate the most cost-effective policies to address climate change. California, New Hampshire, Wisconsin, New Jersey, Maine, Oregon, and the coordinated New England States and Canadian Provinces have each continued efforts to develop greenhouse gas

registry programs by enacting legislation and establishing rules and guidance. Highlights of Federal, State, regional, and other organizations' registry program activities in 2002 are presented below.

- ***President's Climate VISION.*** On February 12, 2003, the U.S. Department of Energy, on behalf of President Bush, launched the President's "Climate VISION" (Voluntary Innovative Sector Initiatives: Opportunities Now)—a voluntary public-private partnership to pursue cost-effective initiatives to reduce the projected growth in U.S. greenhouse gas emissions. Climate VISION, to be administered through the Department of Energy, is intended to help meet the President's goal of reducing U.S. greenhouse gas intensity—the ratio of emissions to economic output—by 18 percent by 2012. Climate VISION involves Federal agencies, including the Department of Energy, the U.S. Environmental Protection Agency, and the Departments of Agriculture and Transportation, working with industry partners to reduce greenhouse gas emissions voluntarily over the next decade. Industry groups making commitments include the Alliance of Automobile Manufacturers, Aluminum Association, American Chemistry Council, American Forest and Paper Association, American Iron and Steel Institute, American Petroleum Institute, American Public Power Association, Association of American Railroads, Business Roundtable, Edison Electric Institute, Electric Power Supply Association, Magnesium Coalition and International Magnesium Association, National Mining Association, National Rural Electric Cooperative Association, Nuclear Energy Institute, Portland Cement Association, and Semiconductor Industry Association.
- ***Climate Leaders.*** The EPA established Climate Leaders, a new voluntary industry-government partnership to encourage companies to establish clear greenhouse gas reduction targets and develop long-term comprehensive climate change strategies. In 2002, the EPA published several draft Greenhouse Gas Inventory Protocol documents and began soliciting public feedback.
- ***California.*** In 2002, the California Climate Action Registry, a voluntary program for reporting and registering greenhouse gas emissions occurring in or outside of the State of California, commenced operations. The California Registry issued reporting protocols and began enrolling members in October 2002. The California Registry requires third-party verification and seeks to protect participants' reported reductions under possible future regulatory programs.
- ***New Hampshire.*** New Hampshire recently promulgated rules to govern its Voluntary Greenhouse Gas Emissions Reductions Registry, based on legislation adopted in 1999. New Hampshire's program provides technical assistance to in-State participants in preparing greenhouse gas emissions reports.
- ***Wisconsin.*** Wisconsin continued to develop its greenhouse gas registry components during 2002, including a registry handbook, forms, and a web site.
- ***New Jersey.*** In 2002, New Jersey discontinued its multi-pollutant Open Market Emissions Trading (OMET) program. New Jersey had been the first State to take on a greenhouse gas reduction target and had initiated the development of a greenhouse gas registry to compliment the OMET program.
- ***Northeastern States.*** The six New England States and the Eastern Canadian Provinces have engaged in a joint effort to develop a regional greenhouse gas registry, as specified in the New England Governors and Eastern Canadian Premiers (NEG/ECP) Climate Change Action Plan. Separately, the New England States, plus New York and New Jersey, have also created an interstate association of air quality control divisions, titled the North East States for Coordinated Air Use Management (NESCAUM). NESCAUM supports the States, businesses, and environmental groups in the region with their development of registries, provides other technical assistance, and facilitates information exchange.
- ***Illinois, Iowa, New York, and Texas.*** These States have taken initial steps in developing State-level registries. For example, early in 2002, Texas authorities issued recommendations related to greenhouse gas reduction incentives for the State of Texas, to include the development of a greenhouse gas registry. Texas currently operates an Emissions Banking and Trading Program to facilitate compliance with Federal and State multi-pollutant air quality standards.
- ***Oregon.*** Oregon established the Oregon Climate Trust to facilitate the development and implementation of offset projects mandated under the State's carbon dioxide standard, a 1997 law that capped carbon dioxide emissions from power plants. In 2002, the Trust completed its first five offset project contracts, which began in 1999, and the Trust is currently finalizing contracts for seven projects to offset emissions from two State power projects. The Trust also has expanded the Greenhouse Gas Partnership Program to allow any organization to offset its emissions.
- ***WRI/WBCSD Greenhouse Gas Protocol Initiative.*** The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) Greenhouse Gas Protocol initiative is not a formal reporting program but an international program for developing accounting and reporting standards for greenhouse gas emissions and reductions that can be adopted by other reporting programs and registries. The corporate protocol is designed for entity-level reporting, but a project module is currently under development.

