2008 Greenhouse Gas Emissions from Selected Iowa Source Categories

August 31, 2009

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Acronyms and Key Terms

AR4	Fourth Assessment Report
CAMD	Clean Air Markets Division
CCS	Center for Climate Strategies
CEEE	Center for Energy and Environmental Education
CEM	Continuous Emissions Monitor
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DGS	Distillers Grain with Solubles
DNR	Iowa Department of Natural Resources
DOE	Department of Energy
DOT	Department of Transportation
DSCFM	Dry Standard Cubic Feet per Minute
EIA	Energy Information Administration
EIIP	Emission Inventory Improvement Program
EPA	Environmental Protection Agency
EtOH	Ethanol
GHG	Greenhouse Gas
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
HFC	Hydrofluorocarbons
HFE	Hydrofluorinated ethers
ICCAC	Iowa Climate Change Advisory Council
IPCC	Intergovernmental Panel on Climate Change
LPG	Liquefied Petroleum Gas
MMBtu	Million British Thermal Units
MMcf	Million Cubic Feet
MMTCE	Million Metric Tons of Carbon Equivalent
$MMtCO_2e$	Million Metric Tons of Carbon Dioxide Equivalent
$MtCO_2e$	Metric Tons of Carbon Dioxide Equivalent
N_2O	Nitrous Oxide
NH_3	Nitrogen Trifluoride
NO_X	Nitrogen Oxides
ODS	Ozone Depleting Substance
PFC	Perfluorocarbons
PM_{10}	Particulate Matter Less Than 10 Microns in Aerodynamic Diameter
RCI	Residential, Commercial, Industrial
SAR	Second Assessment Report
SF_6	Sulfur Hexafluoride
SIC	Standard Industrial Classification
SIT	State Inventory Tool
SO_2	Sulfur Dioxide
TAR	Third Assessment Report
UNI	University of Northern Iowa
USDA	United States Department of Agriculture
VMT	Vehicles Mile Traveled
VOC	Volatile Organic Compounds
WBSCD	World Business Council for Sustainable Development
WRI	World Resources Institute

Executive Summary

Background

This is the second greenhouse gas (GHG) inventory that has been prepared by the Iowa Department of Natural Resources (DNR) as required by legislation passed by the Iowa General Assembly in 2007. The legislation, SF 485, requires that "By September 1 of each year, the department shall submit a report to the governor and the general assembly regarding the GHG emissions in the state during the previous calendar year and forecasting trends in such emissions. The first submission by the department shall be filed by September 1, 2008, for the calendar year beginning January 1, 2008."[1] The legislation allows "a series of reporting requirements to be phased in over a period of time and may provide for phasing in by producer sector, geographic area, size of producer, or other factors."[2]

Like the Department's previous inventory, *2007 Greenhouse Gas Emissions from Selected Sources,* this inventory for 2008 is fairly narrow in scope and is a *refinement* of previous statewide inventories. It is a bottom-up inventory of ethanol production plants and major sources with federally-enforceable operating permits (also known as Title V operating permits). These facilities were required to estimate and report calendar year 2008 emissions from several processes – fossil fuel combustion, ethanol fermentation, cement manufacturing, lime manufacturing, ammonia production, nitric acid production, iron and steel production, and soda ash consumption. They were also required to calculate and report emissions of hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6).

In a bottom-up inventory, facility-specific activity data is used to calculate emissions. In a top-down inventory, aggregate activity data is used to calculate emissions. For example, this bottom-up inventory calculates GHG emissions from the fossil fuel combustion at each individual facility instead of using the total amount of fossil fuel combusted state-wide, which would be a top-down inventory method. The advantage to a bottom-up inventory is that the calculations are more accurate than a top-down inventory. However, because the two methods differ, the results from a bottom-up inventory are not directly comparable to a top-down inventory. The Department would like to conduct both top-down and bottom-up inventories in the future, but currently does not have the resources to do so. This is further discussed in Chapter 6 of this report.

Four top-down inventories of Iowa emissions have been conducted from 1996 – 2008. In 1996, the Department published a GHG emission inventory for 1990 using United States Environmental Protection Agency (U.S. EPA) inventory tools as part of an Iowa Greenhouse Gas Action Plan.[3] The 1990 inventory was prepared in partnership with the Center for Global and Regional Environmental Research (CGRER) at the University of Iowa and reported gross emissions of 86,745,131 tons of carbon dioxide equivalent or 78.7 million metric tons of carbon dioxide equivalent ($MMtCO_2e$). [4]

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[1] Iowa Code 455B.851
[2] Iowa Code 455B.152
[3] Iowa Department of Natural Resources and University of Iowa Center for Global and Regional Environmental Research (CGRER). 1996. *Iowa Greenhouse Gas Action Plan.* Internet address: http://www.iowadnr.gov/air/prof/ghg/files/1990%20Iowa%20Greenhouse%20Gas%20Action%20Plan.pdf
[4] Ibid., Table A.1.

In 2005, the Department published a 2000 GHG inventory that was completed by the Center for Energy & Environmental Education (CEEE) at the University of Northern Iowa (UNI) on behalf of the Department and was funded by a grant from EPA.[5] This report recalculated the data from the 1990 CGRER inventory using new methods, reporting gross GHG emissions of 21.1 million metric tons of carbon equivalent (MMTCE) or 77.4 $MMtCO_2e$ in 1990 and 26.2 MMTCE or 96.07 $MMtCO_2e$ for calendar year 2000[6] as shown in Table 1.

In October 2007, the World Resource Institute (WRI) released a GHG inventory, *Charting the Midwest: an Inventory and Analysis of Greenhouse Gas Emissions in America's Heartland,*[7] which summarized 1990 -2003 emissions trends for Iowa and other Midwestern states. WRI found that 2003 Iowa gross GHG emissions totaled 108 $MMtCO_2e$ and that emissions from agriculture were 22% of total emissions, the highest percentage of any state in the Midwest.

One year later, the Center for Climate Strategies (CCS) finalized their GHG inventory and forecast, *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 – 2025,*[8] that they conducted for the Iowa Climate Change Advisory Council (ICCAC). Results from this inventory are also shown in Table 1 and were slightly lower than previous inventories because more refined calculation methods and Iowa specific-activity data were used. The full results from the *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 – 2025,* including emissions by sector from 1990 – 2025 are provided in Appendix B of this report.

Table 1 - Historical Iowa State-wide GHG Emissions

Emissions Year	Gross MMtCO2e (excludes sinks)	Net MMtCO2e (includes sinks)	Prepared By	Year Prepared
1990	78.7	NA	U of Iowa CGRER / DNR	1996
1990	83.6	77.4	UNI CEEE / DNR	2005
2000	120.3	96.1	UNI CEEE / DNR	2005
2003	108	NA	WRI	2007
1990	97.3	75.4	CCS for ICCAC	2008
2000	114.2	94.3		
2005	119.5	92.2		

U.S. EPA also develops the official GHG inventory for the nation each year. The national inventory is a top-down inventory and is submitted to the United Nations in accordance with the Framework Convention on Climate Change. The latest version, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007,*[9] was released April 15, 2009 and found that 2007 national gross GHG emissions were 7,150 $MMtCO_2e$ and increased 1.4% from 2006.

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[5] Iowa Department of Natural Resources and University of Northern Iowa Center for Energy and Environmental Education. 2005. *Year 2000 Iowa Greenhouse Gas Emission Inventory.* Internet address: http://www.iowadnr.gov/air/prof/ghg/files/Iowa2000inventory.pdf.

[6] http://www.epa.gov/climatechange/emissions/downloads/IAInventorySummary_11-16b.pdf

[7] World Resources Institute. 2007. *Charting the Midwest: An Inventory and Analysis of Greenhouse Gas Emissions in America's Heartland.* Internet address: http://www.wri.org/publication/charting-the-midwest.

[8] Center for Climate Strategies. 2008. *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 – 2005.* Internet address: http://www.iaclimatechange.us/Inventory_Forecast_Report.cfm.

[9] U.S. EPA. 2009. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007.* Internet address: http://www.epa.gov/climatechange/emissions/usinventoryreport.html.

On April 10, 2009, U.S. EPA published a proposed rule[10] that requires mandatory reporting of GHG emissions from large sources in the United States. The proposed rule generally requires reporting of annual GHG emissions from fossil fuel suppliers, industrial GHG suppliers, vehicle and engine manufacturers, and facilities that emit 25,000 $mtCO_2e$ or more per year of GHG emissions. When finalized, this rule may duplicate the Department's current mandatory GHG reporting program. The implications of this rule are further discussed in Chapter 6 of this report.

Corrections to the Department's 2007 GHG Inventory

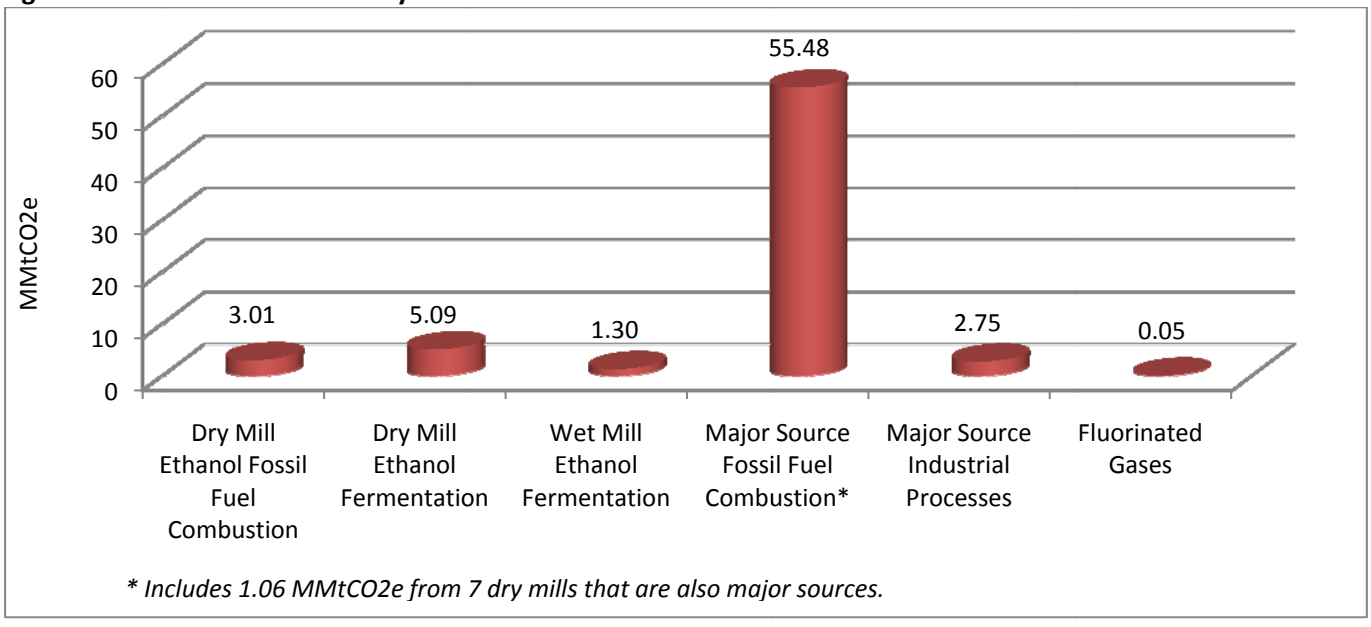
The Department released its report *2007 Greenhouse Gas Inventory for Selected Iowa Source Categories* on August 28, 2008. Since the release of that document, eleven companies have submitted corrections to their 2007 fossil fuel combustion GHG emissions data as shown in Appendix A of this report. The corrections added an additional 2.03 $MMtCO_2e$ of emissions to the reported total of 52.06 $MMtCO_2e$, bringing the total 2007 GHG emissions from fossil fuel combustion at major sources to 54.09 $MMtCO_2e$.

One dry mill ethanol plant notified the Department that they had under-reported the amount of ethanol produced by 2.97 million gallons. While this slightly increased the facility's emissions, the increase was small enough that the statewide total did not change, still rounding out to 3.94 $MMtCO_2e$.

Findings

2008 GHG emissions from fossil fuel combustion were calculated to be 55.48 $MMtCO_2e$ from the federally-recognized major sources and 3.01 $MMtCO_2e$ from Dry Mill Ethanol Plants. GHG emissions from the ethanol plant fermentation processes were estimated to be 5.09 $MMtCO_2e$ from dry mills and 1.30 $MMtCO_2e$ from wet mills. Another 0.05 $MMtCO_2e$ of GHG emissions from use of fluorinated gases and 2.75 $MMtCO_2e$ from industrial processes were reported as shown in Figure 1 below.

Figure 1 – 2008 GHG Emissions by Sector



[10] U.S. EPA, 2009. *Mandatory Reporting of Greenhouse Gases; Proposed Rule*. Internet address: http://www.epa.gov/climatechange/emissions/ghgrulemaking.html.

EPA's Greenhouse Gas Equivalencies Calculator [11] estimates that the total GHG emissions from major sources' fossil fuel combustion (55.48 $MMtCO_2e$) are equivalent to:

- Annual GHG emissions from 10,161,172 passenger vehicles
- CO_2 emissions from the *electricity* use of 7,694,868 homes for one year
- CO_2 emissions from the *energy* use of 5,048,226 homes for one year
- Carbon sequestered by 1,422,564,103 tree seedlings grown for 10 years
- CO_2 emissions from 2,311,666,668 propane cylinders used for home barbeques
- GHG emissions avoided by recycling 19,131,034 tons of waste instead of sending it to the landfill

Emissions Trends

Overall, GHG emissions increased from 2007 – 2008:

1. Total gallons of ethanol produced at dry mills and direct GHG emissions from dry mill ethanol production increased 29%, while total gallons of ethanol produced at wet mills decreased 5%.

2. Total stationary fossil fuel GHG emissions increased 2.57% ;
    - CO_2 increased 2.57%
    - CH_4 increased 2.03%
    - N_2O increased 2.24%

3. GHG emissions from coal combustion increased 4%, accounting for 87% of the total major source fossil fuel combustion GHG emissions reported.

However, other GHG emissions trends are not obvious as the data collected is varied. This variability may be caused by many factors including the economic downturn and record-setting flooding in some communities.

- 40% of major source facilities reported lower fossil fuel GHG emissions
- 18% of major source facilities reported no increase or decrease in fossil fuel GHG emissions
- 42% of major source facilities reported higher fossil fuel GHG emissions

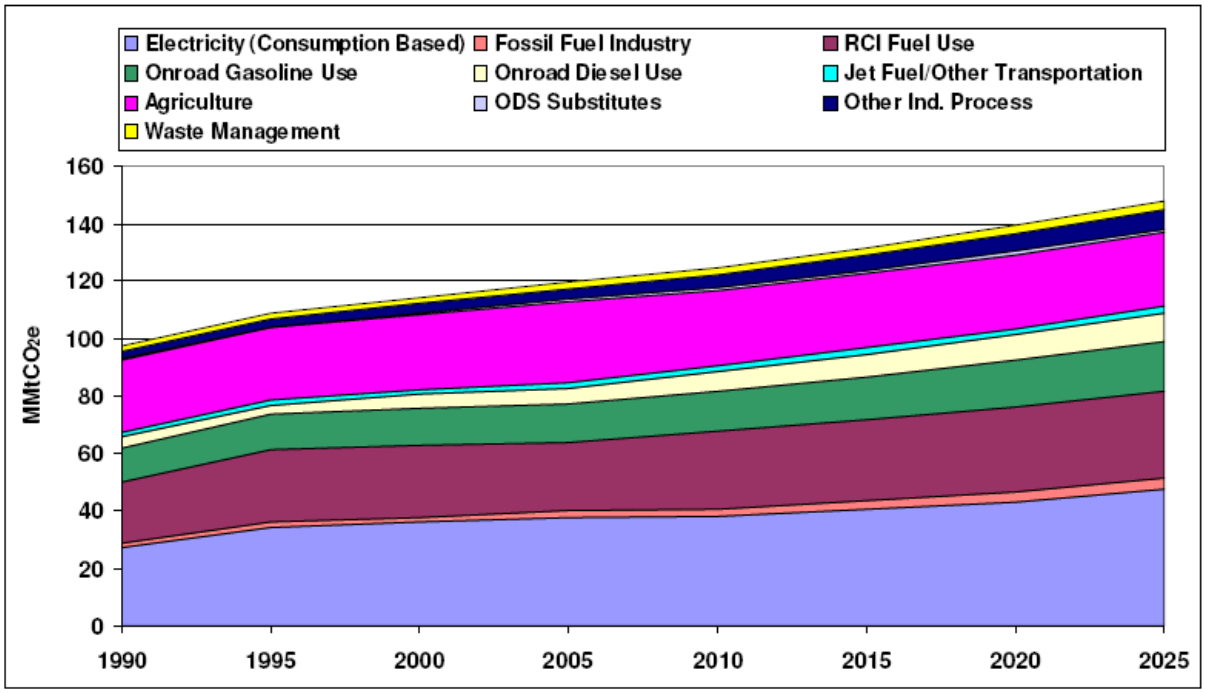
Forecasting

The Department's 2008 inventory does not include any direct forecasting. However, the Center for Climate Strategies (CCS) forecasted Iowa's anthropogenic GHG emissions and carbon sinks to 2025 in their comprehensive *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 - 2005*[12] that was prepared for the Iowa Climate Change Advisory Council (ICCAC). The Department chose to use CCS's forecast because it was the most comprehensive, accurate forecast that was readily available. The CCS report shows that Iowa's gross GHG emissions increased by 20% from 1990 to 2005 to 119.5 $MMtCO_2e$. Assuming a business-as-usual scenario, CCS projects Iowa's gross GHG emissions will continue to grow, reaching 51% above 1990 levels by 2025 as shown in Figure 2 and Appendix B.

[11] http://www.epa.gov/cleanenergy/energy-resources/calculator.html

[12] Center for Climate Strategies. 2008. *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 – 2005.* Internet address: http://www.iaclimatechange.us/Inventory_Forecast_Report.cfm.

