2007 Greenhouse Gas Emissions from Selected Iowa Source Categories

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Acronyms and Key Terms

CAMD	Clean Air Markets Division
CCAR	California Climate Action Registry
CCS	Center for Climate Strategies
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
EGU	Electric Generating Unit
EIIP	Emission Inventory Improvement Program
EPA	Environmental Protection Agency
EtOH	Ethanol
GHG	Greenhouse Gas
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
HFCs	Hydrofluorocarbons
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
N_2O	Nitrous Oxide
NO_X	Nitrogen Oxides
ODS	Ozone Depleting Substance
PFCs	Perfluorocarbons
PM_{10}	Particulate Matter Less Than 10 Microns in Aerodynamic Diameter
RCI	Residential, Commercial, Industrial
SF_6	Sulfur Hexafluoride
SIC	Standard Industrial Classification
SIT	State Inventory Tool
SO_2	Sulfur Dioxide
USDA	United States Department of Agriculture
VMT	Vehicles Mile Traveled
VOC	Volatile Organic Compounds
WRI	World Resources Institute

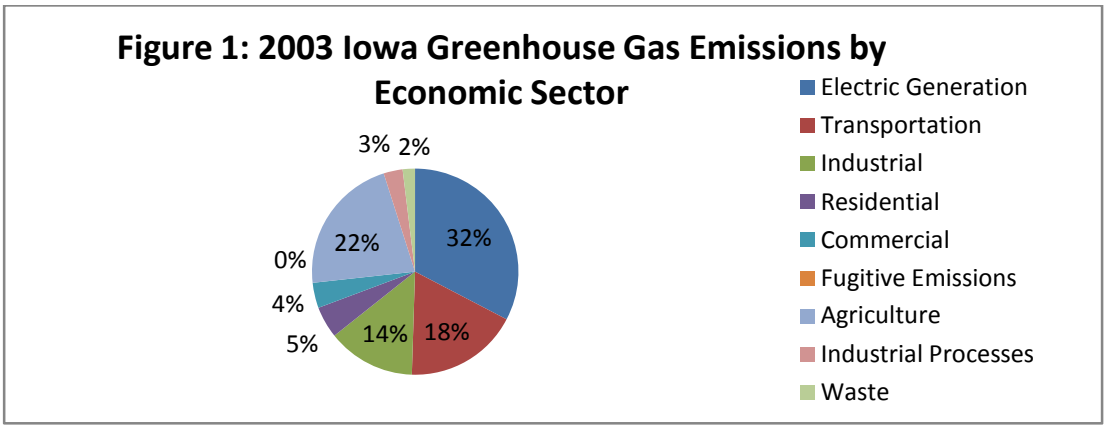
Summary of Findings

Background

This inventory has been prepared by the Iowa Department of Natural Resources (DNR) as required by legislation passed by the Iowa General Assembly in 2007 which states that "By September 1 of each year, the department shall submit a report to the governor and the general assembly regarding the greenhouse gas 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, 2007".[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]

In 1996, the Department published a greenhouse gas emission inventory for 1990 using United States Environmental Protection Agency (US EPA) inventory tools as part of an Iowa Greenhouse Gas Action Plan.[3] In 2005, the Department published a 2000 greenhouse gas inventory that was completed by the Center for Energy & Environmental Education at the University of Northern Iowa on behalf of the Department and was funded by a grant from EPA[4]. The inventories showed greenhouse gas emissions of 21.1 million metric tons of carbon equivalent (MMTCE) or 77.37 $MMtCO_2e$ in 1990 and 26.2 MMTCE or 96.07 $MMtCO_2e$ for calendar year 2000[5].

In October 2007, the World Resource Institute (WRI) released a greenhouse gas inventory, *Charting the Midwest: an Inventory and Analysis of Greenhouse Gas Emissions in America's Heartland*[6], which summarized 1990 -2003 emissions trends for Iowa and other Midwestern states. WRI found that 2003 Iowa greenhouse gas emissions totaled 108 $MMtCO_2e$ and that emissions from agriculture were 22% of total emissions, the highest percentage of any state in the Midwest. Figure 1 shows the emissions from other economic sectors[7].



[1] Iowa Code 455B.851
[2] Iowa Code 455B.152
[3] http://www.iowadnr.gov/air/prof/ghg/files/1990%20Iowa%20Greenhouse%20Gas%20Action%20Plan.pdf
[4] http://www.iowadnr.gov/air/prof/ghg/files/Iowa2000inventory.pdf
[5] http://www.epa.gov/climatechange/emissions/downloads/IAInventorySummary_11-16b.pdf
[6] 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.
[7] Ibid., p.34, Figure 4.8.

The WRI inventory also estimated that Iowa greenhouse gas emissions increased 15% from 1990 – 2003. Table 1 below shows the emissions trends by sector.