Accounting Issues for Voluntary Reporting and Beyond

The Voluntary Reporting of Greenhouse Gases Program was designed primarily to serve as a mechanism by which entities could report voluntary actions intended to reduce greenhouse gas emissions and sequester carbon.[6] EIA has the responsibility, among other things, for establishing and maintaining a database of reported greenhouse reductions that also serves as a national registry of reported reductions. While the information in the database may be used by the reporting entity to demonstrate achieved reductions of greenhouse gases, the program was not designed to support credit for early reductions or emissions trading programs. The program guidelines did not attempt to resolve the issues that arise in constructing the required reporting rules that would create a set of comparable, verifiable, auditable emission and reduction reports. Such rules would also be required for the flexible mechanisms, such as the Clean Development Mechanism, Activities Implemented Jointly, and Joint Implementation, included in the United Nations Framework Convention on Climate Change and its Kyoto Protocol.

The current Voluntary Reporting of Greenhouse Gases Program allows reporters considerable flexibility in the scope and content of their reports. As a result, companies can report their emissions and reductions in several different ways, and potentially more than one reporter can claim the same reduction. Some commentators on the program have characterized this aspect as a defect: a problem needing a solution. A more restrictive program, however, could limit the number of entities reporting, as well as the types of activities reported. Therefore, because it tends to increase participation in voluntary reporting, flexibility can be viewed as a useful attribute of the program for the following reasons:

- The educational and public recognition aspects of the program are enhanced by maximizing the participation and do not necessarily require a complete and fully-defined system of property rights to a reported emission reduction.
- The Voluntary Reporting Program can be viewed as a survey of emission accounting methods and theories actually in use, and a set of illustrations of the potential accounting and baseline problems that must be confronted in designing future policy instruments. A more structured approach might have been less useful for identifying and analyzing these emissions accounting issues.
- The Voluntary Reporting database illustrates the range and diversity of concrete actions that firms can undertake to limit greenhouse gas emissions, including many not imagined by the designers of the program. A more structured approach might have excluded some of the more original and innovative projects reported to the program.

These features make the program useful in evaluating the design and consequences of any proposed credit for early action program as well as the Kyoto Protocol's flexible mechanisms. By creating a database of real-world emission reduction actions and actors, the data reported to the Voluntary Reporting Program can be used to gain insight into the incentive effects and beneficiaries of various credit for early action and related proposals. The Voluntary Reporting of Greenhouse Gases database has provided a mechanism for identifying some of the issues that would have to be resolved in developing an accounting system for quantifying emissions, emission reductions, and sequestration. Such an accounting system will have to answer the following questions:

- Who can report?
- What is a reduction?
- Who owns the reduction?
- Would the reduction have happened anyway?
- How does one verify reports?

Who Can Report?

Section 1605(b) of the Energy Policy Act of 1992 mentioned only "entities" and "persons" as prospective reporters. Several overlapping concepts of "who can report" surfaced at the public hearings for the guidelines for the Voluntary Reporting Program, all of which were accommodated. These included:

- **A legal person: i.e., an individual, household, corporation, or trade association.** In this approach, emissions and reductions are calculated and reported for the entire entity.
- **A facility or group of facilities.** Emissions and reductions are calculated as those of a particular facility, defined as a single plant in a specified location, or perhaps even a single stack within a plant. A corporation or legal person acquires responsibility for emissions and reductions through ownership of one or more specified facilities.
- **A "project" or activity.** Reductions are defined by comparing the emissions from some set of sources deemed relevant with an estimate of what emissions would have been if a particular action or bundle of actions had not been undertaken.

[6]This discussion of accounting issues is based on testimony given by Jay Hakes, former EIA Administrator, on March 30, 2000, before the Senate Committee on Energy and Natural Resources on Senate Bills S. 882 and S. 1776 and their potential impacts on EIA's Programs. The full text of the testimony is available on EIA's web site at www.eia.doe.gov/neic/speeches/hrtest3-30-00/testimony3.htm.

What is a Reduction?

Perhaps the most intuitive definition of a reduction is one measured against an historical baseline, which represents the use of a "basic reference case." In this approach, the reduction is defined as the difference between the emissions of an entity or facility in a prior, baseline year, usually 1990, and in the current year. This approach is best suited to reporters whose activities have not appreciably changed since the baseline year. It presents particular problems for firms that have participated in mergers, acquisitions, or divestitures, or have made significant changes in the composition of their business. Startup companies or new facilities that have no history cannot use historical baselines. The historical baseline approach is also not well suited to measuring the reductions achieved by projects, because projects are often entirely new activities with no history.