Figure 2 - Iowa Gross GHG Emissions by Sector, 1990-2025: Historical and Projected



However, new information released by the Energy Information Administration (EIA) in its August 11, 2009 *Short-Term Energy Outlook* indicates that Iowa's projected emissions may differ from Figure 2 if Iowa follows national trends. The EIA states that "The economic downturn, combined with natural gas displacing some coal as a source of electricity generation, is projected to lead to a 5-percent decline in fossil-fuel-based CO_2 emissions in 2009. We expect an improving economy to increase CO_2 emissions from fossil fuels by 0.7 percent in 2010."[13]

[13] Energy Information Administration, August 11, 2009. *Short-term Energy Outlook*, Internet address: http://www.eia.doe.gov/emeu/steo/pub/contents.html.

Chapter 1: 2008 GHG Emissions from Fossil Fuel Combustion at Major Sources

Overview

Title V of the 1990 federal Clean Air Act Amendments created a national operating permit program to standardize operating permit applicable requirements for major sources of air pollution. These facilities are the largest federally-recognized sources of air pollution and are commonly referred to as major sources. In general, a facility is subject to the Title V operating permit program if it has an annual potential to emit greater than 100 tons of either particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), or volatile organic compounds (VOC); or greater than ten tons per year of a single hazardous air pollutant (HAP); or greater than twenty-five tons of a combination of HAPs.

In 2007, 276 facilities subject to this regulatory program operated in Iowa. In 2008, nine facilities dropped out of the program (see Table 2) and five facilities (see Table 3) were added to the program, making a total of 272 facilities subject to the Department's 2008 major source GHG reporting requirements. These facilities were required to estimate and submit their calendar year 2008 GHG emissions to the Department by March 31, 2009.

Table 2 - Major Source Facilities Included in 2007 Inventory, but not in 2008 Inventory

Facility ID	Facility Name	City	Explanation
59-01-009	Astoria Industries of Iowa, Inc.	Osceola	Closed.
13-03-007	Brand FX Body Company	Swea City	Closed.
73-01-017	Featherlite, Inc.	Shenandoah	Closed.
85-01-062	IPL - Ames Diesel Station	Ames	Closed.
69-01-023	Johnson Controls Battery Group, Inc.	Red Oak	Now a minor source.
82-01-141	NST Landfill Gas of Iowa, Inc.	Davenport	Closed.
78-01-017	Omaha Standard, Inc.	Council Bluffs	Now a minor source.
85-03-007	Pella Corporation - Story City Division	Story City	Closed.
01-01-004	Quad/Greenfield, LLC	Greenfield	Now a minor source.

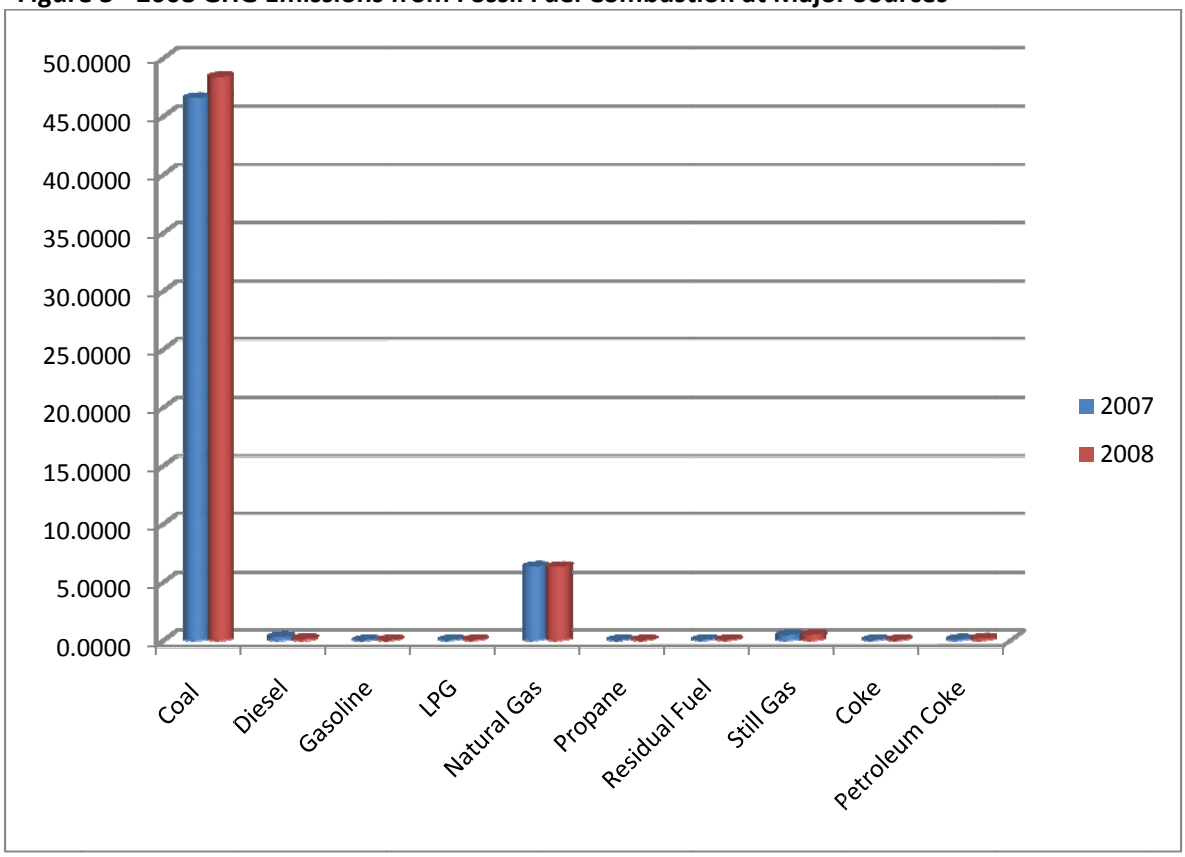
Table 3 - New Major Source Facilities in 2008 Inventory

Facility ID	Facility Name	City	Explanation
82-16-002	ACO YP Inc	Riverdale	Previously a minor source.
23-01-006	ADM Clinton Cogeneration	Clinton	New source.
07-02-053	Cedar Falls Municipal Water Utility	Cedar Falls	Previously a minor source.
57-02-008	Maax U.S. Corp	Cedar Rapids	Only operated 2 months in 2007; did not submit a 2007 GHG inventory.
98-02-004	Manly Terminal	Manly	New source.

Emissions

Total GHG emissions from fossil fuel combustion at major sources were calculated to be 55.48 $MMtCO_2e$,[14] an increase of 2.57 percent from 2007. The combustion of two fuels – coal (87.2%) and natural gas (11.4%) – accounted for 98.5% of the emissions. The remaining 1.4 percent were from combustion of a variety of fuels such as diesel, gasoline, liquefied petroleum gas (LPG), propane, residual fuel, still gas, coke, and petroleum coke. Figure 3 shows the $MMTCO_2e$ of GHG emissions from each fossil fuel that was combusted. Emissions from the combustion of butane, crude oil, and kerosene rounded to 0.00 MMtCO2e and are not included in Figure 3.

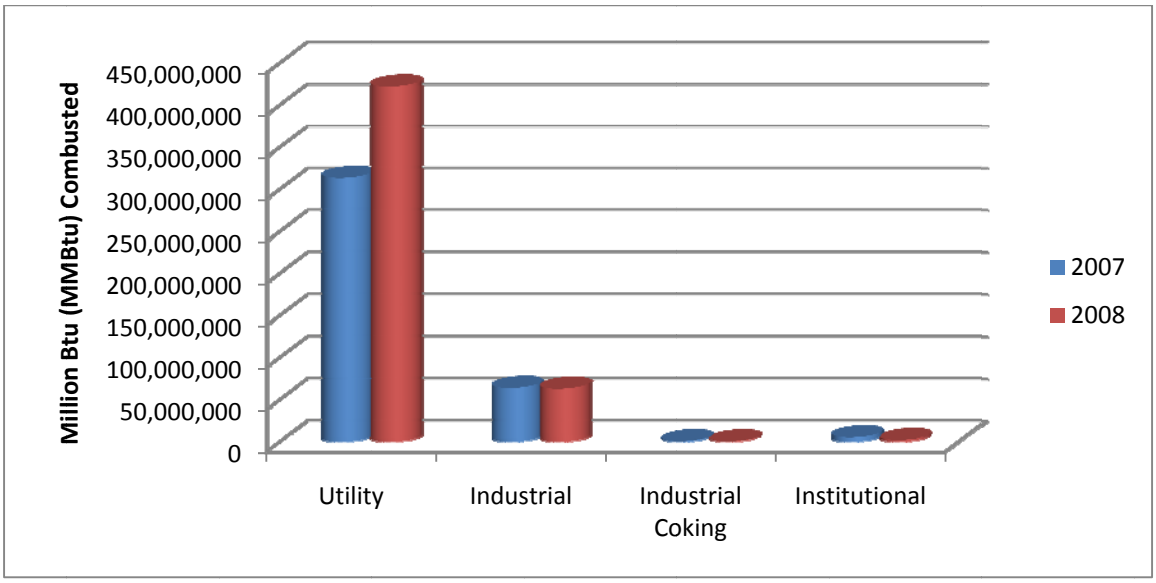
Figure 3 - 2008 GHG Emissions from Fossil Fuel Combustion at Major Sources



Coal combustion is divided into four sectors – utility, industrial, industrial coking and institutional. Of the four sectors, only the utility sector reported increased GHG emissions. From 2007 – 2008, GHG emissions from the utility sector increased 5% as shown in Figure 4.

[14] Includes fossil fuel combustion emissions from four ethanol wet mills and eight ethanol dry mills that are major sources.

Figure 4 - Coal Combustion GHG Emissions by Category 2007 - 2008



In addition, nine of the ten facilities that had the highest GHG emissions from fossil fuel combustion in 2008 were all coal-fired utilities as shown in Table 4**.** The other facility, ADM Corn Processing, uses coal-fired boilers. The emissions from these ten facilities account for 74% of the total GHG emissions from fossil fuel combustion.

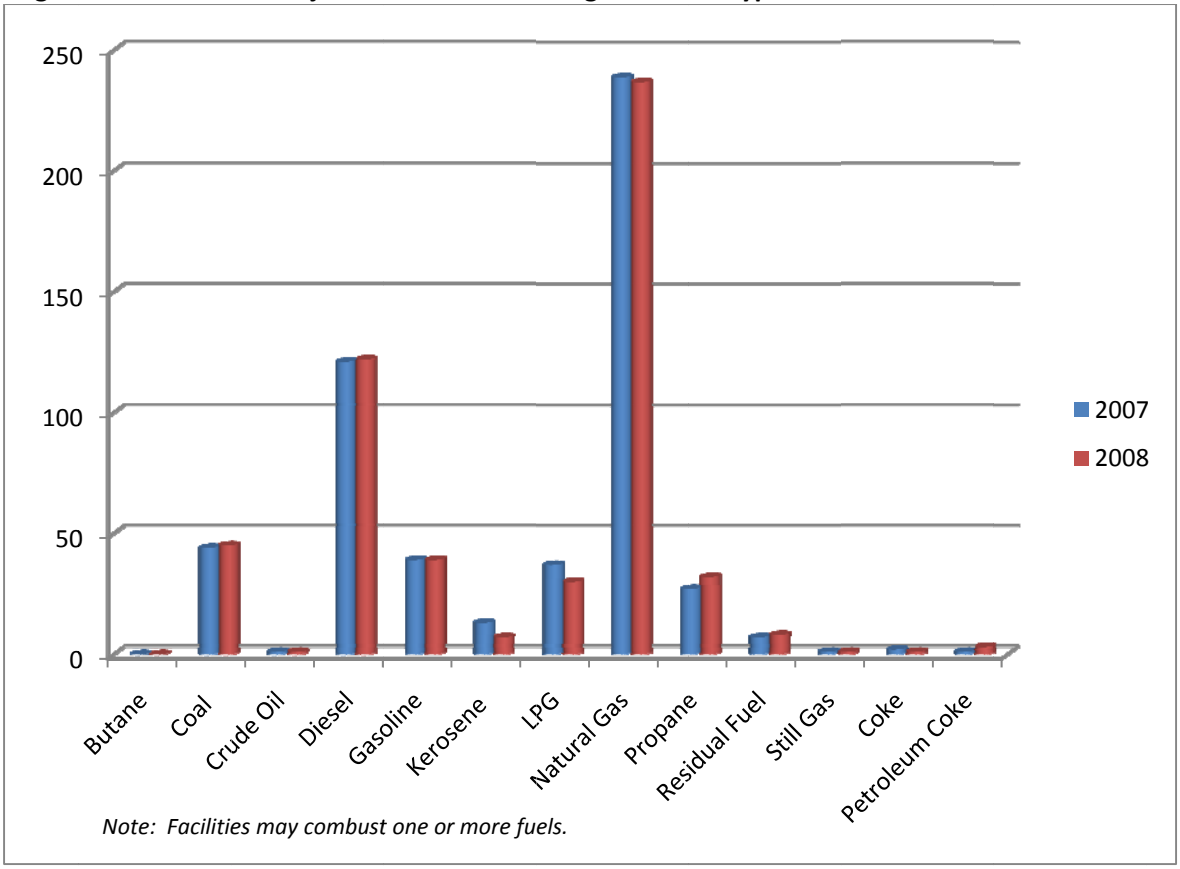
Table 4 - Ten Largest Sources of 2008 GHG Emissions from Fossil Fuel Combustion

Facility ID	Facility Name	City	2007 $MMtCO_2e$	2008 $MMtCO_2e$	2007 Rank
78-01-026	MidAmerican Energy Co. - Walter Scott Jr. Energy Center	Council Bluffs	9.14	10.94	1
97-04-010	MidAmerican Energy Co. - George Neal North	Sergeant Bluff	6.28	6.16	2
90-07-001	IPL - Ottumwa Generating Station	Ottumwa	4.26	4.93	4
58-07-001	MidAmerican Energy Co. - Louisa Station	Muscatine	3.66	4.70	5
97-04-011	MidAmerican Energy Co. - George Neal South	Sergeant Bluff	4.46	4.59	3
57-01-080	ADM Corn Processing	Cedar Rapids	2.38	2.39	6[15]
03-03-001	IPL - Lansing Generating Station	Lansing	1.91	2.05	8
70-01-011	Muscatine Power & Water	Muscatine	2.19	2.00	7
29-01-013	IPL - Burlington Generating Station	Burlington	1.42	1.35	10
64-01-012	IPL - Sutherland Generating Station	Marshalltown	1.31	0.95	11
82-02-006	MidAmerican Energy Co. – Riverside Station	Bettendorf	0.93	0.90	14
	Total		**37.94**	**40.96**	

[15] ADM Corn Processing was not listed in the list of "Ten Largest Sources of 2008 Greenhouse Gas Emissions from Fossil Fuel Combustion" in the 2007 inventory because the facility reported emissions of 0.30 $MMtCO_2e$. The facility has since corrected its 2007 inventory to emissions of 2.38 $MMtCO_2e$, which would have made it the sixth largest source, moving sources ranked 6 – 10 down one rank to 7 - 11.

Although a greater number of major sources combusted natural gas than coal a shown in Figure 5, the total emissions from coal combustion were still higher because more CO_2 is emitted per unit of coal than per unit of natural gas as shown on the Major Source Reporting Form included in this report as Appendix C.

Figure 5 - Number of Major Sources Combusting Each Fuel Type 2007 - 2008



Diversity of Sources

The sources inventoried provide a variety of services and manufacture many different products. Table 5 shows the total GHG emissions for different industry types and how their associated fossil fuel combustion GHG emissions changed from 2007 – 2008. No clear statewide trend is evident, despite the weakened economy in 2008. The largest increase in GHG emissions was SIC 51xx Wholesale Trade – Non-durable Goods (93%), and the largest decrease was in SIC 92xx Justice, Public Order, and Safety (-53%).

Table 5 - 2008 GHG Emissions from Fossil Fuel Combustion at Major Sources by General Industrial Groupings

Two-Digit SIC	SIC Division Description	2007		2008		% Change
		mtCO2e	Number of Facilities	MtCO2e	Number of facilities	
49xx	Electric, Gas, and Sanitary Services	42,543,414[16]	69	44,384,206	69	4%
20xx	Food and Kindred Products	6,754,141[16]	32	6,230,938	32	-8%
28xx	Chemicals and Allied Products	1,735,491	15	1,771,727	14	2%
32xx	Stone, Clay, Glass, and Concrete Products	1,158,295	14	1,141,014	14	-1%
82xx	Educational Services	632,800	6	642,512	6	2%
33xx	Primary Metal Industries	595,189	19	641,358	18	8%
35xx	Industrial Machinery and Equipment	195,180[16]	15	187,632	15	-4%
30xx	Rubber and Miscellaneous Plastics Products	142,857	15	136,117	17	-5%
26xx	Paper and Allied Products	55,938	5	69,811	5	25%
80xx	Health Services	33,346	1	33,521	1	1%
97xx	National Security and International Affairs	58,275	1	63,734	1	9%
36xx	Electronic and Other Electrical Equipment and Components, Except Computer Equipment	47,745	6	32,265	6	-32%
87xx	Engineering and Management Services	31,394	2	31,446	2	0%
24xx	Lumber and Wood Products	24,871	14	24,709	13	-1%
25xx	Furniture and Fixtures	19,478	3	21,386	3	10%
34xx	Fabricated Metal Products	19,733	17	21,346	17	8%
37xx	Transportation Equipment	20,941[16]	17	21,143	13	1%
46xx	Pipelines, Except Natural Gas	15,477	12	16,674	12	8%
27xx	Printing and Publishing	4,301	2	4,123	2	-4%
47xx	Transportation Services	0	1	3,021	1	NA
75xx	Automotive Repair, Services, and Parking	1,278	2	952	2	-26%
63xx	Insurance Carriers	884	1	766	1	-13%
51xx	Wholesale Trade-Non-durable Goods	106	4	204	5	93%
92xx	Justice, Public Order, and Safety	390	1	182	1	-53%
39xx	Miscellaneous Manufacturing Industries	110	1	103	1	-6%

Method

The Department developed reporting forms that were pre-filled with emission factors and calculations. The facilities entered their 2008 fossil fuel combustion and/or the number of gallons of denatured ethanol they produced in 2008. The reporting forms also allowed the facility to report CO_2 stack test data or CO_2 continuous emissions monitor (CEM) data if applicable.