Table 1: Iowa Greenhouse Gas Emissions and Trends by Economic Sector: 1990 - 2003[8]

Sector	1990 Emissions (MMtCO2e)	2003 Emissions (MMtCO2e)	1990 - 2003 Emission Trends		
			Iowa % Change	Midwest % Change	US % Change
Energy Sectors	*65*	*79*	*22*	*14*	*14*
Electric Generation	27	36	33	25	24
Transportation	17	20	17	20	19
Industrial	13	15	13	-11	-3
Residential	5	5	6	8	12
Commercial	3	4	20	9	7
Fugitive Emissions	0	--	--	-40	-35
Agriculture	25	24	-4	-8	0
Industrial Processes**	2	3	0	-5	8
Waste	2	2	7	-21	-9
Total**	**94**	**108**	**15**	**11**	**13**

The Department's 2007 Greenhouse Gas Inventory is a *refinement* of previous statewide inventories. It is a bottom-up inventory of two sectors – fossil fuel combustion at federally-recognized major sources of air pollution and fossil fuel combustion and ethanol fermentation at dry mill ethanol plants. This is the first bottom-up greenhouse gas inventory conducted for Iowa and the first bottom-up greenhouse gas inventory of ethanol plants in the nation that the Department is aware of.

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 greenhouse gas 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 chose to inventory the ethanol industry and federally-recognized major source sector for the following reasons:

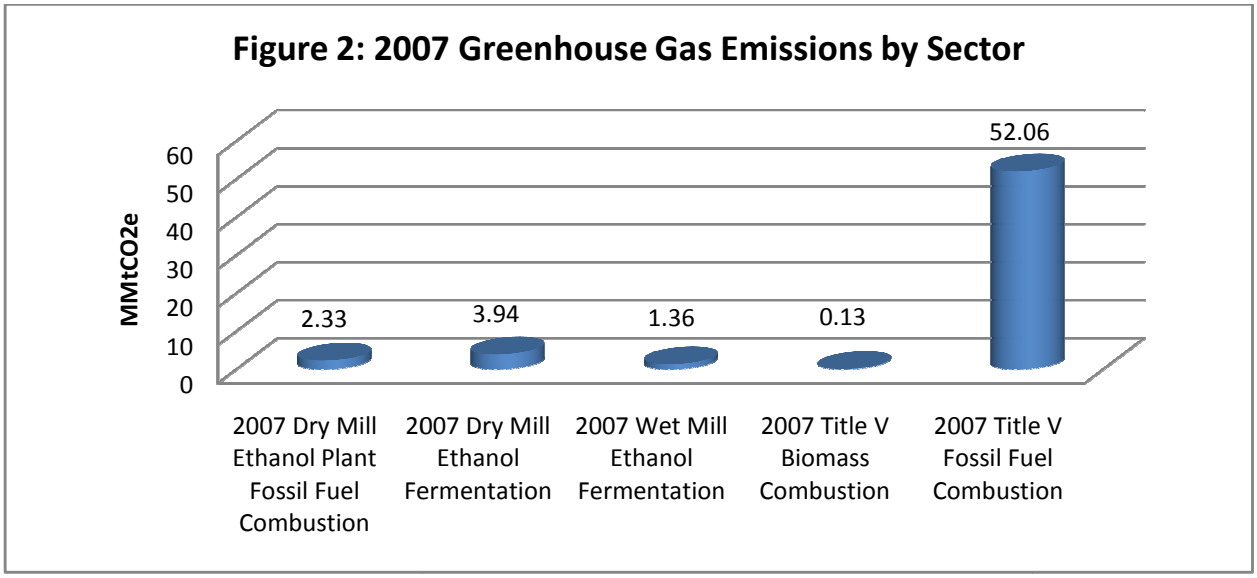
- The legislation requires mandatory reporting from individual affected entities.
- The legislation allows the inventory to phase in sectors over time.
- Iowa is a national leader in ethanol production, and no other states have yet calculated greenhouse gas emissions from ethanol production that DNR is aware of.

[8] Ibid., p.35, Table 4.4

- These sources are the largest industrial sources of air pollution in the state and include the largest electric generating units (EGUs) and major manufacturers. The World Research Institute (WRI) estimates that greenhouse gas emissions from the industrial sector increased 33% from 1990-2003 while electric generation increased 33%[9].
- An existing regulatory program already exists for collecting annual inventories of other air pollutants from major facilities in Iowa.

Results

Greenhouse gas emissions from fossil fuel combustion were calculated to be 52.06 million metric tons of CO_2 equivalent ($MMtCO_2e$) from the federally-recognized major sources and 2.33 $MMtCO_2e$ from Dry Mill Ethanol Plants. Greenhouse gas emissions from the ethanol plant fermentation processes were estimated to be 3.94 $MMtCO_2e$ from dry mills and 1.36 $MMtCO_2e$ from wet mills. Another 0.13 $MMtCO_2e$ of greenhouse gas emissions from biomass combustion was also reported as shown in Figure 2.