Alternatively, many reporters define their reductions by comparison with what would have happened in the absence of a specified set of actions. Thus, corporate emissions may have risen, but they are less than they would have been in the absence of corporate action. This approach is called, in the Voluntary Reporting Program, a "modified reference case" or a "hypothetical baseline." It is important to point out, however, that a hypothetical baseline is a best guess of what would have happened in the absence of a project, and there is no way *per se* to prove or disprove it. Most of the projects reported to the Voluntary Reporting Program use a hypothetical baseline to calculate emission reductions or sequestration.

The "unit of production" approach is a variant of the fixed historical baseline, where the reporter normalizes baseline emissions to reflect changes in production. If emissions per unit of output have declined, by comparison either with levels in a prior year or with what they would have been in the absence of some actions, then the reporter has a reduction. This approach works reasonably well for organizations that have a well-defined product that is homogeneous across companies and over time: for example, kilowatthours generated or sold, tons of steel, or barrels of crude oil. As products increase in complexity, this approach gradually breaks down. Tons of semiconductors, for example, is a meaningless measure of output.

The alternative measures of reductions have their advantages and disadvantages. Basic reference cases are objective and relatively easily verifiable. On the other hand, absolute reductions are often the product of circumstance rather than action, while modified reference cases (which are more difficult to verify) explicitly measure the results of actions. Unit-of-production reference cases are useful only in a limited number of cases, and they can combine some of the disadvantages of both basic and modified reference cases.

Who Owns the Reduction?

Two theories of emissions ownership coexist in the Voluntary Reporting Program. The most intuitive, and commonplace, is called "direct emissions" and "direct reductions." If a reporter owns or uses (e.g., leases) the emission source, that reporter owns the emission as well as any reductions from this source. The advantage of limiting ownership to direct emissions is that it generally prevents multiple ownership of the same emission or reduction. However, this approach excludes many important emission reduction methods, including all activities that tend to reduce electricity consumption, the activities of energy service companies, and the provision of energy-efficient or emission reducing capital goods.

The alternative theory of ownership is based on causation: if an organization causes an emission or reduction, it is responsible for that emission, even if it does not own the emission source. Emissions or reductions from sources not owned by the reporter are referred to as "indirect." The most important example of indirect emissions is those produced through the consumption of electricity. If entities reduce their consumption of electricity, they cause their electric utility to reduce its emissions. This approach permits reporting of any action that has an influence on national emissions. However, the concept of "causing an emission" is inherently more ambiguous than "owning the smoke stack," and in many cases more than one firm may credibly claim to have helped cause an emission reduction.

EIA requires that reporters using Form EIA-1605 explicitly identify all emissions and reductions as either direct or indirect so that potentially double-counted reductions can be identified.

Would the Reduction Have Happened Anyway?

This issue is often discussed in other contexts under the term "additionality." It has been suggested that many emission reduction projects do not represent "real" reductions, because they would have been undertaken "anyway" in the normal course of business; however, creating an operational definition of additionality is difficult, because the "normal course of business" is a hypothetical concept. For the purposes of voluntary reporting—which include publicizing the types of actions that limit national greenhouse gas emissions and providing recognition for the companies that undertake those actions voluntarily—determining the

additionality of projects is unnecessary. For the purposes of a credit for early reduction program, however, additionality is an issue that needs to be considered.

How Does One Verify Reports?

The Department of Energy decided not to require verification by an independent third party after considering this issue during the development of the guidelines for the Voluntary Reporting Program. However, reporters must certify the accuracy of their 1605(b) reports. Also, filing a false statement on a U.S. Government form is illegal. EIA reviews each report received for comprehensiveness, arithmetic accuracy, internal consistency, and plausibility and makes suggestions for improving the accuracy and clarity of reports; however, the reporter is ultimately responsible for the accuracy of any report submitted to the Voluntary Reporting Program.

In general, reports submitted to EIA are factually accurate. Meaningful verification of the accuracy of 1605(b) reporting would require putting in place common baselines and accounting standards that dictate what information should be included in 1605(b) reports and how estimates of greenhouse gas emissions and reductions and carbon sequestration should be calculated. For example, if the accounting treatment for indirect emissions from electricity purchases is undefined, then a particular set of facts about a reporter could result in two different estimates of emissions: one including electricity purchases and one excluding electricity purchases. A third-party verifier can verify the facts about the reporter but cannot determine whether or not indirect emissions from electricity purchases ought to be included and, consequently, cannot determine whether the total emissions reported are correct or not.