GHG emissions from fossil fuel combustion were calculated using emission factors from the California Climate Action Registry's *General Reporting Protocol, Version 2.2* Tables C.5 and C.6 which is consistent with Intergovernmental Panel on Climate Change (IPCC) guidance. Copies of the reporting forms, including emission factors, are attached to this report as Appendices C and E, and the resulting emission data is included in

[16] This value has been corrected since the 2007 inventory was published in August 2008.

Appendices D and F. Stack test results, when available, were used in lieu of emissions factors because source-specific stack test results are typically more accurate than emission factors which are averaged from multiple stack test results. In general, emission factors are developed from source test data from facilities in an industrial category.

Continuous Emissions Monitor (CEM) Data

The Department used CEM data when it was available, and verified all CEM data submitted by comparing it to the values posted on EPA's Clean Air Markets Division (CAMD) website.[17] CEM data is more accurate than emissions calculated using emission factors because CEM data is continuously measured and verified annually through relative accuracy tests. Many of the units with CEMs combusted more than one fuel type. In order to calculate a total CO_2 value for each fuel type, the Department calculated the CO_2 emissions from each fuel using the appropriate emission factor, then applied the ratio of those emissions to the total CEM value. This ratio is further discussed in Chapter 2 under the heading "Key Uncertainties".

Conversion to Million Metric Tons of CO_2 Equivalent ($MMtCO_2e$)

Total emissions were converted to $MMtCO_2e$ as shown below in Equation 1 using global warming potentials (GWPs) from the IPCC Second Assessment Report (SAR) (1996). The IPCC released its Fourth Assessment Report (AR4) in 2008 with new GWPs, but has not updated the GWPs in its published inventory method. The Department chose to use the GWPs from the SAR as shown in Table 6 because it is the nationally-accepted methodology and can be adjusted in the future.

Equation 1: $MMtCO_2 = 1\ ton \times \frac{9.072\ e^{-7}\ MMt}{1\ ton}$

$$MMtCO_2e = (MMtCO_2 \times GWP) + (MMtCH_4 \times GWP) + (MMtN_2O \times GWP)$$

$$MMtCO_2e = (MMtCO_2 \times 1) + (MMtCH_4 \times 21) + (MMtN_2O \times 310)$$

Table 6 - Global Warming Potentials (GWP)

Pollutant	GWP
Carbon Dioxide	1
Methane	21
Nitrous Oxide	310
Fluorinated Gases (HFC, PFC, SF_6)	See Table 9 and Appendix G

Key Uncertainties

1. For 2008, the Department updated the form to allow facilities to report their facility-specific heating value from their fuel supplier. This improved on a key uncertainty in 2007 when the Department assumed that facilities used a heating value of 1,050 million Btu (MMBtu) per million cubic feet (MMcf) of natural gas from Appendix A of EPA's AP-42 Compilation of Air Pollutant Emission Factors[18] for all facilities.

[17] http://camddataandmaps.epa.gov/gdm/

[18] www.epa.gov/ttn/chief/ap42

2. The Department applied a ratio of CO_2 emissions calculated using the emission factor for each fuel to CEMS data to determine the total CO_2 emissions from each fuel combusted. This method assumes that the emission factor for each fuel is of the same accuracy, when this is likely not the case. However, no alternative method was available.

Chapter 2: 2008 GHG Emissions from Ethanol Production

Overview

Direct GHG emissions from ethanol production come from two primary sources – fermentation and fossil fuel combustion. During the dry mill process the corn kernels are ground into flour before processing. Bi-products created are distillers grain with solubles (DGS), which may be sold as livestock feed, and CO_2, which may be sold for use in food processing and bottling. In wet mill production, the corn is steeped before processing. Wet mills often produce other co-products such as starches, corn syrups, feeds, and oils.

Dry mills and wet mills are evaluated separately in this chapter because wet mill plants are not able to definitively calculate the amount of fossil fuels combusted solely for ethanol production versus the amount used to produce co-products.

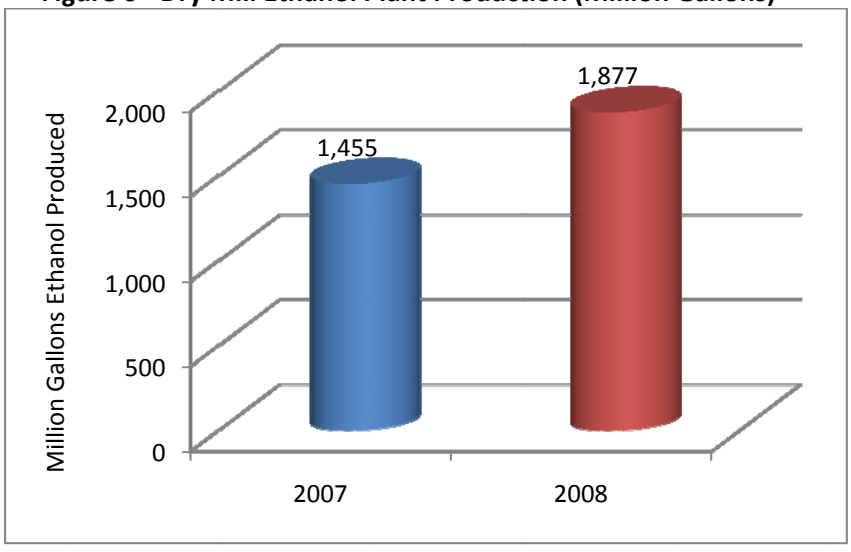
This inventory does not include any type of life-cycle analysis for ethanol production. More information on life cycle analysis can be found on EPA's web site at http://www.epa.gov/otaq/renewablefuels/index.htm.

Ethanol Dry Mill Emissions

GHG emissions from dry mill ethanol production come from two primary sources – fermentation and fossil fuel combustion. Fossil fuels are combusted for various activities such as the drying of DGS and the heating of process water.

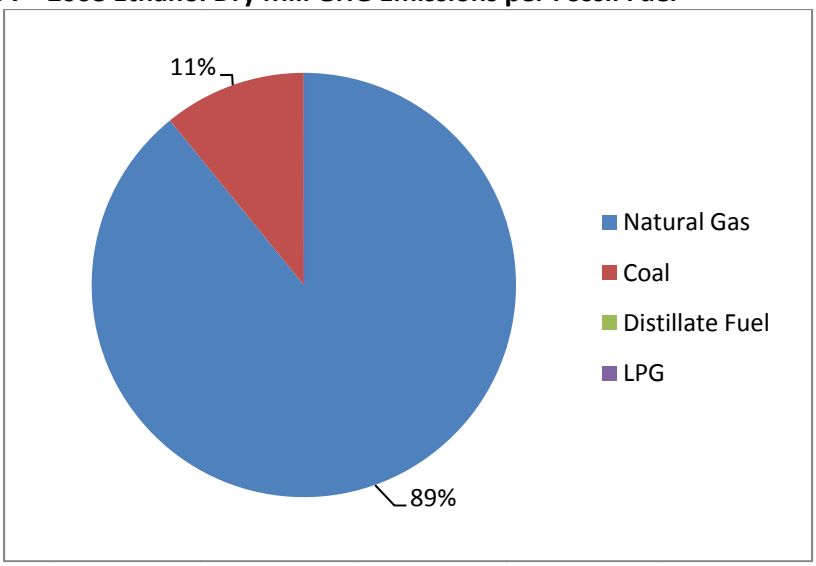
Dry mill ethanol production increased 29% from 2007 to 2008, resulting in a 29% increase in GHG emissions. Six new dry mill plants began production in 2008, raising the number of operating dry mill plants from twenty-six in 2007 to thirty-two in 2008. Production increased from 1,455 million gallons to 1,877 million gallons as shown in Figure 6.

Figure 6 - Dry Mill Ethanol Plant Production (Million Gallons)



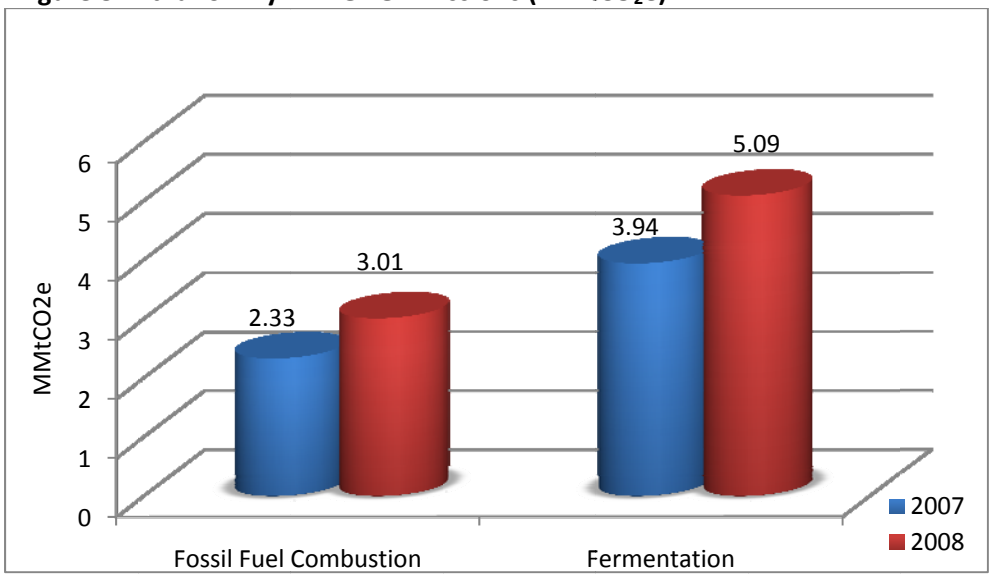
Total GHG emissions from dry mill ethanol production were calculated to be 8.09 million metric tons of CO_2 equivalent ($MMtCO_2e$). Fossil fuel combustion accounted for 3.01 $MMtCO_2e$ of the total emissions as shown in Figure 8 below. Two dry mill plants combust coal as their primary fuel. The other thirty combust natural gas as their primary fuel, accounting for 89% of the total fossil fuel GHG emissions as shown in Figure 7. Emissions from combustion of LPG (143.47 metric tons CO_2e) and diesel fuel (508.17 metric tons CO_2e) calculated to be less than 0.00 $MMtCO_2e$ and are not shown in Figure 7.

Figure 7 - 2008 Ethanol Dry Mill GHG Emissions per Fossil Fuel



Fermentation emissions accounted for 5.09 $MMtCO_2e$ of the total emissions as shown in Figure 8 below. This includes 0.04 $MMtCO_2e$ that one dry mill plant reported they captured and sold to a neighboring CO_2 recovery plant.

Figure 8 - Ethanol Dry Mill GHG Emissions ($MMtCO_2e$)



CO_2 emissions from fermentation are reported separately in this inventory because they are biogenic emissions. According to The Climate Registry's General Reporting Protocol, they are considered biogenic "because the carbon in biomass is of a biogenic origin—meaning that it was recently contained in living organic matter—while the carbon in fossil fuels has been trapped in geologic formations for millennia."[19] Because of this biogenic origin, the Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories* requires that biogenic CO_2 emissions be counted separately. The fermentation and fossil fuel GHG emissions for all Iowa dry mill ethanol plants can be found in Appendix F of this report. The ten largest GHG-emitting dry mill ethanol plants are shown in Table 7.

Table 7 - Ten Largest Sources of 2008 Ethanol Dry Mill GHG Emissions

Facility ID	Facility Name	City	2008 Million Gallons Produced	2008 Fermentation $MMtCO_2e$	2008 Fossil Fuel $MMtCO_2e$
10-04-007	Hawkeye Renewables, LLC	Fairbank	121	0.33	0.17
17-01-100	Golden Grain Energy	Mason City	109	0.30	0.18
94-01-073	Valero Renewable Fuels Company, LLC	Fort Dodge	112	0.30	0.17
34-01-040	Valero Renewable Fuels Company, LLC	Charles City	110	0.30	0.17
18-02-006	Little Sioux Corn Processors, LP	Marcus	102	0.28	0.19
42-01-019	Hawkeye Renewables, LLC	Iowa Falls	99	0.27	0.15
29-02-012	Big River Resources, LLC	W. Burlington	97	0.26	0.14
55-09-003	Global Ethanol	Lakota	93	0.25	0.15
11-05-004	Valero Renewable Fuels Company, LLC	Albert City	93	0.25	0.13
66-10-001	Absolute Energy, LLC	St. Ansgar	77	0.21	0.12

Ethanol Wet Mill Fermentation

In wet mill production, the corn is steeped before processing. Wet mills often produce other co-products such as starches, corn syrups, feeds, and oils. Five wet mill ethanol plants operated in Iowa in 2008 as shown in Table 8. There were 480 million gallons of denatured ethanol produced in 2008, resulting in 1.30 $MMtCO_2e$ of emissions from the fermentation process. This is a 5% decrease in both production and fermentation emissions from 2007. As discussed earlier in this chapter, fermentation emissions are considered biogenic and are not counted in Iowa's GHG emissions total.

[19] *The Climate Registry General Reporting Protocol*, Version 1.1, p. 33, May 2008.

Table 8 - 2008 Ethanol Wet Mill GHG Emissions

			2007	2008	
Facility ID	**Facility Name**	**City**	**Million Gallons Denatured Ethanol Produced**	**Million Gallons Denatured Ethanol Produced**	**MMtCO2e from Fermentation**
23-01-006	ADM	Clinton	154	154	0.42
57-01-080	ADM Corn Processing	Cedar Rapids	242	226	0.61
68-09-001	Cargill	Eddyville	67	32	0.09
70-01-004	Grain Processing Corporation	Muscatine	71	57	0.15
57-01-025	Penford Products	Cedar Rapids	Not operated.	12	0.03
	Total		**503**	**480**	**1.30**

Method

GHG emissions data was collected from fossil fuel combustion as described under the Method section of the "Summary of Findings" of this inventory. Methods specific to the ethanol sector included the following:

Fermentation

CO_2 emissions from fermentation for each dry mill ethanol facility are shown in detail in Appendix F. CO_2 emissions from the four wet mill ethanol plants are shown earlier in Table 8. CO_2 emissions were calculated using mass balance equations that derive CO_2 emissions from the gallons of denatured ethanol (EtOH) produced. The equations used were:

Equation 2: $C_6H_{12}O_6 + yeast = 2\ CH_3CH_2OH + 2\ CO_2$

sugar + yeast = ethanol + carbon dioxide

Assumptions: $gallons\ denatured\ EtOH\ produced\ \times .95 = gallons\ 200\ proof\ EtOH$[20]

Equation 3: $$gallons\ 200\ proof\ EtOH\ \times \frac{0.789g\ EtOH}{1\ cm^3} \times \frac{3785.41cm^3}{gallons} \times \frac{1\ mol\ EtOH}{46.06844g\ EtOH} \times \frac{2\ mol\ CO_2}{2\ mol\ EtOH} \times \frac{44.0095g\ CO_2}{mol\ CO_2} \times \frac{1\ lb}{453.59g} \times \frac{1\ ton}{2000\ lbs} = tons\ CO_2$$

Key Uncertainties

The Department periodically requires stack tests to be conducted by various stationary sources to determine compliance with applicable air emission limits. The percentage of CO_2 in the exhaust stream is sometimes measured during the tests. The Department compared the total amount of CO_2 calculated with emission factors and the mass balance equation to the percentage of CO_2 measured during stack testing conducted at each facility using the following equation to correct for ambient CO_2:

Equation 4: *CO_2 (lbs/hr) = (CO_2%-0.03)*0.001142*flowrate in dscfm*60*

[20] The Department assumed denatured ethanol typically is 5% gasoline and 95% 200 proof ethanol. Penford Products assumed 3% gasoline.

The results showed that the emissions calculated using test data varied widely per facility, both higher and lower, from the Department's calculations using Equations 2 and 3. Reasons for these deviations may include:

Uncertainty in Emission Testing Data

1. Operating capacity and flow rate during stack test vs. typical operations:
   The Department requires that the units being tested should be operated in a normal manner at its maximum continuous output as rated by the equipment manufacturer, or the rate specified by the owner as the maximum production rate at which this units will be operated. However, this may not always reflect normal steady state emissions. Based on conversations with several operating ethanol facilities, plants typically run one boiler at 50-60% capacity and have the second boiler produce the remainder of the steam necessary. The second boiler typically operates between 30 to 50% capacity, depending on the plant needs and a number of other variables including number of fermentation vessels operating, stage of fermentation, ambient temperature, etc. Since the conversion from percentage CO_2 during the test is dependent on flow rate, if the flow rate during normal operation varies during the test, the calculated CO_2 emissions will also vary.

2. Fermentation stage:
   The stack test reports do not document which stages of fermentation the test was conducted. CO_2 emissions during fermentation are not constant. They increase to a peak and then decrease during the cycle and also change with temperature. It is unknown if tests were conducted during the low or high points of this emission curve.

Uncertainty in the Calculation Methods Used

1. The Department used the best available emission factors, but emission factors for fossil fuel combustion were not developed from data collected from testing preformed at ethanol plants.

2. Equation 3 assumes all carbon not converted to alcohol was converted to CO_2 and is therefore worst-case. It does not account for carbon that may have formed other pollutants such as acetaldehyde, formaldehyde, etc. Some yeast is less tolerant to heat and other conditions and may produce more off-products such as acetaldehyde and less ethanol.

3. The Department assumed that denatured ethanol contains 5% denaturant. This is an average. The percentage of denaturant added varies depending on market cost and the ethanol blend produced at each specific plant.

Next Steps or Future Improvements

The discrepancy between fermentation emissions calculated by mass balance and emissions calculated from test data should be investigated further. One improvement would be to record information regarding the status of the fermentation cycle when the test is conducted.

The Department may consider developing a reporting form that allows facilities to use their own facility-specific denaturant percentage rather than and average of 5%.