EPA's Greenhouse Gas Equivalencies Calculator [10] estimates that the total greenhouse gas emissions from major sources' (52.06 $MMtCO_2e$) fossil fuel combustion is equivalent to:

- Annual greenhouse gas emissions from 9,534,277 passenger vehicles
- CO_2 emissions from the *electricity* use of 6,894,987 homes for one year
- CO_2 emissions from the *energy* use of 4,594,630 homes for one year
- Carbon sequestered by 1,334,798,793 tree seedlings grown for 10 years
- CO_2 emissions from 2,169,048,038 propane cylinders used for home barbeques
- Greenhouse gas emissions avoided by recycling 17,950,742 tons of waste instead of sending it to the landfill

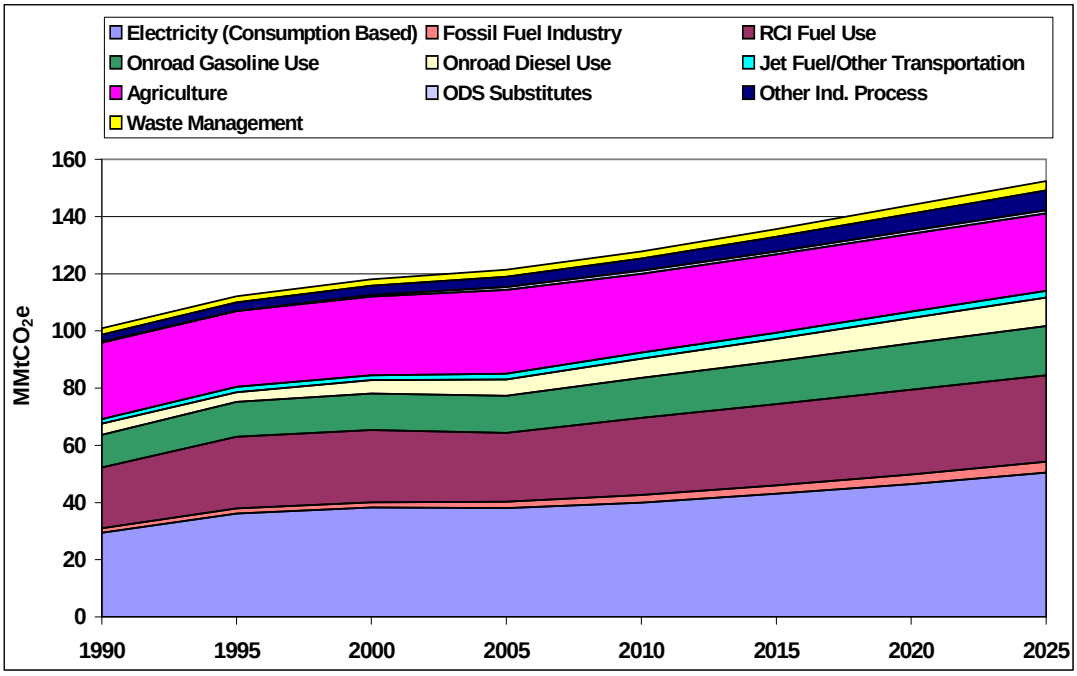
[9] World Resources Institute. 2007. *Charting the Midwest: An Inventory and Analysis of Greenhouse Gas Emissions in America's Heartland.* Internet address: http://www.wri.org/publication/charting-the-midwest.

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

Forecasting

The Department's 2007 inventory does not include any direct forecasting. However, the Center for Climate Strategies (CCS) forecasted Iowa's anthropogenic greenhouse gas emissions and carbon sinks to 2025 in their comprehensive ***Draft*** *Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 - 2005*[11] that was prepared for the Iowa Climate Change Advisory Council (ICCAC). The report is currently under review by ICCAC, and a final version will be released this fall. 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 net greenhouse gas emissions increased by 17% from 1990 to 2005 to 105.5 $MMtCO_2e$. Assuming a business-as-usual scenario, CCS projects Iowa's gross greenhouse gas emissions will continue to grow, reaching 51% above 1990 levels by 2025 as shown in Figure 3 and Table 3.

Figure 3: Iowa Gross Greenhouse Gas Emissions by Sector, 1990-2025: Historical and Projected[12]



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

[12] Ibid., p.7, Figure ES-2. Totals may not equal exact sum of subtotals shown in this table due to independent rounding.

Table 3: Iowa Historical and Greenhouse Gas Emissions Forecast, by Sector[13]

	MMtCO_2e						
Sector	**1990**	**2000**	**2005**	**2010**	**2020**	**2025**	**Explanatory Notes for Projections**
Energy Use (CO_2, CH_4, N_2O)	**69.1**	**84.5**	**85.0**	**92.4**	**106.7**	**114.0**	
Electricity Use (Consumption)	**29.5**	**38.2**	**38.0**	**40.0**	**46.5**	**50.5**	Totals include emissions for electricity production plus emissions associated with net imported electricity.
Electricity Production (in-state)	26.7	36.7	36.3	37.5	41.9	42.3	*See electric sector assumptions*
Coal	26.5	36.3	34.9	37.0	41.2	41.7	*in appendix A.*
Natural Gas	0.17	0.24	1.15	0.31	0.58	0.48	
Oil	0.05	0.10	0.15	0.12	0.14	0.13	
MSW/Landfill Gas	0.01	0.02	0.06	0.03	0.04	0.04	
Imported Electricity	2.78	1.51	1.74	2.46	4.51	8.18	Net imported 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**	**29.5**	
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	1.24	1.32	Based on 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
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

[13] CCS, *Draft Iowa Greenhouse Gas Inventory and Reference Case Projections 1990 – 2005,* p. 5-6, Table ES-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
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	**26.8**	**27.5**	**29.3**	**27.5**	**27.2**	**27.1**	
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
Agricultural Soils (cultivation practices)	1.48	1.48	1.48	1.48	1.48	1.48	Based on 1997 USDA Data
Gross Emissions (Consumption Basis, Excludes Sinks)	**100.9**	**118.1**	**121.4**	**127.8**	**143.9**	**152.3**	
increase relative to 1990		*17%*	*20%*	*27%*	*43%*	*51%*	
Emissions Sinks	**-10.5**	**-8.53**	**-15.9**	**-15.9**	**-15.9**	**-15.9**	
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	
Net Emissions (Includes Sinks)	**90.4**	**109.5**	**105.5**	**111.9**	**128.0**	**136.4**	
increase relative to 1990		*21%*	*17%*	*24%*	*42%*	*51%*	

Method

On October 10, 2007 the Department reviewed its plan for the 2007 Greenhouse Gas inventory at an informational meeting at the DNR Air Quality Bureau. Over twenty stakeholders from Industry, Environmental Groups, Consulting, etc. attended the meeting. The agenda and attendance list can be found in Appendix A of this document. Fourteen stakeholders volunteered to be part of an informal workgroup that reviewed the reporting procedures and forms.

The Department developed reporting forms that were pre-filled with emission factors and calculations. The facilities entered their 2007 fossil fuel combustion and/or the number of gallons of denatured ethanol they produced in 2007. The reporting forms also allowed the facility to report CO_2 stack test data or CO_2 Continuous Emissions Monitor (CEM) data if applicable.

Greenhouse gas 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 B and D, and the resulting emission data is included in Appendices C and E. 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.

The Department also used the following conversions per EPA and DNR protocols:

- 1 MMcf Natural Gas = 1,050 MMBtu
- 1 therm Natural Gas = 0.09997612 MMBtu
- 1 gallon Diesel = 0.140 MMBtu
- 1 gallon LPG = 0.094 MMBtu

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.[14] 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 (1996). The IPCC released its Fourth Assessment Report in 2007 with new GWPs, but has not updated the GWPs in its published inventory method. The Department chose to use the GWPs from the Second Assessment Report as shown in Table 2 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 2: Global Warming Potentials (GWP)

Pollutant	GWP
Carbon Dioxide	1
Methane	21
Nitrous Oxide	310

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

Future Inventories

The Department plans to widen the scope of the inventory, adding more sectors and greenhouse gases each year. Short term plans include adding the other three greenhouse gases – sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs) and adding additional source categories such as landfills, wastewater treatment plants, nitric acid production, lime production, etc. Longer term plans include requiring reporting from non-major sources and possibly emission unit level reporting.

As reporting protocols are developed by EPA, The Climate Registry, the Midwest Governors Association's Midwestern Regional Greenhouse Gas Reduction Accord, etc., the Department will work to coordinate inventory and reporting methods for consistency. The Department continues to work with these groups towards developing a common reporting protocol for greenhouse gas emissions.

Chapter 1: 2007 Greenhouse Gas Emissions from Dry Mill Ethanol Production

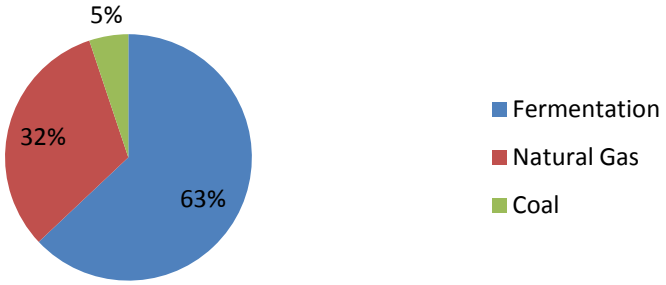
Overview

Greenhouse gas (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 distillers grain with solubles (DGS) and the heating of process water. During the dry mill process the corn kernels are ground into flour before processing. Bi-products created are DGS, which may be sold as livestock feed, and CO_2, which may be sold for use in food processing and bottling.

Twenty-eight dry mills operated in Iowa in 2007. Twenty-six of the ethanol plants combusted natural gas, while two burned coal. Four wet mills – Cargill Eddyville, Grain Processing Corporation, ADM Clinton, and ADM Cedar Rapids – operated in 2007. The four wet mills are evaluated separately in Chapters 2 and 3 because each facility also combusts fossil fuels to manufacture other products and the percentage of fossil fuels combusted for ethanol production versus the percentage used for other products were not reported.