Chapter 3: 2008 Emissions of Fluorinated Gases (HFC, PFC, and SF_6)

Overview

The Department expanded the scope of its 2008 GHG inventory to include emissions of three additional GHG pollutants – hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6), also known as fluorinated gases or "F-gases". All facilities with major source operating permits were required to complete a spreadsheet to calculate emissions from HFC, PFC, and SF_6. The spreadsheet is included in Appendix C of this report. HFC and PFC may be emitted from refrigerants, air conditioning systems, fire suppression and explosion protection, and solvent cleaning. HFC may also be emitted from foam blowing and aerosols. Sources of SF_6 may include blanketing molten magnesium, aluminum recycling, thermal and sound insulation, high voltage insulation, etc. However, the majority of SF_6 emissions come from electricity transmission and distribution, which was not included in the inventory. The Department did not include SF_6 emissions from electricity transmission and distribution in the 2008 inventory because these emissions are usually attributed to electricity companies, not individual generation facilities, and the Department did not have the resources to develop specific reporting forms for this sector.

HFC Emissions

No facilities reported emissions of PFC or SF_6, but sixteen facilities reported emissions of five different HFC as shown in Table 9. One facility, Whirlpool Corporation in Amana, emitted 92% of the HFC emissions reported. Whirlpool manufactures appliances such as refrigerators, emitting nearly 113,000 pounds of HFC-245fa, which has a global warming potential of 950. This means HFC-245fa is approximately 950 times more heat-absorptive than carbon dioxide per unit of weight.

Table 9 - 2008 HFC Emissions

Number of Facilities[21]	Common Name	Name	2008 Emissions (lbs)	GWP[22]	2008 mtCO2e	2008 $MMtCO_2e$
2	HFC-134	1,1,2,2-tetrafluoroethane	875	1,000	396.90	0.00
14	HFC-134a	1,1,1,2-tetrafluoroethane	6,532	1,300	3,852.03	0.00
2	HFC-152a	1,1-difluoroethane	51	140	3.22	0.00
1	HFC-23	trifluoromethane	1.00	11,700	5.31	0.00
2	HFC-245fa	1,1,1,3,3-pentafluoropropane	112,902	950*	48,651.73	0.05
TOTAL					**52,909.19**	**0.05**

[21] A facility may have reported emissions of more than one HFC.

[22] GWP = Global Warming Potential, is the radioactive forcing that results from the addition of 1 kilogram (2.2 pounds) of a gas to the atmosphere, compared to an equal mass of carbon dioxide. To be consistent with international practices, global warming potential (GWP) values are from The Climate Registry's General Reporting Protocol and the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR), 1995, unless no value was assigned in the SAR. In that case, the GWP is from the IPCC Third Assessment Report (TAR), 2001 and are marked with an asterisk (*).

Method

Emissions were calculated using a mass balance equation that derives emissions from a facility's inventory of HFC, PFC, and SF_6, subtracting the quantity consumed and quantity recovered as shown in Equation 5 below. Emissions were then converted to million metric tons (MMt) using Equation 6 and finally converted to $MMtCO_2e$ using Equation 7.

Equation 5: *Emissions (lbs.) = Quantity Added (lbs.) – Quantity Consumed (lbs.) – Quantity Recovered (lbs.)*

Equation 6: $MMt\ HFC = lbs.HFC \times \frac{1\ ton}{2000\ lbs} \times \frac{0.9072\ mt}{ton} \times \frac{MMt}{1{,}000{,}000}$

Equation 7: $MMtCO_2e = MMt\ HFC \times GWP$

Key Uncertainties

Only sixteen of 272 major sources reported emissions of an F-gas. Several facilities reported that they do not keep records of F-gas emissions of less than fifty pounds, and several also reported that they used R-22, a chemical that is not subject to the inventory requirements. Despite this information, the Department has no way to confirm that all facilities that emitted hydrofluorocarbons (HFC), perfluorocarbons (PFC), or sulfur hexafluoride (SF_6) reported their emissions.

Chapter 4: 2008 GHG Emissions from Industrial Sources

Overview

GHG emissions are released as a by-product of many non-energy industrial processes such as production or manufacturing of adipic acid, aluminum, ammonia, cement, electronics, ethanol, ferroalloys, fluorinated greenhouse gases, glass, HCFC-22, hydrogen, iron and steel, lead, lime, magnesium, nitric acid, phosphoric acid, soda ash, semi-conductors, titanium dioxide, and other products. However, many of these products are not manufactured in Iowa. A review of Iowa industries showed seven industrial source categories that may emit GHG emissions: ammonia production and urea application, cement manufacturing, ethanol production, iron and steel production, lime manufacturing, nitric acid production, and soda ash consumption.

In December 2008, the Department expanded the scope of Iowa's mandatory reporting program to include all seven of these source categories. The Department created a reporting spreadsheet for soda ash consumption, but for the other five categories the Department required affected facilities to use calculation tools provided by the *Greenhouse Gas Protocol* (GHG Protocol)- (http://www.ghgprotocol.org/calculation-tools/all-tools). A partnership between two reputable groups, the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBSCD), the *GHG Protocol* is used internationally by governments, companies, and organizations such as The Climate Registry to quantify GHG emissions and is consistent with IPCC methods. The GHG emissions reported in this chapter do not include emissions from fossil fuel combustion as they are already reported in Chapter 1.

Cement Manufacturing

CO_2 is created during a process called calcining when limestone ($CaCO_3$) is heated in a cement kiln to form lime (CaO) and CO_2.

$$CaCO_3 + Heat \rightarrow CaO + CO_2$$

The lime is then mixed with silica-containing materials such as clay "to form dicalcium or tricalcium silicates, two of the four major compounds in cement clinker, an intermediate product from which finished Portland and masonry cement are made (Griffin 1987), while the CO_2 is released into the atmosphere."[23]

For the 2007 inventory, the Department calculated CO_2 emissions from cement kilns by applying an emission factor of 1,800 lb CO_2/ton of clinker from EPA's Web FIRE emission factor database to the clinker production reported by the three manufacturers in their annual major source inventories, resulting in total emissions of 2.21 MMtCO2e. This emission factor is rated "poor" by EPA because the factor is developed from average and

[23] STAPPA/ALAPCO and U.S. EPA. 2004. *Emission Inventory Improvement Program (EIIP) Volume VIII: Greenhouse Gases*, p. 6-4.1.

below-average test data from a small number of facilities that may not be an adequate sample of the source category.[24] For 2008, the Department required the facilities to calculate and report their own emissions using worksheets from the *GHG Protocol*. These worksheets use a more refined mass balance calculation method that calculates emissions using the clinker to cement ratio. Lafarge North America Inc. and the Lehigh Cement Company used the *GHG Protocol*, while Holcim (US) Inc. used their own custom worksheet that was developed by WBSCD but calculates emissions similarly. The total emissions reported for 2008 were 46% percent lower than 2007 as shown in Table 10.

Table 10 - 2008 Cement Manufacturing GHG Emissions

Facility ID	Facility Name	2007 Clinker (tons)	2007 MMtCO2e	2008 Clinker (tons)	2008 MMtCO2e	% Change
17-01-009	Holcim (US) Inc.	998,495	0.82	944,927	0.46	- 44%
82-04-005	Lafarge North America Inc.	993,929	0.81	886,086	0.44	- 46%
17-01-005	Lehigh Cement Company	717,991	0.59	623,390	0.29	-.51%
	Total	**2,710,415**	**2.21**	**2,454,403**	**1.19**	**-46%**

Iron and Steel Mills

Iron and steel production is an energy-intensive process that also generates process-related GHG emissions. Steel is produced from pig iron in a variety of specialized steel-making furnaces, including electric arc furnaces (EAFs) and basic oxygen furnaces (BOFs).[25] Two iron and steel facilities, Gerdau Ameristeel US, Inc. and SSAB Iowa Inc., operate in Iowa and use EAFs to produce steel. These furnaces use carbon electrodes, charge carbon and other substances such as natural gas to aid in melting scrap and other metals, which are then improved to create the preferred grade of steel. In EAFs, CO_2 emissions result primarily from the consumption of carbon electrodes and also from the consumption of supplemental materials used to augment the melting process.[26] Emissions from iron and steel mills were calculated using the iron and steel worksheet from *the GHG Protocol.*

Table 11 - 2008 Iron and Steel Production GHG Emissions

Facility ID	Facility Name	2008 mtCO2e	2008 MMtCO2e
70-03-003	Gerdau Ameristeel US Inc. - Wilton Mill	12,708.72	0.01
70-08-002	SSAB Iowa Inc (formerly IPSCO)	42,047.65	0.04
	Total	**54,756.37**	**0.05**

Lime Manufacturing

Similar to cement manufacturing, lime is produced by heating limestone in a kiln, creating lime (CaO) and CO_2.

$$CaCO_3 + Heat \rightarrow CaO + CO_2$$

The CO_2 is typically released to the atmosphere, leaving behind a product known as quicklime, which can then be used to produce other types of lime.[27] Iowa has one lime manufacturer, Linwood Mining & Minerals

[24] U.S. EPA, January 1995. *AP-42 Compilation of Air Pollutant Emission Factors*, Introduction, p. 10.
[25] U.S. EPA. April 2009. *2009 U.S. Greenhouse Gas Inventory Report,* p. 4-35 – 4-36.
[26] Ibid.
[27] STAPPA/ALAPCO and U.S. EPA. 2004. *Emission Inventory Improvement Program (EIIP) Volume VIII: Greenhouse Gases*, p. 6-4.5.

Corporation, in Buffalo, Iowa. Linwood used *the GHG Protocol's* lime manufacturing worksheet to calculate 0.19 $MMtCO_2e$ of GHG emissions from its manufacturing processes as shown in Table 12.

Table 12 - 2008 Lime Manufacturing GHG Emissions

Facility ID	Facility Name	2008 MMtCO2e
82-01-015	Linwood Mining & Minerals Corporation	0.19

Nitric Acid and Ammonia Production

Nitrous oxide (N_2O) is produced when ammonia is oxidized to produce nitric acid, and CO_2 is released from the manufacture of ammonia. Two facilities, Terra Nitrogen – Port Neal Complex and Koch Nitrogen Company, produce both ammonia and nitric acid. The facilities calculated and reported their GHG emissions from these two sectors using mass balance equations in worksheets from *the GHG protocol*. The results are shown below in Table 13 and Table 14.

Table 13 - 2008 Nitric Acid Production GHG Emissions

Facility ID	Facility Name	2008 N_2O Metric Tons	2008 MMtCO2e
94-01-005	Koch Nitrogen Company	1,532.78	0.48
97-01-030	Terra Nitrogen - Port Neal Complex	1,355.04	0.42
	Total	**2,887.82**	**0.90**

Table 14 - 2008 Ammonia Production GHG Emissions

Facility ID	Facility Name	2008 CO_2 Metric Tons	2008 MMtCO2e
94-01-005	Koch Nitrogen Company	1,186.33	0.00
97-01-030	Terra Nitrogen - Port Neal Complex	424,810.11	0.42
	Total	**425,996.44**	**0.43**

Soda Ash Consumption

Four facilities reported emissions from soda ash consumption to the Department. All four facilities are corn wet millers. A survey of their plant managers shows that the corn wet millers use soda ash in pH control, ion exchange regeneration, and other operations. Emissions were calculated using an EPA emission factor of 830 lbs. CO_2/ton soda ash (0.415 metric ton CO_2/metric ton soda ash).[28] Table 15 shows that GHG emissions from soda ash consumption in Iowa are significantly smaller than emissions from other sectors.

Table 15 - 2008 Soda Ash Consumption Emissions

Facility ID	Facility Name	Soda Ash Used (tons)	2008 CO_2 Metric Tons	2008 MMtCO2e
23-01-006	ADM Clinton Corn Processing	5,561.57	2,093.86	0.00
57-01-080	ADM Corn Processing	1,321.00	497.34	0.00
57-01-004	Cargill Inc	307.11	115.62	0.00
56-01-009	Roquette America Inc	1,605.22	604.35	0.00
	Total	**8,794.90**	**3,311.17**	**0.00**

[28] STAPPA/ALAPCO and U.S. EPA. 2004. *Emission Inventory Improvement Program (EIIP) Volume VIII: Greenhouse Gases*, p. 6-4.14.

Chapter 5: 2008 GHG Emissions from Other Sources

Biomass

The Department required that facilities also report any biomass they combusted in 2008. As shown in Table 16, six facilities reported combusting a total of 227,429 MMBtu of wood, resulting in 0.02 $MMtCO_2e$ of GHG emissions. Eight facilities reported combustion of other biomass materials such as corn, biogas, refuse derived fuel (RDF), high carbon ash, oat hulls, etc. as shown in Table 17. Emission factors for combustion of these materials are not available, so the facilities were not able to estimate their resulting GHG emissions. GHG emissions from the combustion of biomass are not included in the statewide GHG emissions total because like ethanol fermentation, they are considered biogenic emissions, meaning that the carbon in the biomass was recently contained in living organic matter.

Table 16 - 2008 Wood Combustion GHG Emissions

Facility ID	Facility Name	Wood Combusted (MMBtu)	2008 CO_2 Metric Tons	2008 MMtCO2e
57-01-125	BFC Electric Company, LLC	4,321.76	391.77	0.00
10-02-008	Bertch Cabinet Mfg - Jesup	6,931.92	674.44	0.00
07-01-063	Bertch Cabinet Waterloo	61,984.72	6,030.79	0.01
31-01-021	JELD-WEN, inc. DBA JELD-WEN	146,430.80	13,274.20	0.01
07-01-061	Omega Cabinetry	6,445.00	584.25	0.00
63-02-005	Pella Municipal Power Plant	1,314.46	119.16	0.00
	Total	**227,428.66**	**21,074.6157**	**0.02**

Table 17 - 2008 Biomass Combustion

Facility ID	Facility Name	Fuel Type	Throughput	Units
57-01-080	ADM Corn Processing	Corn	15,762.50	tons
57-01-080	ADM Corn Processing	Waste Treatment Biomass	2,924.90	tons
77-01-010	Cargill - Des Moines	Biogas	145,288	MMBtu
85-01-006	City of Ames Steam Electric Plant	Refuse Derived Fuel (RDF)	439,490	MMBtu
57-01-042	IPL - Prairie Creek	Landfill Gas	160.07	MMcf
17-01-005	Lehigh Cement - Mason City	Seed Corn	704,750.00	MMBtu
17-01-005	Lehigh Cement - Mason City	High Carbon Ash	1,466.00	MMBtu
70-01-008	Monsanto Company	Seed Corn	6,601	tons
70-01-008	Monsanto Company	WWTP Sludge	589	ton (dry)
63-02-005	Pella Municipal Power Plant	Seed Corn	22.55	tons
63-02-005	Pella Municipal Power Plant	Corn Cobs	85.35	tons
63-02-005	Pella Municipal Power Plant	Construction Waste	16.70	tons
63-02-005	Pella Municipal Power Plant	TDF	2.00	tons
52-01-005	University of Iowa Power Plant	Oat Hulls	392,704.79	MMBtu

Other Greenhouse Emissions Reported to DNR

Legislation passed by the General Assembly in 2008 also required that "all applications for construction permits or prevention of significant deterioration permits shall quantify the potential to emit GHG emissions due to the proposed project."[29] The law became effective on July 1, 2008, and since that time the Department has received applications with potential GHG emissions as shown in Table 18.

Table 18 - Potential GHG Emissions from Construction Permit Applications

Time Period	CO2 (tons/yr)*	CH4 (tons/yr)	N_20 (tons/yr)	SF_6 (lb/yr)	PFC (lb/yr)	HFC (lb/yr)	MMtCO2e
7/1/07 - 12/31/07	16,791,813.90	1,820.89	243.60	3.42	0.00	0.0046	15.34
1/1/08 – 12/31/08	102,172,745.98	2,909.80	2,580.67	0.10	0.00	49,900.10	93.48
Total	**118,964,559.88**	**4,730.69**	**2,824.27**	**3.52**	**0.00**	**49,900.10**	**108.82**

** includes biogenic emissions from ethanol fermentation*

It should be noted that *potential emissions* are considered to be a theoretical maximum, whereas the emissions data collected for this inventory was calculated directly from the quantities of materials actually combusted and produced in 2008.

[29] Iowa Code 455B.134

Chapter 6: Lessons Learned and Future Inventories

The Department's mandatory GHG reporting program is at a crossroads; does the Department continue with its long range goals for the inventory, adapt its inventory goals to be consistent with U.S. EPA's proposed reporting program, or cease Iowa's mandatory reporting program to focus on a statewide top-down inventory?

When the legislation requiring mandatory GHG reporting was passed in 2007, the Department developed both short-term and long-term goals for the GHG inventory. The short-term goal is to begin inventorying ethanol plants and fossil fuel combustion at major sources for calendar year 2007 because:

- The legislation requires mandatory reporting from individual affected entities.
- The legislation allows the inventory to phase in sectors over time.
- Iowa is a national leader in ethanol production, and no other states had yet calculated GHG emissions from ethanol production.
- These sources are the largest industrial sources of air pollution in the state and include the largest electric generating units (EGUs) and major manufacturers.
- An existing regulatory program already exists for collecting annual inventories of other air pollutants from major facilities in Iowa.

The goal is to then widen the scope of the inventory, adding more sectors and GHGs each year, which the Department has done for the 2008 inventory. Long-term goals are to include reporting from non-major sources and possibly require emission unit level reporting. The Department also monitors and participates in the development of GHG emissions reporting protocols by several groups including U.S. EPA, The Climate Registry, and the Midwest Governors Association's Midwestern Regional Greenhouse Gas Reduction Accord. Few additional funds have been provided to the Department to hire more staff or contractors to conduct a full statewide top-down inventory, to improve the Department's current bottom-up inventory requirements, or to perform forecasting of GHG emissions.

In addition, on April 10, 2009, the U.S. EPA published a proposed rule[30] for mandatory reporting of GHG emissions that duplicates the Department's mandatory reporting program. The proposed rule generally requires reporting of annual GHG emissions from fossil fuel suppliers, industrial GHG suppliers, vehicles and engine manufacturers, and facilities that emit 25,000 $mtCO_2e$ or more per year of GHG emissions. Affected facilities are required to report emissions of nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE) in addition to the six gases subject to Iowa's reporting program: CO_2, CH_4, N_2O, HFC, PFC, and SF_6. U.S. EPA's proposed rule has many

[30] U.S. EPA, 2009. *Mandatory Reporting of Greenhouse Gases; Proposed Rule*. Internet address: http://www.epa.gov/climatechange/emissions/ghgrulemaking.html.

implications for the Department's mandatory reporting program, and when it is finalized, the Department will likely have to adjust its long-term goals for its own mandatory reporting program. Issues to be addressed include:

1. *Duplicative Reporting*

   The Preamble of U.S. EPA's proposed rule states that EPA's reporting program should "supplement and compliment, rather than duplicate, U.S. government and other GHG programs (e.g. State and Regional based programs)"[31] and that "EPA will work with States to ease burden on reporters to State and Federal systems by harmonizing data management, where possible."[32] As proposed, EPA's reporting rules, coupled with Iowa's current GHG reporting program, would require at least 103 Iowa facilities to report their GHG emissions to both EPA and Iowa in two different reporting formats. In addition, four Iowa corporations that have voluntarily joined the Climate Registry (TCR) would potentially have to report emissions to three jurisdictions – TCR, EPA, and the State. Two of these corporations operate more than twenty individual facilities in Iowa.