Total greenhouse gas emissions from dry mill ethanol production were calculated to be 6.27 Million Metric Tons of CO_2 equivalent ($MMtCO_2e$), with 3.94 $MMtCO_2e$ of the total attributed to emissions from fermentation as shown in Figure 4 below. 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."[15] 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.

Figure 4: Greenhouse Gas Emissions from 2007 Ethanol Dry Mills (MMtCO2e)



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

The ethanol plants surveyed combusted four fossil fuels – natural gas, coal, liquefied petroleum gas (LPG), and diesel fuel. Emissions from combustion of LPG (189.40 metric tons CO_2e) and diesel fuel (397.51 metric tons CO_2e) calculated to be 0 $MMtCO_2e$ and are not discussed further in this report.

Method

Greenhouse gas 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 dry mill ethanol sector included the following:

Fermentation

CO_2 emissions from fermentation for each dry mill ethanol facility are shown in detail in Appendix C. 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: $gallons\ denatured\ EtOH\ produced\ \times .95 = gallons\ 200\ proof\ EtOH$[16]

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

Correction to Reported CO_2 Emissions from Diesel Fuel Combustion

When tabulating the results, the Department discovered an error in the formula that calculates CO_2 emissions from diesel combustion. The formula did not include a conversion of 1 gallon diesel = 0.140 MMBtu. The Department recalculated all diesel CO_2 emissions with the correct conversion, resulting in all CO_2 emissions from diesel combustion being 0.140 times smaller than reported by the facilities.

[16] Denatured ethanol typically is 5% gasoline and 95% 200 proof ethanol.

Results

A capacity of 5,704 million gallons from dry mill ethanol plants is currently permitted in the state, but not all of these plants were constructed and operating in 2007. Significantly more CO_2 was emitted from the natural gas-combusting facilities because twenty-six of these plants operated, producing 1,353 million gallons of ethanol, while only two coal-combusting plants operated, producing 99 million gallons of ethanol as shown in Tables 4 and 5.

Table 4: Comparison of 2007 Dry Mill CO_2 Emissions and Natural Gas Combustion

Facility Name - City	Million Gallons Denatured Ethanol Produced[17]	% of Operating Capacity[18]	MMBtu Natural Gas Combusted[19]	CO_2 (tons)	MMtCO2e
Amaizing Energy, LLC - Denison	53	82%	1,354,800	78,836	0.0715
Big River Resources, LLC – West Burlington	53	41%	1,567,962	91,240	0.0828
Global Ethanol, LLC - Lakota	93	93%	2,776,041	161,538	0.1465
Golden Grain Energy – Mason City	84	56%	2,317,535	134,857	0.1223
Green Plains Renewable Energy, Inc - Shenandoah	17	26%	430,514	25,052	0.0227
Hawkeye Renewables, LLC - Fairbank	122	92%	3,159,057	183,826	0.1668
Hawkeye Renewables, LLC – Iowa Falls	102	98%	2,914,409	169,589	0.1539
Little Sioux Corn Processors, LP - Marcus	54	45%	1,387,063	80,713	0.0732
Pine Lake Corn Processors LLC – Steamboat Rock	30	84%	811,900	47,244	0.0429
POET Biorefining - Ashton	55	84%	1,681,153	97,826	0.0887
POET Biorefining – Coon Rapids	50	78%	1,324,506	77,073	0.0699
POET Biorefining - Corning	36	55%	1,049,136	61,049	0.0554
POET Biorefining - Gowrie	67	96%	1,825,871	106,247	0.0964
POET Biorefining - Emmetsburg	56	88%	1,579,197	91,893	0.0821
POET Biorefining - Hanlontown	55	88%	1,554,635	90,464	0.0890
POET Biorefining - Jewell	67	96%	1,685,221	98,063	0.0410
Quad County Corn Processors Coop - Galva	28	87%	776,046	45,158	0.0314
Siouxland Energy & Livestock Co-op – Sioux Center	24	37%	595,680	34,663	0.1486
US BIO - Albert City	106	96%	2,815,621	163,841	0.1301
VeraSun – Charles City	81	59%	2,464,397	143,403	0.1822
VeraSun – Fort Dodge	114	95%	3,451,267	200,829	0.0114
Xethanol Biofuels, LCC - Blairstown	5	15%	215,902	12,563	0.0964
TOTAL	**1,353**		**37,737,913**	**2,195,969**	**1.9922**

[17] As reported by each facility on their 2007 inventory.

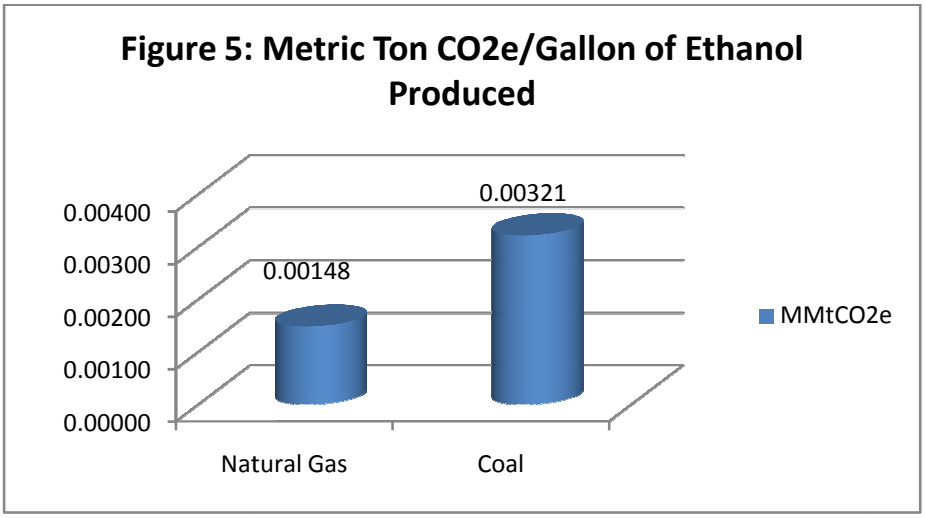
[18] Percent operating capacity = permitted capacity (gallons) / gallons produced

[19] As reported by each facility on their 2007 inventory.

Table 5: Comparison of 2007 Dry Mill CO_2 Emissions and Coal Combustion

Facility Name - City	Million Gallons Denatured Ethanol Produced[9]	% of Operating Capacity[10]	MMBtu Coal Combusted[11]	CO_2 (tons)	MMtCO2e
CORN, LP - Goldfield	49	90%	1,700,512	174,430	0.1582
Lincolnway Energy, LLC - Nevada	50	91%	1,758,020	180,329	0.1636
TOTAL	**99**		**3,458,532**	**354,759**	**0.3218**

As shown in Figure 5, a coal-burning dry mill ethanol plant produces more CO_2 in terms of the amount of CO_2 emitted per gallon of ethanol produced than a natural gas-burning dry mill ethanol plant with similar ethanol production.



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 CO2 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*

The results showed that the emissions calculated using test data varied widely per facility from 0.12 $MMtCO_2e$ lower to 0.24 $MMtCO_2e$ higher than the Department's calculations using Equations 2 and 3 (see p. 12). 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.

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.

Chapter 2: 2007 Greenhouse Gas Emissions from Fossil Fuel Combustion at Major Sources

Overview

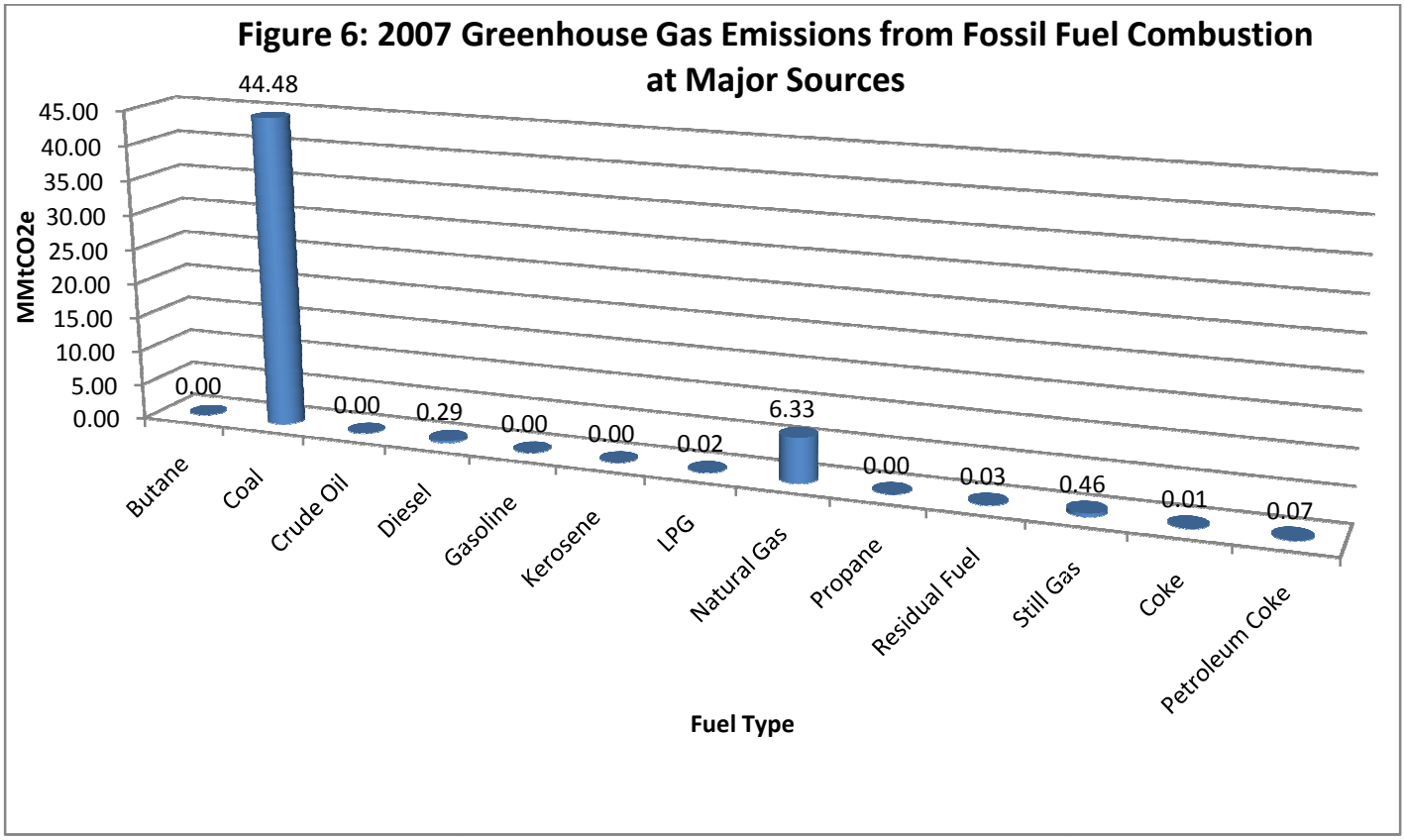
Title V of the 1990 federal Clean Air Act Amendments created a national operating permit program to standardize operating permits for major sources of air pollution. These facilities are the largest federally-recognized sources of air pollution and are commonly referred to as major sources. In general, a facility is subject to the Title V operating permit program if it has an annual potential to emit of 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.