   The Department believes there are two options for successful GHG data collection:

   a. EPA collects the data, provides the data to the States within ninety days, and the States modify or cease their existing mandatory reporting programs to avoid duplicate reporting,
      -or-
   b. EPA delegates the reporting program to the States and provides them with the staff and information technology resources needed to collect the data efficiently and accurately.

   Also, the Department has invested what little GHG inventory resources it has into its mandatory reporting program and does not conduct a top-down inventory of statewide GHG emissions from all sectors. Should the Department move its resources to a statewide inventory and depend on U.S. EPA's mandatory reporting program instead of the Department's?

2. *Scope of Inventory*

   U.S. EPA's proposed rule requires reporting of annual GHG emissions from fossil fuel suppliers, industrial GHG suppliers, vehicles and engine manufacturers, and facilities that emit 25,000 $mtCO_2e$ or more per year of GHG emissions. U.S. EPA estimates that their proposed thresholds will affect 13,000 reporters while capturing 85% of U.S. emissions.[33]

   The Department's 2007 GHG inventory shows that 103 facilities that reported stationary fossil fuel GHG emissions greater than 25,000 $mtCO_2e$. This is less than half of major sources with federally-enforced operating permits. If U.S. EPA is confident with a threshold of 25,000 mtCO2e, should the Department proceed with its long-term plan to require non-major sources to report GHG emissions?

[31] Federal Register, Vol. 74 No. 68, April 10, 2009, p. 15456.
[32] Ibid., p. 16595.
[33] Ibid., p. 16467.

3. *Level of Reporting*

   The Department currently requires reporting of facility-wide GHG emissions, while The Climate Registry requires corporate level reporting. U.S. EPA's rule proposes that "reporting be at the facility level, except that certain suppliers of fossil fuels and industrial gases and manufacturers of vehicles and engines would report at the corporate level."[34]

4. *Information Technology Resources*

   The level of reporting issue is further complicated because the Department's electronic reporting system, SPARS, was designed for emission unit level reporting. Instead allowing facilities to report their 2007 and 2008 GHG emissions using SPARS, the Department created reporting spreadsheets for the facilities to use. Data from the more than 276 individual spreadsheets was then data-entered by staff into a master spreadsheet. This is very labor-intensive for the Department. However, if the Department were to require emission unit level reporting, it may be burdensome for large facilities to data enter emissions from six additional pollutants for every emission unit.

   In addition, if U.S. EPA were to delegate their mandatory program to Iowa, SPARS was not designed to accept many of the data fields or to be used by many of the sectors (such as manure management systems, fossil fuel suppliers, etc.) that are affected by U.S. EPA's proposed rule.

[34] Federal Register, Vol. 74 No. 68, April 10, 2009, p. 16481.

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Glossary

Anthropogenic – Caused or influenced by humans.

Biogenic - Produced by living organisms or biological processes. Examples of biogenic greenhouse gas emissions are CO_2 emissions from trees, vegetation, decomposition of solid waste, etc.

Biomass - Materials that are biological in origin, including organic material both living and dead such as trees, crops, grasses, tree litter, roots, and animals and animal waste.

Bottom-up Inventory – An emission inventory that calculates emissions based on source-specific activity data rather than aggregate data. For example, a bottom-up inventory of residential fuel emissions would calculate greenhouse gas emissions from the fuel use of each individual house instead of using the total fuel combusted state-wide.

Carbon Dioxide (CO_2) - A naturally occurring gas that is also a byproduct of burning fossil fuels and biomass, other industrial processes, and land-use changes.

Carbon Sinks – Carbon storage. The main natural sinks are the oceans and plants and other organisms that use photosynthesis to remove carbon from the atmosphere by incorporating it into biomass and release oxygen into the atmosphere.

Continuous Emission Monitor (CEM) – Equipment that measures the concentration or emission rate of a gas or particulate matter using analyzer measurements and a conversion equation, graph, or computer program. Installation and operation of a CEM may be required by EPA or DNR in order to determine compliance with specific standards. Operation of a CEM must meet performance specifications, certification procedures, and recordkeeping and reporting requirements as specified in applicable regulations.

Distillers Grain with Solubles (DGS) – A by-product of ethanol production consisting of protein, fiber, oil, and other nutrients.

Dry Mill Ethanol Plant – An ethanol production facility in which the entire corn kernel is first ground into flour before processing.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example – pounds of CO_2 per ton of coal.

Fluorinated Gases "F-Gases"- Gases sometimes used as substitutes for ozone depleting substances. HFC, PFC, and SF6 are "F-gases" and are emitted from a variety of industrial processes. "F-gases" are commonly emitted in smaller quantities, but because they have high global warming potentials (GWP).

Global Warming Potential (GWP) – An index that allows for comparison of various greenhouse gases. It is the radioactive forcing that results from the addition of 1 kilogram (2.2 pounds) of a gas to the atmosphere, compared to an equal mass of carbon dioxide.

Greenhouse Gas (GHG) – Any gas that absorbs and re-emits infrared radiation into the atmosphere. Greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC).

Hydrofluorocarbons (HFC) – A group of human-made chemicals composed of one or two carbon atoms and varying numbers of hydrogen and fluorine atoms.

Hydrofluorinated ethers (HFE) – A group of refrigerant gases that have been developed as alternatives to chlorofluorocarbons and hydrofluorocarbons (HFC).

Major Source – A source subject to the federally enforceable operating permit program established by EPA as required by Title V of the 1990 federal Clean Air Act Amendments.

Mass Balance - A process of estimating emissions using knowledge of the process, process rate, material used, and material properties.

Methane (CH_4) – A colorless, flammable, odorless hydrocarbon that is a greenhouse gas.

Million Metric Tons of Carbon Dioxide Equivalent ($MMtCO_2e$) – This measure aggregates different greenhouse gases into a single measure, using global warming potentials.

Nitrogen Trifluoride (NF_3) – A high-GWP gas used in the manufacture flat panel televisions, computer displays and other products.

Nitrous Oxide (N_2O) – A greenhouse gas formed from soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

Perfluorocarbons (PFC) – A group of human-made chemicals composed of carbon and fluorine. PFC have no commercial uses and are emitted as a byproduct of aluminum smelting and semiconductor manufacturing.

Potential to Emit (PTE) – The maximum capacity of a source to emit any air pollutant under its physical and operational design.

Stack Test – A test that measures the concentration of pollutants in the exhaust stack. Measurements are performed following procedures specified and developed by the US EPA and/or Iowa DNR. Such testing is required by DNR to be conducted by various stationary sources to determine compliance with applicable air emission limits.

Standard Industrial Classification (SIC) – A United States government system for classifying industries by a four-digit code.

State Inventory Tool (SIT) – US EPA's Excel-based companion tool to the Emissions Inventory Improvement Program guidance documentation. SIT produces a state-wide top-down inventory.

Sulfur Hexafluoride (SF_6) – A greenhouse gas used primarily to insulate high-voltage equipment and to assist in the manufacturing of cable cooling systems.

The Climate Registry - A nonprofit partnership whose mission is to develop an accurate, complete, consistent and transparent greenhouse gas emissions measurement protocol that is capable of supporting voluntary and mandatory greenhouse gas emission reporting policies for its Members and Reporters – see www.theclimateregsitry.org. Iowa joined as a member state in July 2008.

Top-Down Inventory – An emission inventory that calculates emissions using aggregate activity data rather than source-specific activity data. For instance, a top-down inventory of residential fuel use would calculate greenhouse gas emissions using the total amount of fuel combusted state-wide instead of using the fuel combusted at each individual house.

Wet Mill Ethanol Plant – An ethanol production facility in which the corn is first steeped in water before processing.

Appendix A: Corrections to 2007 GHG Emissions from Fossil Fuel Combustion at Major Sources

Facility ID	Facility Name	2007 Reported Emissions (mtCO2e)	2007 Corrected Emissions (mtCO2e)	Change (mtCO2e)	Error Type
57-01-080	ADM Corn Processing	297,606.76	2,381,576.96	+2,083,970.21	1
17-01-027	Ag Processing Inc. (Mason City)	7,091.64	27,433.52	+20,341.89	2
74-01-012	Ag Processing Inc. (Emmetsburg)	35.09	24,746.12	+24,711.03	2
71-01-001	Ag Processing Inc. (Sheldon)	24.60	22,839.35	+22,814.76	2
04-01-002	Bemis Co. Inc – Curwood	18,536.22	1,858.62	-16,677.61	2
57-01-125	BFC Electric Company, L.L.C.	2,488.90	0.00	-2,488.90	3
77-10-002	CB&I Constructors, Inc.	5.13	504.09	+498.95	2
34-01-035	CDI, LLC - Charles City	2.12	212.30	+210.18	2
95-01-012	CDI, LLC - Forest City	10.66	1,066.14	+1,055.48	2
45-01-003	Donaldson Company, Inc.	25.13	2,211.22	+2,186.09	2
56-02-005	DuPont Performance Coatings	13,789.60	6,800.92	-6,988.68	2
18-06-002	Northern Natural Gas Company (Paullina)	1.76	1,550.64	+1,548.88	2
52-01-005	University of Iowa Power Plant	196,702.50	164,435.31	-32,267.19	3
48-05-001	Whirlpool Corporation (Amana)	78,425.94	12,984.31	-65,441.63	2, 4
	Total	**614,746.05**	**2,648,219.50**	**+2,033,473.46**	

Error Types:

1. Error in converting tons coal to million Btu (MMBtu) coal.
2. Error in converting million cubic feet (MMcf) natural gas to MMBtu natural gas.
3. Error in CEMS calculation.
4. Reported additional fuel use.

Appendix B: Iowa Historical Greenhouse Gas Emissions and Forecast, by Sector

		$MMtCO_2e$[35]						
Sector		**1990**	**2000**	**2005**	**2010**	**2020**	**2025**	**Explanatory Notes for Projections**
Energy Use (CO_2, CH_4, N_2O)		**67.0**	**82.1**	**84.6**	**90.5**	**103.3**	**111.0**	
Electricity Use (Consumption)		**27.4**	**35.8**	**37.6**	**38.0**	**43.1**	**47.5**	Totals include emissions for electricity production plus emissions associated with net imported electricity.
	Electricity Production (in-state)	26.7	36.7	36.3	41.8	41.8	41.8	*See electric sector assumptions in Appendix A of the CCS Inventory.*
	Coal	26.5	36.3	34.9	40.4	40.4	40.4	
	Natural Gas	0.17	0.24	1.15	1.15	1.15	1.15	
	Oil	0.05	0.10	0.15	0.15	0.15	0.15	
	MSW/Landfill Gas	0.01	0.02	0.06	0.06	0.06	0.06	
	Imported Electricity	0.68	-0.87	1.33	-3.74	1.38	5.78	Negative values represent net exported electricity.
Residential/Commercial/ Industrial (RCI) Fuel Use		**21.3**	**25.3**	**24.1**	**27.0**	**29.7**	**30.2**	
	Coal	5.53	6.42	6.22	6.45	6.82	6.83	Based on US DOE regional projections
	Natural Gas	10.9	11.6	11.0	13.9	15.8	16.3	Based on US DOE regional projections
	Petroleum	4.70	7.25	6.78	6.51	6.93	6.86	Based on US DOE regional projections
	Wood (CH4 and N2O)	0.13	0.08	0.09	0.17	0.19	0.20	Based on US DOE regional projections
Transportation		**16.9**	**19.1**	**20.7**	**22.8**	**27.2**	**29.4**	
	Onroad Gasoline	11.4	12.8	13.0	13.9	16.2	17.2	Based on linear regression of historical VMT and projected national fuel economy
	Onroad Diesel	3.96	4.66	5.69	6.76	8.80	9.94	Based on linear regression of historical VMT and projected national fuel economy
	Rail	0.31	0.26	0.56	0.56	0.56	0.56	Assumed no growth in activity
	Marine Vessels, Natural Gas, LPG, other	0.81	1.07	1.04	1.08	1.22	1.29	Based on US DOE regional projections and historical trends in activity
	Jet Fuel and Aviation Gasoline	0.39	0.34	0.45	0.48	0.45	0.42	Based on Iowa DOT operations projections
Fossil Fuel Industry		**1.49**	**1.81**	**2.25**	**2.61**	**3.32**	**3.78**	
	Natural Gas Industry	1.48	1.81	2.25	2.61	3.32	3.78	Based on historical trends in activity
	Oil Industry	0.00	0.00	0.00	0.00	0.00	0.00	No oil production in Iowa.
	Coal Mining	0.01	0.00	0.00	0.00	0.00	0.00	No coal mining in Iowa since 1994

[35] CCS, *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 – 2005,* p. 4-5, Table 1. Totals may not equal exact sum of subtotals shown in this table due to independent rounding.

Sector	MMtCO$_2$e 1990	2000	2005	2010	2020	2025	Explanatory Notes for Projections
Industrial Processes	**2.74**	**3.82**	**4.59**	**5.35**	**7.04**	**8.14**	
Cement Manufacture (CO_2)	1.18	1.28	1.28	1.35	1.48	1.56	Based on 2004-2014 employment projections for Nonmetallic Mineral Production Manufacturing from Iowa Workforce Information Network
Lime Manufacture (CO_2)	0.06	0.06	0.09	0.11	0.14	0.17	Based on historical annual increase in Iowa state production from 1995-2005
Limestone and Dolomite Use (CO_2)	0.20	0.21	0.18	0.17	0.15	0.15	Based on historical annual decline in Iowa state consumption from 1994-2004
Soda Ash (CO_2)	0.03	0.03	0.03	0.02	0.02	0.02	Based on historical annual decline in Iowa state consumption from 1990-2005
Iron & Steel (CO2)	0.03	0.10	0.12	0.16	0.27	0.36	Based on historical annual increase in Iowa state production from 2000-2005
Ammonia and Urea (CO_2)	0.64	0.56	0.49	0.47	0.44	0.43	Based on historical annual decline in Iowa state production from 2000-2005
Nitric Acid Production (N_2O)	0.30	0.57	1.01	1.05	1.14	1.19	Based on US EPA projections for this industry.
ODS Substitutes (HFC, PFC)	0.00	0.83	1.23	1.87	3.25	4.15	Based on national projections (US EPA)
Electric Power T&D (SF_6)	0.29	0.17	0.15	0.14	0.13	0.13	Based on national projections (US EPA)
Waste Management	**2.18**	**2.27**	**2.40**	**2.57**	**2.95**	**3.16**	
Waste Combustion	0.07	0.07	0.06	0.06	0.05	0.05	Based on one half growth rate calculated for 1990-2005 emissions growth
Landfills	1.65	1.68	1.82	1.97	2.30	2.48	Based on growth rate calculated for 1995-2005 emissions growth
Wastewater Management	0.46	0.53	0.52	0.54	0.60	0.62	Based on growth rate calculated for 1990-2005 emissions growth
Agriculture	**25.4**	**26.0**	**27.9**	**26.0**	**25.8**	**25.6**	
Enteric Fermentation	5.04	4.39	4.26	3.81	3.27	2.98	Based on projected livestock population
Manure Management	4.49	6.02	6.64	6.55	6.86	7.01	Based on projected livestock population
Agricultural Soils	15.7	15.5	16.8	15.5	15.4	15.3	Used growth rate calculated for 1990-2005 emissions growth
Agricultural Burning	0.13	0.16	0.19	0.20	0.24	0.26	Used growth rate calculated for 1990-2005 emissions growth
Gross Emissions (Consumption Basis, Excludes Sinks)	**97.3**	**114.2**	**119.5**	**124.4**	**139.1**	**147.9**	
increase relative to 1990		*17%*	*20%*	*27%*	*43%*	*51%*	
Emissions Sinks	**-21.8**	**-19.9**	**-27.3**	**-27.3**	**-27.3**	**-27.3**	
Forested Landscape	-7.88	-7.88	-15.3	-15.3	-15.3	-15.3	
Urban Forestry and Land Use	-2.59	-0.65	-0.63	-0.63	-0.63	-0.63	Assumed no change after 2005
Forest Wildfires	0.00	0.00	0.00	0.00	0.00	0.00	
Agricultural Soils (cultivation practices)	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	Based on 2000 NRCS data
Net Emissions (Includes Sinks)	**75.4**	**94.3**	**92.2**	**97.1**	**111.8**	**120.6**	
increase relative to 1990		*25%*	*22%*	*29%*	*48%*	*60%*	

Appendix C: 2008 Major Source Reporting Form

Greenhouse Gas Emissions Inventory Reporting Form for Title V Facilities (except Ethanol Plants)

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2008 throughputs. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to Form 1.0 of your SPARS inventory submittal.

Emission Year:	**2008**		
Facility Name:			
Facility #:		EIQ #:	

Assumptions:

1 gallon diesel = 0.140 MMBtu, 1 gallon gasoline = 0.130 MMBtu,
1 gallon kerosene = 0.135 MMBtu, 1 gallon LPG = 0.094 MMBtu, 1 gallon residual fuel = 0.150 MMBtu
1 therm Natural Gas = 0.09997612 MMBtu.
1 MMcf Natural Gas = 1050 MMBtu (if other value used, please enter it in Cell C41).

				CO2		CH4		N2O		CO2	CH4	N2O
Fuel Type	**Fuel Subtype**	**Throughput**	**Units**	**Emission Factor**		**Emission Factor**		**Emission Factor**		**Emissions (tons)**	**Emissions (tons)**	**Emissions (tons)**
Butane	-		gallons	14.38	lbs/gallon	NA	NA	NA	NA	0.0000	NA	NA
Coal	Commercial		MMBtu	208.11	lbs/MMBtu	0.0245	lbs/MMBtu	0.0035	lbs/MMBtu	0.0000	0.0000	0.0000
Coal	Industrial		MMBtu	205.15	lbs/MMBtu	0.0245	lbs/MMBtu	0.0035	lbs/MMBtu	0.0000	0.0000	0.0000
Coal	Industrial Coking		MMBtu	204.58	lbs/MMBtu	0.02451	lbs/MMBtu	0.0035	lbs/MMBtu	0.0000	0.0000	0.0000
Coal	Institutional		MMBtu	208.11	lbs/MMBtu	0.0245	lbs/MMBtu	0.0035	lbs/MMBtu	0.0000	0.0000	0.0000
Coal	Utility		MMBtu	206.19	lbs/MMBtu	0.0245	lbs/MMBtu	0.0035	lbs/MMBtu	0.0000	0.0000	0.0000
Crude Oil	-		MMBtu	161.94	lbs/MMBtu					0.0000	0.0000	0.0000
Distillate Fuel (Diesel)	Commercial		gallons	159.69	lbs/MMBtu	0.00309	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Distillate Fuel (Diesel)	Industrial		gallons	159.69	lbs/MMBtu	0.00066	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Distillate Fuel (Diesel)	Institutional		gallons	159.69	lbs/MMBtu	0.00309	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Gasoline	Reformulated		gallons	18.85	lbs/gallon	0.00287	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Gasoline - Motor	Commercial		gallons	154.79	lbs/MMBtu	0.00287	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Gasoline - Motor	Industrial		gallons	154.79	lbs/MMBtu	NA	NA	NA	NA	0.0000	NA	NA
Gasoline - Motor	Institutional		gallons	154.79	lbs/MMBtu	0.00287	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Kerosene	Commercial		gallons	157.86	lbs/MMBtu	0.00309	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Kerosene	Industrial		gallons	157.86	lbs/MMBtu	0.00066	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Kerosene	Institutional		gallons	157.86	lbs/MMBtu	0.00309	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
LPG	Commercial		gallons	136	lbs/MMBtu	0.00221	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
LPG	Industrial		gallons	136	lbs/MMBtu	0.00044	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
LPG	Institutional		gallons	136	lbs/MMBtu	0.00221	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Methanol (neat)	-		gallons	9.06	lbs/gallon					0.0000	0.0000	0.0000
Natural Gas	Commercial		MMBtu	116.38	lbs/MMBtu	0.0130	lbs/MMBtu	0.00022	lbs/MMBtu	0.0000	0.0000	0.0000
Natural Gas	Industrial		MMBtu	116.38	lbs/MMBtu	0.0130	lbs/MMBtu	0.00022	lbs/MMBtu	0.0000	0.0000	0.0000
Natural Gas	Institutional		MMBtu	116.38	lbs/MMBtu	0.0130	lbs/MMBtu	0.00022	lbs/MMBtu	0.0000	0.0000	0.0000
Petroleum	Commercial		MMBtu			0.0245	lbs/MMBtu	0.0015	lbs/MMBtu	0.0000	0.0000	0.0000
Petroleum	Industrial		MMBtu			0.0049	lbs/MMBtu	0.0015	lbs/MMBtu	0.0000	0.0000	0.0000
Petroleum	Institutional		MMBtu			0.0245	lbs/MMBtu	0.0015	lbs/MMBtu	0.0000	0.0000	0.0000
Propane	-		gallons	12.57	lbs/gallon	NA	NA	NA	NA	0.0000	NA	NA
Residual Fuel	Commercial		gallons	172.01	lbs/MMBtu	0.00331	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Residual Fuel	Industrial		gallons	172.01	lbs/MMBtu	0.00066	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Residual Fuel	Institutional		gallons	172.01	lbs/MMBtu	0.00331	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Still Gas	-		MMBtu	140.86	lbs/MMBtu					0.0000	0.0000	0.0000
Natural Gas Conversion Used if not 1050			MMBtu = 1 MMcf							**0.0000**	**0.0000**	**0.0000**

Note: This spreadsheet is formatted to be printed on legal-size paper.
Note: Unless otherwise noted, all emission factors were obtained from the California Climate Action Registry General Reporting Protocol Version 2.2 March 2007 Tables C.5 and C.6
(DNR Form 542-1571 December 18, 2007). *Updated on 12/16/08.*

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2008 usage. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to your SPARS inventory submittal.

Emission Year:		**2008**		
Facility Name:				
Facility #:			**EIQ #:**	

Source: The Climate Registry's General Reporting Protocol and the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR), 1995, unless no value was assigned in the document. In that case, the global warming potential (GWP) values are from the IPCC Third Assesment Report, 2001. Values from the SAR are consistent with international practices.

A		C	D	E	F	G	H = E - F - G	I = H/2000	J	K = I x J
Common Name	**Name**	**Formula**	**CAS Number**	**Q_Added (lbs)**	**Q_Consumed (lbs)**	**Q_Recovered (lbs)**	**Emissions (lbs)**	**Emissions (tons)**	**GWP**	**Estimated Emissions (tons CO_2e)**
HFC-23	trifluoromethane	CHF_3	75-46-7				0.00	0.00	11,700	0.00
HFC-32	difluoroethane	CH_2F_2	75-10-5				0.00	0.00	650	0.00
HFC-41	fluoromethane	CH_3F	593-53-3				0.00	0.00	150	0.00
HFC-43-10mee	1,1,1,2,2,3,4,5,5,5-decafluoropentane	$CF_3CHFCHFCF_2CF_3$	138495-42-8				0.00	0.00	1,300	0.00
HFC-125	pentafluoroethane	CHF_2CF_3	354-33-6				0.00	0.00	2,800	0.00
HFC-134	1,1,2,2-tetrafluoroethane	CHF_2CHF2	359-35-3				0.00	0.00	1,000	0.00
HFC-134a	1,1,1,2-tetrafluoroethane	CF_3CH_2F	811-97-2				0.00	0.00	1,300	0.00
HFC-143	1,1,2-trifluoroethane	CHF_2CH_2F	430-66-0				0.00	0.00	300	0.00
HFC-143a	1,1,1-trifluoroethane	CF_3CH_3	420-46-2				0.00	0.00	3,800	0.00
HFC-152	1,2-difluroethane	$C_2H_4F_2$	624-72-6				0.00	0.00	43*	0.00
HFC-152a	1,1-difluoroethane	CH_3CHF_2	75-37-6				0.00	0.00	140	0.00
HFC-161	fluoroethane	CH_3CH_2F	353-36-6				0.00	0.00	12*	0.00
HFC-227ea	1,1,1,2,3,3,3-heptafluoropropane	CF_3CHFCF_3	431-89-0				0.00	0.00	2,900	0.00
HFC-236cb	1,1,1,2,2,3-hexafluoropropane	$CH_2FCF_2CF_3$	677-56-5				0.00	0.00	1,300*	0.00
HFC-236ea	1,1,1,2,3,3-hexafluoropropane	CHF_2CHFCF_3	431-63-0				0.00	0.00	1,200*	0.00
HFC-236fa	1,1,1,3,3,3-hexafluoropropane	$CF_3CH_2CF_3$	690-39-1				0.00	0.00	6,300	0.00
HFC-245ca	1,1,2,2,3-pentafluoropropane	$CH_2FCF_2CHF_2$	679-86-7				0.00	0.00	560	0.00
HFC-245fa	1,1,1,3,3-pentafluoropropane	$CHF_2CH_2CF_3$	460-73-1				0.00	0.00	950*	0.00
HFC-365mfc	1,1,1,3,3-pentafluorobutane	$CH_3CF_2CH_2CF_3$	406-58-6				0.00	0.00	890*	0.00
PFC-14	perfluoromethane	CF_4	75-73-0				0.00	0.00	6,500	0.00
PFC-116	perfluoroethane	C_2F_6	76-16-4				0.00	0.00	9,200	0.00
PFC-218	perfluorpropane	C_3F_8	76-19-7				0.00	0.00	7,000	0.00
PFC-3-1-10	perfluorobutane	C_4F_{10}	355-25-9				0.00	0.00	7,000	0.00
PFC-318	perfluorocyclobutane	$c\text{-}C_4F_8$	115-25-3				0.00	0.00	8,700	0.00
PFC-4-1-12	perfluoropentane	C_5F_{12}	678-26-2				0.00	0.00	7,500	0.00
PFC-5-1-14	perfluorohexane	C_6F_{14}	355-42-0				0.00	0.00	7,400	0.00
Nitrogen trifluoride		NF_3	7783-54-2				0.00	0.00	10,800*	0.00
Sulfur hexafluoride		SF_6	2551-62-4				0.00	0.00	23,900	0.00

Note: This spreadsheet is formatted to be printed on legal-size paper.

GWP = Global Warming Potential, which is the radioactive forcing that results from the addition of 1 kilogram (2.2 pounds) of a gas to the atmosphere, compared to an equal mass of carbon dioxide.

Please see http://www.iowadnr.gov/air/prof/ghg/ghg.html for a list of HFC and PFC Chemical Names, Trade Names, and Blends

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2008 throughputs. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to Form 1.0 of your SPARS inventory submittal.

There are little or no emission factors for biomass combustion. Please report your througput anyway, so we may include it in our inventory. If you burn a fuel other than switchgrass or wood, please add additional lines as needed and report the throughput and units.

Assumptions:

1 gallon diesel = 0.140 MMBtu, 1 gallon gasoline = 0.130 MMBtu,
1 gallon kerosene = 0.135 MMBtu, 1 gallon LPG = 0.094 MMBtu, 1 gallon residual fuel = 0.150 MMBtu

Emission Year:	**2008**												
Facility Name:													
Facility #:		EIQ #:											
				CO2		**CH4**		**N2O**		**CO2**	**CH4**	**N2O**
Fuel Type	**Fuel Subtype**	**Throughput**	**Units**	**Emission Factor**		**Emission Factor**		**Emission Factor**		**Emissions (tons)**	**Emissions (tons)**	**Emissions (tons)**
Switchgrass	**?**			**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**
Wood	Commercial		MMBtu	195	lbs/MMBtu	0.7748	lbs/MMBtu	0.0104	lbs/MMBtu	0.0000	0.0000	0.0000
Wood	Industrial		MMBtu	195	lbs/MMBtu	0.0774	lbs/MMBtu	0.0104	lbs/MMBtu	0.0000	0.0000	0.0000
Wood	Institutional		MMBtu	195	lbs/MMBtu	0.7748	lbs/MMBtu	0.0104	lbs/MMBtu	0.0000	0.0000	0.0000
										0.0000	**0.0000**	**0.0000**

Note: This spreadsheet is formatted to be printed on legal-size paper.

Note: Unless otherwise noted, all emission factors were obtained from the California Climate Action Registry General Reporting Protocol Version 2.2 March 2007 Tables C.5 and C.6

Instructions: Please fill in the green cells with your facility information and yellow cells with any stack test data. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to Form 1.0 of your SPARS inventory submittal.

Emission Year:		**2008**		
Facility Name:				
Facility #:				
EIQ #:				
		CO2		
Emission Point ID	**Date of Stack Test**	**Result (lb/hr)**	**Hours Operated/Year**	**Emissions (tons)**
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000

Please add a note to identify any stack test result from combustion of biomass.

Instructions: Please fill in the green cells with your facility information and yellow cells with your 2008 CEM data. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to Form 1.0 of your SPARS inventory submittal.

Emission Year:	**2008**
Facility Name:	
Facility #:	
EIQ #:	

	CO2
Emission Point ID	**Emissions (tons)**
	0.0000

Please add a note to identify any biomass-combusting sources with CEMs.

Appendix D: 2008 Fossil Fuel Combustion GHG Emissions Per Major Source Facility

Bolded values were adjusted to use CEMS data.

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
63-01-001	3M (Minnesota Mining & Manufacturing Co.)	2672	17,829.9830	1.6797	0.0578	0.0162
79-02-006	A-1 Fiberglass	3089	85.7174	0.0096	0.0002	0.0001
92-01-021	ACH Foam Technologies, LLC.	3086	1,140.6986	0.1274	0.0022	0.0010
82-16-002	ACO YP Inc	3059	167.0475	0.0182	0.0003	0.0002
23-01-006	ADM Clinton Cogeneration	4911	880,747.0095	99.8308	5.2553	0.8024
57-01-080	ADM Corn Processing	2046	2,616,899.1033	310.8161	41.3063	2.3916
23-01-006	ADM Corn Processing - Clinton	2046	923,141.4207	106.6673	9.3081	0.8421
98-01-003	Advanced Component Technologies	3089	806.3441	0.0901	0.0015	0.0007
99-01-001	Ag Processing Inc. - Eagle Grove	2075	167,137.2585	19.9398	2.8112	0.1528
74-01-012	Ag Processing Inc. - Emmetsburg	2075	26,393.8054	2.9490	0.0501	0.0240
14-02-003	Ag Processing Inc. - Manning	2075	24,846.1281	2.0956	0.0994	0.0226
17-01-027	Ag Processing Inc. - Mason City	2075	24,917.3302	2.3344	0.0905	0.0227
97-04-005	Ag Processing Inc. - Sergeant Bluff	2075	8,976.6017	0.9954	0.0177	0.0082
71-01-001	Ag Processing Inc. - Sheldon	2075	23,983.1279	2.6790	0.0453	0.0218
68-09-002	Ajinomoto Heartland, LLC	2048	117,696.9946	13.1410	0.2225	0.1071
82-01-002	Alcoa, Inc.	3353	195,548.0391	21.2007	0.4283	0.1779
28-01-026	Alliance Pipeline L.P./Manchester 27-A Compressor Station	4922	72,266.7289	8.0724	0.1366	0.0658
70-01-050	Allsteel Muscatine Components Plant	2521	10,291.3205	1.1496	0.0195	0.0094
85-03-003	American Packaging Corporation	2759	2,155.1470	0.2407	0.0041	0.0020
56-01-023	Amsted Rail (Griffin Wheel)	3325	17,965.5773	1.9631	0.0332	0.0163
53-01-002	Anamosa State Penitentiary	9223	199.8847	0.0275	0.0019	0.0002
51-03-001	ANR Pipeline Company - Birmingham Compressor	4922	47,053.6781	5.2560	0.0889	0.0428
93-05-001	ANR Pipeline Company - Lineville Compressor	4922	50,026.5515	5.5881	0.0946	0.0455
82-02-031	Arch Mirror North	3231	238.6430	0.0267	0.0005	0.0002
77-01-045	Archer Daniels Midland - Des Moines Soybean	2075	152,081.9323	18.1229	2.5181	0.1390
56-01-002	Archer Daniels Midland - Keokuk	2041	18,688.4168	2.0876	0.0353	0.0170
20-01-018	Astoria Industries of Iowa, Inc.	3713	451.1611	0.0504	0.0009	0.0004
04-01-002	Bemis Co Inc. - Curwood Operation Centerville Facility	2673	1,898.3356	0.2120	0.0036	0.0017
10-02-008	Bertch Cabinet Mfg. - Jesup Facility	2434	508.0810	0.0568	0.0010	0.0005
07-01-086	Bertch Cabinet Oasis	2434	228.2423	0.0255	0.0004	0.0002

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
33-01-020	Bertch Cabinet Oelwein	2434	490.1686	0.0548	0.0009	0.0004
07-01-063	Bertch Cabinet Waterloo	2434	1,150.4325	0.1285	0.0022	0.0010
08-01-002	Besser Quinn Machine & Foundry	3321	535.8135	0.0599	0.0010	0.0005
57-01-125	BFC Electric Company, L.L.C.	4931	92.8712	0.0104	0.0002	0.0001
07-01-121	Black Hawk County Sanitary Landfill	9511	0.0000	0.0000	0.0000	0.0000
82-01-004	Blackhawk Foundry & Machine Co.	3321	12,389.4040	0.3432	0.0058	0.0112
26-01-001	Bloomfield Foundry, Inc.	3321	2,649.1101	0.3147	0.0403	0.0024
82-02-024	BP - Bettendorf Terminal	5171	35.6577	0.0040	0.0001	0.0000
52-07-001	BP - Cedar Rapids Terminal	5171	10.1189	0.0000	0.0000	0.0000
77-01-158	BP - Des Moines Terminal	5171	106.7958	0.0119	0.0002	0.0001
76-01-014	Brand FX Body Company	3713	572.2754	0.0639	0.0011	0.0005
55-03-004	Brand FX Body Company	3713	319.7851	0.0338	0.0006	0.0003
77-01-022	Bridgestone Americas Tire Operations (was Firestone)	3011	81,726.2115	9.1238	0.1549	0.0744
78-01-085	Bunge Corporation	2075	101,713.8506	11.3617	0.1923	0.0925
68-09-001	Cargill Corn Milling - Eddyville	2046	720,433.0140	85.1275	10.5030	0.6582
57-01-003	Cargill Soybean East Plant	2075	68.0870	0.0020	0.0007	0.0001
57-01-002	Cargill Soybean West Plant - Cedar Rapids	2075	19,202.7000	2.1450	0.0363	0.0175
57-01-004	Cargill, Inc.	2046	99,417.6151	11.6771	1.3308	0.0908
77-01-010	Cargill, Inc. - Des Moines, IA	2075	30,598.2572	3.4179	0.0578	0.0278
42-01-003	Cargill, Inc. - Iowa Falls	2075	54,036.7469	6.0361	0.1021	0.0492
97-01-001	Cargill, Inc. - Sioux City	2075	71,364.7979	7.9717	0.1349	0.0649
77-10-002	CB&I Constructors, Inc.	3443	740.7005	0.0827	0.0014	0.0007
34-01-035	CDI, LLC - Charles City	7532	171.1950	0.0191	0.0003	0.0002
95-01-012	CDI, LLC - Forest City	7532	875.4686	0.0978	0.0017	0.0008
44-01-024	Ceco Building Systems	3448	795.3322	0.0888	0.0015	0.0007
07-02-005	Cedar Falls Municipal Electric Utility	4911	**83,620.0774**	8.6016	1.2224	0.0764
07-02-005	Cedar Falls Municipal Electric Utility - CTS	4911	205.7598	0.0230	0.0004	0.0002
07-02-053	Cedar Falls Municipal Water Utility	4911	9.6973	0.0013	0.0001	0.0000
57-01-077	Cedar Rapids WPCF	4952	4,178.2457	0.4485	0.0097	0.0038
95-02-012	Central Disposal Systems, Inc.	4953	60.2936	0.0095	0.0008	0.0001
70-08-003	Central Iowa Power Coop - Fair Station	4911	**473,454.7505**	48.4726	6.9175	0.4324
88-01-004	Central Iowa Power Coop/Summit Lake Facility	4911	2,108.1073	0.2355	0.0040	0.0019
99-05-003	Central Iowa Renewable Energy (CORN) LP	2869	175,733.6070	20.9740	2.9981	0.1607
94-01-002	CertainTeed Gypsum	3275	41,980.3236	4.6776	0.0817	0.0382
90-07-002	Chariton Valley Resource Conserv. & Dvlpmnt, Inc. - OGS Switchgrass Processing	4911	0.0000	0.0000	0.0000	0.0000
85-01-006	City of Ames Combustion Turbine	4911	**3,899.6867**	0.1145	0.0382	0.0036