All 276 facilities subject to this regulatory program that operated in Iowa in 2007 were required to submit greenhouse gas calculations to the Department of Natural Resources by March 31, 2008. As discussed earlier in Chapter 1, the four facilities that have ethanol wet mills (Cargill Eddyville, Grain Processing Corporation, ADM Clinton, and ADM Cedar Rapids) are evaluated in both Chapters 2 and 3 because each facility also combusts fossil fuels to manufacture other products, and the percentage of fossil fuels combusted for ethanol production versus the percentage combusted for other products was not included in the greenhouse gas inventory reporting forms.

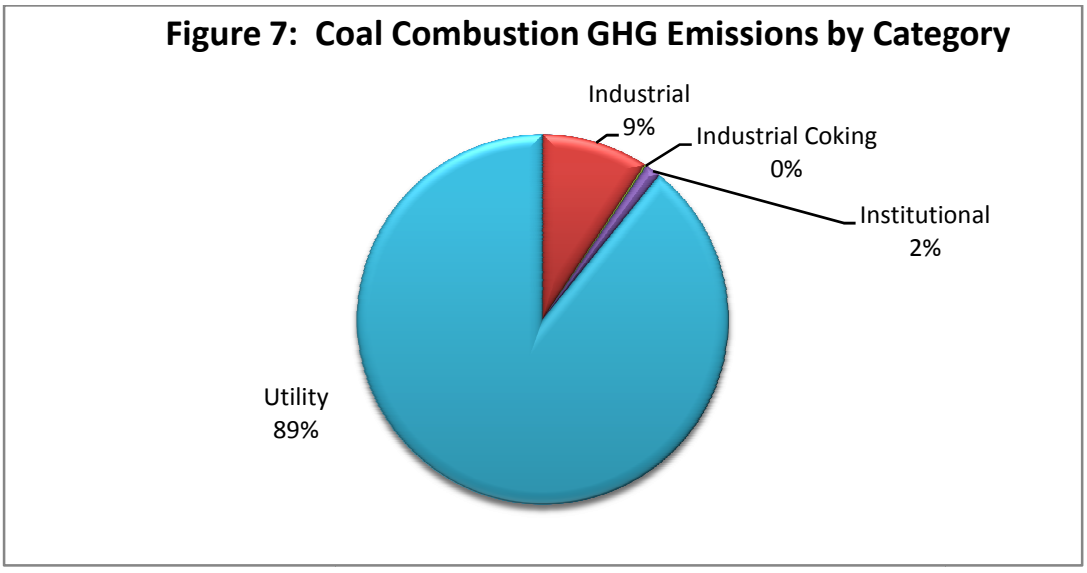
Results

Total greenhouse gas emissions from fossil fuel combustion at the major sources were calculated to be 51.68 $MMtCO_2e$. Ninety-eight percent of the emissions were from the combustion of two fuels – coal (86%) and natural gas (12%). The remaining two percent were from combustion of a variety of fuels such as butane, crude oil, gasoline, kerosene, liquefied petroleum gas (LPG), propane, residual fuel, still gas, coke, and petroleum coke. An additional 0.38 $MMTCO_2e$ from startup/shutdown operations were measured by CEMs, but could not be attributed to a particular fuel, bringing the total to 52.06 $MMTCO_2e$.

Figure 6 shows the $MMTCO_2e$ of greenhouse gas emissions from each fossil fuel that was combusted.