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
85-01-006	City of Ames Steam Electric Plant	4911	**653,673.7225**	63.6125	9.1017	0.5968
56-02-021	Climax Molybdenum Company	3339	13,151.6228	1.4905	0.0327	0.0120
62-01-001	Clow Valve Company - Foundry	3494	4,111.9964	0.4593	0.0078	0.0037
62-01-001	Clow Valve Company - Machine Shop	3321	1,746.8347	0.1951	0.0033	0.0016
42-01-018	CMC Joist	3441	884.5636	0.0896	0.0026	0.0008
29-01-006	CNH America LLC	3531	9.1451	0.0010	0.0000	0.0000
77-01-109	Construction Products, Inc.	3441	659.0599	0.0736	0.0012	0.0006
21-01-003	Corn Belt Power Coop/ Wisdom Generation Station	4911	**135,422.9708**	12.9745	1.8020	0.1236
68-09-005	CR-1, L.P. (dba Cargill Nutri-Products)	2833	1,600.2250	0.1788	0.0030	0.0015
88-01-021	Creston Bean Processing, LLC	2075	11.6729	0.0013	0.0000	0.0000
57-01-082	Cryovac Inc., Sealed Air Corporation	2673	3,191.6159	0.3438	0.0073	0.0029
95-02-001	Cummins Filtration (was Fleetguard)	3714	3,755.9899	0.4196	0.0071	0.0034
17-01-035	CURRIES Division of AADG, Inc. - 9th Street Facility	3442	2,331.9061	0.2605	0.0044	0.0021
17-01-087	CURRIES Division of AADG, Inc. - 12th Street NE Facility & 12th Street NW Facility	3442	3,237.1097	0.3616	0.0062	0.0029
51-01-005	Dexter Foundry, Inc.	3321	17,155.8184	2.0168	0.2211	0.0157
57-01-045	Diamond V Mills Inc.	2048	5,908.3217	0.6600	0.0112	0.0054
46-01-005	Dodgen Industries, Inc.	3711	481.5991	0.0538	0.0009	0.0004
45-01-003	Donaldson Company, Inc.	3599	2,113.4392	0.2275	0.0057	0.0019
31-01-035	Dubuque Water Pollution Control Plant	4952	1,743.9708	0.0735	0.0150	0.0016
56-02-005	DuPont Performance Coatings	2851	7,756.4361	0.8664	0.0147	0.0071
31-01-061	Eagle Window & Door, Inc.	2431	3,515.5168	0.3927	0.0066	0.0032
32-01-017	Electrimold	3089	2.5531	0.0000	0.0000	0.0000
40-01-002	Electrolux Home Products	3633	19,881.7635	1.3520	0.1045	0.0181
52-01-032	Enterprise NGL Pipeline LC. - Iowa City Terminal	4613	12,419.5218	0.4275	0.2137	0.0113
23-01-004	Equistar Chemicals, LP	2869	800,138.8497	31.7750	0.5377	0.7266
88-01-002	Fansteel/Wellman Dynamics	3365	3,913.1029	0.4371	0.0074	0.0036
45-01-009	Featherlite Inc.	3715	2,304.9974	0.2575	0.0044	0.0021
69-01-020	Fres-co System USA, INC.	2754	2,376.0531	0.2654	0.0045	0.0022
49-01-024	Generac Power Systems, Inc. - Maquoketa Iowa Plant	3621	565.1276	0.0703	0.0032	0.0005
57-01-012	General Mills Operations, Inc.	2043	49,188.7681	5.4071	0.1058	0.0448
94-01-010	Georgia-Pacific Gypsum LLC	3275	36,818.3782	4.0733	0.0751	0.0335
70-03-003	Gerdau Ameristeel US Inc. - Wilton Mill	3312	41,161.5416	4.7160	0.2527	0.0375
32-02-004	GKN Armstrong Wheels	3714	977.2457	0.1092	0.0018	0.0009
32-01-016	GKN Armstrong Wheels, Inc.	3523	5,517.9695	0.6164	0.0104	0.0050
25-05-008	Glen-Gery Corp./Redfield Plant	3251	7,258.6574	0.7996	0.0149	0.0066
70-01-004	Grain Processing Corporation	2046	796,585.4749	94.1953	11.7500	0.7278

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
88-01-017	Green Valley Chemical Corporation	2873	69,735.8258	7.7166	0.1389	0.0635
56-02-035	Gregory Manufacturing Co., Inc.	3441	282.4543	0.0316	0.0005	0.0003
78-01-012	Griffin Pipe Products Company	3321	13,656.7857	1.5255	0.0258	0.0124
84-03-015	Groschopp, Inc.	3621	183.2985	0.0205	0.0003	0.0002
23-02-013	Guardian Industries Corporation	3211	93,709.8906	10.4665	0.1773	0.0853
70-01-005	H.J. Heinz Company, L.P.	2033	13,252.3576	1.4803	0.0251	0.0121
35-01-008	Hampton Hydraulics, LLC a Div. of Seabee	3593	1,786.8325	0.1989	0.0034	0.0016
56-01-008	Henniges Automotive Iowa (was Metezeler)	3061	5,414.3130	0.6046	0.0103	0.0049
17-01-009	Holcim (US) Inc. - Mason City Plant	3241	468,623.8562	38.9277	5.3454	0.4274
70-01-006	Hon Company-Oak Steel Plant	2521	12,412.5380	1.3865	0.0235	0.0113
52-01-003	IAC Iowa City, LLC	3086	5,988.3860	0.6123	0.0104	0.0054
03-02-001	Industrial Laminates/Norplex, Inc.	3083	13,956.1716	1.5439	0.0261	0.0127
29-01-004	Iowa Army Ammunition Plant	9711	69,716.5137	8.3160	1.1694	0.0637
52-01-053	Iowa City Sanitary Landfill	4959	63.9775	0.0111	0.0011	0.0001
77-01-175	Iowa E.P.S. Products, Inc.	3086	1.0463	0.0001	0.0000	0.0000
77-01-142	Iowa Methodist Medical Center	8062	36,842.2532	4.1002	0.0711	0.0335
85-01-007	Iowa State University (Power Plant)	8221	374,959.6898	44.1426	6.3061	0.3428
85-01-007	Iowa State University Central Campus	8221	5,212.1007	0.5841	0.0104	0.0047
29-02-003	IPL - Burlington Agency Street Combustion Turbines Station	4911	123.9398	0.0101	0.0006	0.0001
29-01-013	IPL - Burlington Generating Station	4911	**1,480,711.8392**	155.2197	22.1623	1.3525
04-01-003	IPL - Centerville Combustion Turbines and Diesels Station	4911	1,640.8627	0.0484	0.0161	0.0015
31-01-017	IPL - Dubuque Generation Station	4911	**407,386.1368**	48.4540	6.8012	0.3724
17-02-016	IPL - Emery Generating Station	4911	**415,857.2070**	45.0905	0.7667	0.3783
79-01-022	IPL - Grinnell Combustion Turbines Station	4911	328.5257	0.0365	0.0006	0.0003
03-03-001	IPL - Lansing Generating Station	4911	**2,245,633.0465**	264.8638	37.8486	2.0529
17-01-066	IPL - Lime Creek Combustion Turbines Station	4911	**6,461.0804**	0.2141	0.0714	0.0059
23-01-014	IPL - M.L. Kapp Generating Station	4911	**888,017.4677**	102.6048	14.6248	0.8117
90-07-001	IPL - Ottumwa Generating Station	4911	**5,394,214.2648**	576.3006	82.3691	4.9278
57-01-042	IPL - Prairie Creek Generating Station	4911	**836,910.3968**	90.0219	10.4093	0.7639
57-01-040	IPL - Sixth Street Generating Station	4911	**189,592.6025**	21.9488	2.6348	0.1732
64-01-012	IPL - Sutherland Generating Station	4911	**1,036,335.9407**	95.4013	13.5729	0.9458
31-01-021	JELD-WEN, inc. dba JELD-WEN	2493	1,237.4611	0.1382	0.0023	0.0011
82-01-043	John Deere Davenport Works	3531	6,378.1097	0.6206	0.0209	0.0058
77-01-035	John Deere Des Moines Works	3523	23,953.4505	2.5853	0.0597	0.0218
31-01-009	John Deere Dubuque Works	3531	97,074.4584	11.2139	1.5896	0.0887
07-01-091	John Deere Engine Works	3519	7,108.8958	0.5554	0.0367	0.0065
07-01-010	John Deere Foundry Waterloo	3321	23,910.0291	2.6002	0.0510	0.0218

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
90-01-003	John Deere Ottumwa Works	3523	695.4810	0.0214	0.0088	0.0006
07-01-087	John Deere Product Engineering Center	3523	19,679.4876	0.8034	0.1717	0.0179
07-01-077	John Deere Waterloo Works	3523	21,300.1955	2.1900	0.0485	0.0194
07-01-085	John Deere Waterloo Works - DSS	3523	10,644.7542	1.0444	0.0270	0.0097
75-01-018	Kaneb Pipe Line Operating Partnership LP - Le Mars	4613	0.0000	0.0000	0.0000	0.0000
30-02-010	Kaneb Pipe Line Operating Partnership LP - Milford	4613	0.0000	0.0000	0.0000	0.0000
60-01-012	Kaneb Pipe Line Operating Partnership LP - Rock Rapids	4613	0.0000	0.0000	0.0000	0.0000
56-01-025	Keokuk Steel Castings, A Matrix Metals Company LLC	3325	9,349.5619	1.0444	0.0177	0.0085
41-03-003	Kiefer Built, LLC	3499	693.5550	0.0775	0.0013	0.0006
94-01-005	Koch Nitrogen Company	2873	259,130.6014	28.9456	0.4899	0.2358
82-01-018	Kraft Foods Global, Inc – Davenport Plant	2013	7,356.3171	0.8212	0.0139	0.0067
82-04-005	Lafarge North America Inc.	3241	249,689.9986	25.2244	3.6026	0.2280
17-01-005	Lehigh Cement Company - Mason City	3241	159,099.7272	17.1065	2.4655	0.1454
64-01-009	Lennox Manufacturing, Inc.	3585	5,828.8639	0.6499	0.0113	0.0053
85-02-017	Lincolnway Energy, LLC	2869	181,390.6605	21.6625	3.0946	0.1658
82-01-015	Linwood Mining & Minerals Corporation	3274	59,088.7605	6.9974	0.9608	0.0540
52-01-037	LOPAREX, Inc.	2672	27,003.8405	3.0164	0.0510	0.0246
57-02-008	Maax U.S. Corp	3088	112.1321	0.0125	0.0002	0.0001
52-02-006	Magellan Pipeline Company, L.P - Iowa City Terminal	4613	138.8943	0.0155	0.0003	0.0001
77-01-114	Magellan Pipeline Company, L.P. - Des Moines Terminal	4613	2,542.7284	0.2840	0.0048	0.0023
31-01-034	Magellan Pipeline Company, L.P. - Dubuque Terminal	4613	0.0000	0.0000	0.0000	0.0000
94-07-001	Magellan Pipeline Company, L.P. - Fort Dodge Terminal	4613	6.9173	0.0000	0.0000	0.0000
17-02-002	Magellan Pipeline Company, L.P. - Mason City Terminal	4613	878.9258	0.1233	0.0090	0.0008
30-02-004	Magellan Pipeline Company, L.P. - Milford Terminal	4613	0.0000	0.0000	0.0000	0.0000
97-01-118	Magellan Pipeline Company, L.P. - Sioux City Terminal	4613	1,326.4104	0.1792	0.0118	0.0012
07-01-040	Magellan Pipeline Company, L.P. - Waterloo Terminal	4613	964.5765	0.1294	0.0082	0.0009
15-01-014	MAHLE Engine Components USA, Inc.	3714	966.3947	0.1067	0.0021	0.0009
98-02-004	Manly Terminal	5171	71.6350	0.0016	0.0005	0.0001
49-01-013	Maquoketa Municipal Electric Utility	4911	1,144.8654	0.0852	0.0063	0.0010
50-01-002	Maytag Newton Laundry Products - Plant 2	3633	5.4117	0.0006	0.0000	0.0000
70-01-025	McKee Button Company	3965	113.6643	0.0127	0.0002	0.0001
11-01-029	Meridian Mfg. Group	3443	1.5600	0.0002	0.0000	0.0000
07-02-023	MetoKote Corporation - Plant 15	3479	5.8225	0.0007	0.0000	0.0000
07-01-111	MetoKote Corporation - Plant 24	3479	3.4500	0.0004	0.0000	0.0000
77-14-002	Metro Methane Recovery Facility	4953	12.8815	0.0002	0.0001	0.0000
77-14-003	Metro Park East Sanitary Landfill	4953	189.0208	0.0261	0.0019	0.0002
52-02-001	MidAmerican Energy Co. - Coralville Turbines	4911	15.9256	0.0018	0.0000	0.0000

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
07-01-038	MidAmerican Energy Co. - Electrifarm Turbines	4911	19,985.4481	2.2255	0.0384	0.0182
97-04-010	MidAmerican Energy Co. - George Neal North	4911	**6,740,283.4864**	778.3845	110.8196	6.1608
97-04-011	MidAmerican Energy Co. - George Neal South	4911	**5,018,235.4121**	572.4154	81.8080	4.5865
63-01-017	MidAmerican Energy Co. - Knoxville Power Station	4911	56.7858	0.0017	0.0006	0.0001
58-07-001	MidAmerican Energy Co. - Louisa Station	4911	**5,136,540.9239**	626.1555	89.3103	4.6969
34-01-023	MidAmerican Energy Co. - Merl Parr CTs	4911	197.7599	0.0221	0.0004	0.0002
77-13-002	MidAmerican Energy Co. - Pleasant Hill CTs/Greater Des Moines Energy Center	4911	**479,949.4981**	51.5363	0.8746	0.4366
77-01-054	MidAmerican Energy Co. - River Hills Turbines	4911	429.9184	0.0480	0.0008	0.0004
82-02-006	MidAmerican Energy Co. - Riverside Station	4911	**985,881.7400**	116.4887	16.3611	0.9012
73-01-018	MidAmerican Energy Co. - Shenandoah Power Station	4911	79.9248	0.0024	0.0008	0.0001
77-09-002	MidAmerican Energy Co. - Sycamore Turbines	4911	866.2966	0.0949	0.0018	0.0008
78-01-026	MidAmerican Energy Co. - Walter Scott Jr. Energy Center	4911	**11,969,514.2556**	1,391.2478	198.8260	10.9412
07-01-133	MidAmerican Energy Co. - Waterloo Lundquist Power Station	4911	60.9951	0.0018	0.0006	0.0001
31-02-002	Modernfold Inc.	2542	801.1401	0.0844	0.0014	0.0007
70-01-008	Monsanto Company - Muscatine (3670)	2879	5,940.3262	0.6636	0.0112	0.0054
70-01-008	Monsanto Company - Muscatine (6909)	2879	103,494.1280	13.1373	1.5748	0.0946
56-01-013	Morse Rubber, LLC	3069	763.8045	0.0853	0.0015	0.0007
70-01-054	Multiserv Plant 52 - IPSCO Montpelier	3295	207.7711	0.0061	0.0020	0.0002
70-01-011	Muscatine Power & Water	4911	**2,194,716.5482**	231.3792	33.0180	2.0047
78-01-092	National Cooperative Refinery Association	5171	0.0000	0.0000	0.0000	0.0000
65-04-001	Natural Gas Pipeline Co. of America/Station 107	4922	78,364.7965	8.7536	0.1481	0.0713
91-06-001	Natural Gas Pipeline Co. of America/Station 108	4922	77,753.6209	8.6853	0.1470	0.0707
54-10-001	Natural Gas Pipeline Co. of America/Station 109	4922	70,915.2310	7.9214	0.1341	0.0645
63-01-013	Natural Gas Pipeline Co. of America/Station 198	4922	48,709.0781	5.4410	0.0921	0.0443
58-04-002	Natural Gas Pipeline Co. of America/Station 199	4922	3,375.5765	0.3771	0.0064	0.0031
58-02-007	Natural Gas Pipeline Co. of America/Station 204	4922	14,298.2786	1.5972	0.0270	0.0130
92-10-001	Natural Gas Pipeline Co. of America/Station 205	4922	2,153.1421	0.2405	0.0041	0.0020
82-01-089	Nichols Aluminum - Casting	3353	56,010.4846	6.2564	0.1059	0.0510
82-01-017	Nichols Aluminum - Davenport	3353	8,888.0523	0.9928	0.0168	0.0081
41-02-005	Northern Natural Gas Company - Garner LNG Plant	4922	4,766.4559	0.5317	0.0091	0.0043
78-04-006	Northern Natural Gas Company - Oakland	4922	93,903.2798	10.4893	0.1775	0.0854
08-03-004	Northern Natural Gas Company - Ogden	4922	92,043.7597	10.2813	0.1740	0.0837
18-06-002	Northern Natural Gas Company - Paullina	4922	3,931.7209	0.4390	0.0075	0.0036
25-05-002	Northern Natural Gas Company - Redfield	4922	23,352.8061	2.5723	0.0446	0.0212
41-02-005	Northern Natural Gas Company - Ventura	4922	32,891.8201	3.6733	0.0622	0.0299
07-01-057	Northern Natural Gas Company - Waterloo	4922	38,522.1742	4.3028	0.0728	0.0350

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
07-01-061	Omega Cabinets Ltd.	2434	5,407.1908	0.4991	0.0084	0.0049
14-01-010	Pella Corporation - Carroll Division	2431	1,188.6297	0.1328	0.0022	0.0011
62-03-003	Pella Corporation - Pella Division	2431	9,855.4134	1.1009	0.0186	0.0090
73-01-012	Pella Corporation - Shenandoah Operations	2431	415.3369	0.0464	0.0008	0.0004
84-03-018	Pella Corporation - Sioux Center Operations	2431	1,045.2088	0.1168	0.0020	0.0010
63-02-005	Pella Municipal Power Plant	4911	**118,778.1910**	14.1491	2.0210	0.1086
57-01-025	Penford Products Co.	2046	92,865.6070	10.3677	0.1761	0.0845
57-01-095	PMX Industries Inc.	3351	19,793.5309	2.1978	0.0377	0.0180
14-03-006	POET Biorefining - Coon Rapids	2869	78,054.5396	8.7183	0.1476	0.0710
30-01-012	Polaris Industries, Inc.	3799	36.8824	0.0007	0.0000	0.0000
94-07-004	Praxair, Inc. - Fort Dodge, IA Carbon Dioxide Plant	2813	0.0000	0.0000	0.0000	0.0000
90-01-023	Praxis Companies, LLC	3088	0.9060	0.0001	0.0000	0.0000
77-01-174	Principal Life Insurance Company	6311	842.0063	0.0952	0.0019	0.0008
57-01-027	Quaker Manufacturing LLC	2043	8,806.7597	0.9837	0.0166	0.0080
57-01-226	Red Star Yeast Company, LLC	2099	0.0000	0.0000	0.0000	0.0000
29-01-079	Riley Industrial Painting	3479	418.8146	0.0456	0.0010	0.0004
56-01-009	Roquette America, Inc.	2046	**589,595.8347**	55.9532	6.1567	0.5377
82-01-121	Scott County Landfill	4953	26.3076	0.0045	0.0004	0.0000
77-01-169	Siegwerk USA Inc.	2893	216.5832	0.0242	0.0004	0.0002
94-01-040	Silgan Containers Mfg. Corp. - Fort Dodge	3411	1,121.4377	0.1253	0.0021	0.0010
56-02-030	Silgan Containers Mfg. Corp. - Fort Madison	3411	549.8955	0.0614	0.0010	0.0005
97-04-001	Sioux City Brick & Tile Company	3251	8,280.3206	0.9249	0.0157	0.0075
82-02-004	Sivyer Steel	3325	18,879.7455	2.1089	0.0357	0.0172
55-01-002	Snap-On Tools Manufacturing Company	3499	6,637.6334	0.7333	0.0140	0.0060
63-08-001	South Central Iowa Solid Waste Agency (SCISWA)	4953	0.0000	0.0000	0.0000	0.0000
70-08-002	SSAB Iowa Inc (was IPSCO)	3312	247,797.5012	28.1701	1.3666	0.2257
53-02-008	Star Building Systems	3448	985.4200	0.1101	0.0019	0.0009
41-02-011	Stellar Industries, Inc.	3713	748.0667	0.0836	0.0014	0.0007
86-01-001	Tama Paperboard- (was Caraustar Mill Group)	2631	26,802.8598	2.9940	0.0507	0.0244
40-01-014	Tasler, Inc. - EPS	3086	4,757.8472	0.5315	0.0090	0.0043
97-01-030	Terra Nitrogen - Port Neal Complex	2873	262,224.1574	29.2912	0.4957	0.2386
77-01-003	Titan Tire Corporation	3011	34,616.6870	3.1222	0.1228	0.0315
65-01-005	Trajet Products, Inc.	3087	0.0000	0.0000	0.0000	0.0000
18-01-002	Tyson Deli, Inc.	2013	7,555.9715	0.8440	0.0143	0.0069
07-01-071	Tyson Fresh Meats, Inc.	2011	39,964.4664	4.4325	0.0777	0.0364
70-01-048	Union Tank Car Co.-Muscatine	4741	3,319.8559	0.3708	0.0063	0.0030
25-02-001	United Brick & Tile - Adel Plant	3251	14,767.2162	1.6670	0.0623	0.0134

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
29-06-001	United States Gypsum Company	3275	80,799.4336	9.0255	0.1527	0.0735
94-01-017	United States Gypsum Company	3275	30,544.2510	3.4119	0.0577	0.0278
52-01-005	University of Iowa Main Campus, Hospitals, and Oakdale Campus	8221	12,833.7269	1.3122	0.0261	0.0117
52-01-005	University of Iowa Main Power Plant	8221	**190,624.9059**	22.7043	2.5664	0.1741
07-02-006	University of Northern Iowa - Main Campus	8221	723.8433	0.0818	0.0016	0.0007
07-02-006	University of Northern Iowa - Power Plant	8221	118,788.7642	13.7838	1.9232	0.1086
12-04-005	Unverferth Manufacturing Co. Inc.	3523	1,789.0315	0.0000	0.0000	0.0016
85-01-017	USDA - NADC	8733	33,448.3152	3.6846	0.0682	0.0304
85-01-056	USDA - National Veterinary Services Laboratories	8734	1,112.3798	0.1234	0.0022	0.0010
63-02-004	Vermeer Manufacturing Company	3531	1,885.0974	0.2152	0.0075	0.0017
84-01-002	Vogel Paint & Wax Co., Inc.	2851	1,152.5693	0.1287	0.0022	0.0010
68-09-006	Wacker Chemical Corporation	2046	12,079.2992	1.3474	0.0229	0.0110
09-01-013	Waverly Light & Power - North & South Plants	4911	285.9493	0.0171	0.0020	0.0003
40-01-003	Webster City Diesel Turbine	4911	156.8763	0.0046	0.0015	0.0001
05-04-002	Western Minnesota Municipal Power Agency - Exira Station	4911	**11,942.6000**	1.2656	0.0312	0.0109
48-05-001	Whirpool Corporation - Amana Division (was Maytag)	3632	13,978.7131	1.4674	0.0427	0.0127
29-01-012	Winegard Company	3663	840.4498	0.0939	0.0016	0.0008
34-01-027	Winnebago Industries, Inc. - Charles City	3716	1,057.0214	0.1181	0.0020	0.0010
95-01-001	Winnebago Industries, Inc. - Forest City	3716	10,509.1140	1.1739	0.0199	0.0096
35-01-010	Winnebago Industries, Inc. - Hampton	3716	1,057.0214	0.1181	0.0020	0.0010
17-01-068	Woodharbor Doors and Cabinetry	2434	1,057.4287	0.1181	0.0020	0.0010
98-01-006	Woodharbor Doors and Cabinetry - Northwood Facility	2431	1,060.7455	0.1185	0.0020	0.0010
16-01-004	Xerxes Corporation	3089	62.2704	0.0012	0.0004	0.0001
	Total		**60,740,850.9091**	**6,815.4818**	**877.9003**	**55.4808**

Appendix E: 2008 Ethanol Reporting Form

Greenhouse Gas Emissions Inventory Reporting Form for Ethanol Plants

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2008 throughputs. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to your SPARS inventory submittal. If you do not have an inventory due in 2009, please print out and mail to DNR.

Emission Year:	**2008**
Facility Name:	
Facility #:	
EIQ #: (Title V Facilities Only)	

Assumptions:

1 therm Natural Gas = 0.09997612 MMBtu

1 gallon diesel = 0.140 MMBtu, gallon LPG = 0.094 MMBtu

1 MMcf Natural Gas = 1050 MMBtu (if other value used, please enter it in Cell C13).

				CO2		CH4		N2O		CO2	CH4	N2O
Fuel Type	**Fuel Subtype**	**Throughput**	**Units**	**Emission Factor**		**Emission Factor**		**Emission Factor**		**Emissions (tons)**	**Emissions (tons)**	**Emissions (tons)**
Coal	Industrial		MMBtu	205.15	lbs/MMBtu	0.0245	lbs/MMBtu	0.0035	lbs/MMBtu	0.0000	0.0000	0.0000
Distillate Fuel (Diesel)	Industrial		gallons	159.69	lbs/MMBtu	0.00066	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
LPG	Industrial		gallons	136	lbs/MMBtu	0.00044	lbs/gallon	0.00022	lbs/gallon	0.0000	0.0000	0.0000
Natural Gas	Industrial		MMBtu	116.38	lbs/MMBtu	0.0130	lbs/MMBtu	0.00022	lbs/MMBtu	0.0000	0.0000	0.0000
**Natural Gas Conversion Used if not 1050*			MMBtu = 1 MMcf							**0.0000**	**0.0000**	**0.0000**

Note: This spreadsheet is formatted to be printed on legal-size paper.

Note: Unless otherwise noted, all emission factors were obtained from the California Climate Action Registry General Reporting Protocol Version 2.2 March 2007 Tables C.5 and C.6

(DNR Form 542-1572 December 18, 2007)

Updated on 1/20/09 to add conversion factor for CO2 emissions for diesel and LPG.

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2008 throughput. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to your SPARS inventory submittal. If you do not have an inventory due in 2009, please print out and mail to DNR.

Emission Year:	**2008**
Facility Name:	
Facility #:	
EIQ #: (Title V Facilities Only)	

	bushels of corn processed

Given:

	gallons of denatured EtOH produced
95%	of the denatured EtOH is 200 proof EtOH
46.06844	[g/mol] mole weight of EtOH
0.789	[g/cm^3] density of liquid EtOH
44.0095	[g/mol] mole weight of CO2

and:

$C_6H_{12}O_6$ + yeast = 2 CH_3CH_2OH + 2 CO_2

sugar + yeast = ethanol + carbon dioxide

Therefore:

	0	gal denatured EtOH	95%	gal 200 proof EtOH	0.789	g EtOH	3,785.41	cm^3
				gal denatured EtOH	1	cm^3	1	gal
=	0	g EtOH	1	mol EtOH				
			46.06844	g EtOH				
=	-	mol EtOH	2	mol CO_2				
			2	mol EtOH				
=	-	mol CO_2	44.0095	g CO_2	1	lb		
			1	mol CO_2	453.59	g		

=	-	**lbs CO_2 / annual production of denatured EtOH (gallons)**
=	-	**tons CO_2**

Instructions: Please fill in the green cells with your facility information and yellow cells with any stack test data from testing data. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to your SPARS inventory submittal. If you do not have an inventory due in 2009, please print out and mail to DNR.

Emission Year:		**2008**		
Facility Name:				
Facility #:				
EIQ #: (Title V Facilities Only)				
		CO2		
Emission Point ID	**Date of Stack Test**	**Result (lb/hr)**	**Hours Operated/Year**	**Emissions (tons)**
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000
				0.0000

Instructions: Please fill in the green cells with your facility information and yellow cells with your 2008 CEM data. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to your SPARS inventory submittal. If you do not have an inventory due in 2009, please print out and mail to DNR.

Emission Year:	**2008**
Facility Name:	
Facility #:	
EIQ #: (Title V Facilities Only)	
	CO2
Emission Point ID	**Emissions (tons)**
	0.0000

Appendix F: 2008 GHG Emissions Per Dry Mill Ethanol Plant

			2008			
Facility ID	**Facility Name**	**City**	**Million Gallons Denatured Ethanol Produced[36]**	**% of Operating Capacity[37]**	**MMtCO2e Fermentation**	**MMtCO2e Fuel Combustion**
66-10-001	Absolute Energy, LLC	St. Ansgar	77	70%	0.21	0.12
24-01-007	Amaizing Energy, LLC	Denison	51	78%	0.14	0.06
29-02-012	Big River Resources, LLC*	W. Burlington	97	74%	0.26	0.14
99-05-003	CORN LP*	Goldfield	54	98%	0.15	0.16
55-09-003	Global Ethanol, LLC*	Lakota	93	93%	0.25	0.15
17-01-100	Golden Grain Energy*	Mason City	109	73%	0.30	0.18
73-01-025	Green Plains Shenandoah LLC	Shenandoah	55	88%	0.15	0.08
30-01-022	Green Plains Superior LLC	Superior	21	34%	0.06	0.03
39-06-002	Hawkeye Menlo	Menlo	24	18%	0.07	0.03
10-04-007	Hawkeye Renewables, LLC	Fairbank	121	92%	0.33	0.17
42-01-019	Hawkeye Renewables, LLC	Iowa Falls	99	86%	0.27	0.15
12-04-007	Hawkeye Shell Rock LLC	Shell Rock	20	15%	0.05	0.04
85-02-017	Lincolnway Energy, LLC*	Nevada	55	99%	0.15	0.17
18-02-006	Little Sioux Corn Processors, LP*	Marcus	102	85%	0.28	0.19
42-08-001	Pine Lake Corn Processors LLC	Steamboat Rock	30	43%	0.08	0.04
47-04-001	Platinum Ethanol	Arthur	16	12%	0.04	0.03

[36] As reported by each facility on their 2008 inventory.
[37] Percent operating capacity = permitted capacity (gallons) / gallons produced

			2008			
Facility ID	**Facility Name**	**City**	**Million Gallons Denatured Ethanol Produced[38]**	**% of Operating Capacity[39]**	**MMtCO2e Fermentation**	**MMtCO2e Fuel Combustion**
75-05-005	Plymouth Energy LLC	Merrill	2	3%	0.00	0.00
72-03-002	Poet Biorefining	Ashton	54	83%	0.15	0.09
14-03-006	Poet Biorefining*	Coon Rapids	50	78%	0.14	0.07
02-05-001	Poet Biorefining	Corning	64	98%	0.17	0.10
74-01-022	Poet Biorefining	Emmetsburg	54	49%	0.15	0.08
94-02-004	Poet Biorefining	Gowrie	65	93%	0.18	0.09
98-07-004	Poet Biorefining	Hanlontown	56	89%	0.15	0.08
40-02-002	Poet Biorefining	Jewell	68	98%	0.18	0.09
47-05-002	Quad County Corn Processors Cooperative	Galva	28	88%	0.08	0.04
84-03-020	Siouxland Energy & Livestock Coop	Sioux Center	54	84%	0.15	0.06
11-05-004	Valero Renewable Fuels Company, LLC	Albert City	93	85%	0.25	0.13
94-01-073	Valero Renewable Fuels Company, LLC	Charles City	110	81%	0.30	0.17
34-01-040	Valero Renewable Fuels Company, LLC	Fort Dodge	112	94%	0.30	0.17
71-02-010	Valero Renewable Fuels Company, LLC	Hartley	26	22%	0.07	0.06
31-02-019	Verasun Dyersville LLC	Dyersville	15	12%	0.04	0.03
06-04-001	Xethanol Biofuels, LLC	Blairstown	2	5%	0.00	0.00
	Total		**1,877**		**5.09**	**3.01**

* Facility is subject to the federally enforceable major source operating permit program (Title V).

NOT OP. = facility did not operate

[38] As reported by each facility on their 2008 inventory.

[39] Percent operating capacity = permitted capacity (gallons) / gallons produced

Appendix G: 2008 Hydrofluorocarbons (HFC) Emissions per Major Source Facility

Facility ID	Facility Name	Common Name	Name	Emissions (lbs)	GWP	MtCO2e	$MMtCO_2e$
70-01-008	Monsanto Company - Muscatine	HFC-134	1,1,2,2-tetrafluoroethane	875.00	1000	396.90	0.00
85-01-056	USDA - National Veterinary Services Laboratories	HFC-134	1,1,2,2-tetrafluoroethane	0.00	1000	0.00	0.00
57-01-080	ADM Corn Processing	HFC-134a	1,1,1,2-tetrafluoroethane	1,962.00	1300	1,156.95	0.00
82-01-002	Alcoa	HFC-134a	1,1,1,2-tetrafluoroethane	276.00	1300	162.75	0.00
04-01-002	Bemis Co Inc - Curwood Operation Centerville	HFC-134a	1,1,1,2-tetrafluoroethane	775.00	1300	457.00	0.00
85-01-007	Iowa State University Central Campus	HFC-134a	1,1,1,2-tetrafluoroethane	25.00	1300	14.74	0.00
85-01-007	Iowa State University Heating Plant	HFC-134a	1,1,1,2-tetrafluoroethane	1,750.00	1300	1,031.94	0.00
77-14-003	Metro Park East Sanitary Landfill	HFC-134a	1,1,1,2-tetrafluoroethane	75.00	1300	44.23	0.00
82-01-017	Nichols Aluminum Davenport	HFC-134a	1,1,1,2-tetrafluoroethane	14.40	1300	8.49	0.00
07-01-061	Omega Cabinetry	HFC-134a	1,1,1,2-tetrafluoroethane	5.00	1300	2.95	0.00
51-01-095	PMX Industries Inc	HFC-134a	1,1,1,2-tetrafluoroethane	114.00	1300	67.22	0.00
53-02-008	Robertson Ceco II dba Star Building Systems	HFC-134a	1,1,1,2-tetrafluoroethane	141.00	1300	83.14	0.00
52-01-008	U. of Iowa Campus, Hospitals, & Oakdale Campus	HFC-134a	1,1,1,2-tetrafluoroethane	120.00	1300	70.76	0.00
85-01-017	USDA - National Animal Disease Center	HFC-134a	1,1,1,2-tetrafluoroethane	1,275.00	1300	751.84	0.00
48-05-001	Whirlpool Corporation - Amana Division	HFC-134a	1,1,1,2-tetrafluoroethane	0.00	1300	0.00	0.00
31-01-009	John Deere Dubuque Works	HFC-152a	1,1-difluoroethane	48.75	140	3.10	0.00
85-01-056	USDA - National Veterinary Services Laboratories	HFC-152a	1,1-difluoroethane	2.00	140	0.13	0.00
85-01-017	USDA - National Animal Disease Center	HFC-23	trifluoromethane	1.00	11700	5.31	0.00
82-01-017	Nichols Aluminum Davenport	HFC-245fa	1,1,1,3,3-pentafluoropropane	36.00	950*	15.51	0.00
48-05-001	Whirlpool Corporation - Amana Division	HFC-245fa	1,1,1,3,3-pentafluoropropane	112,866.00	950*	48,636.22	0.05
	TOTAL					**52,909.19**	**0.05**

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