From the data collected, 362,281,770 million Btu of coal was combusted in 2007 among eighteen utilities, three state universities, twenty industrial facilities, and one coking facility. This results in 89% of the coal CO_2 emissions coming from the utilities, 9% from the industrial facilities, and 2% from the state universities as shown in Figure 7.

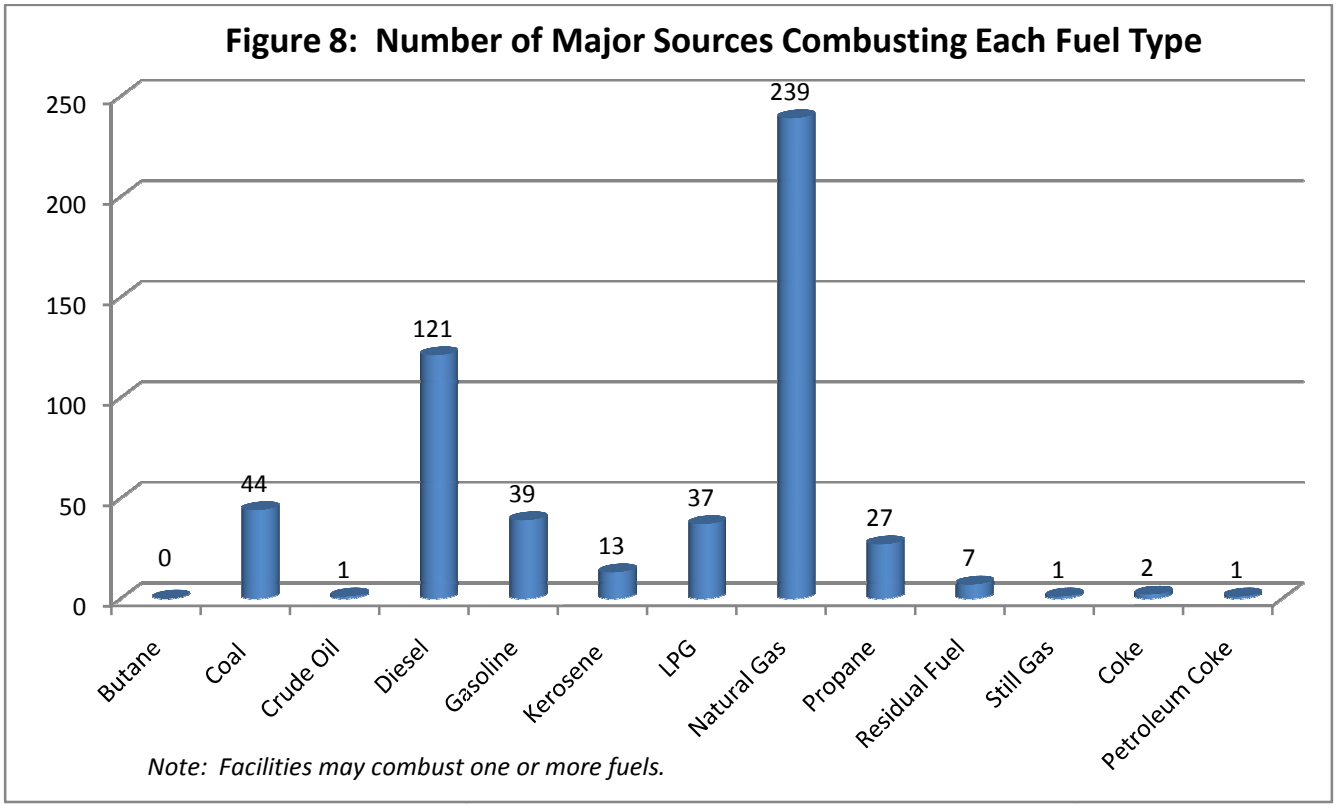


In addition, the ten facilities that had the highest greenhouse gas emissions from fossil fuel combustion in 2007 were all coal-fired utilities as shown in Table 6. The emissions from these ten facilities account for 69% of the total greenhouse gas emissions from fossil fuel combustion.

Table 6: Ten Largest Sources of 2007 Greenhouse Gas Emissions from Fossil Fuel Combustion

Facility ID	Facility Name	City	MMtCO2e
78-01-026	MidAmerican Energy Co. - Walter Scott Jr. Energy Center	Council Bluffs	9.14
97-04-010	MidAmerican Energy Co. - George Neal North	Sergeant Bluff	6.28
97-04-011	MidAmerican Energy Co. - George Neal South	Sergeant Bluff	4.46
90-07-001	IPL - Ottumwa Generating Station	Ottumwa	4.26
58-07-001	MidAmerican Energy Co. - Louisa Station	Muscatine	3.66
70-01-011	Muscatine Power & Water	Muscatine	2.19
03-03-001	IPL - Lansing Generating Station	Lansing	1.91
57-01-042	IPL - Prairie Creek Generating Station	Cedar Rapids	1.51
29-01-013	IPL - Burlington Generating Station	Burlington	1.42
64-01-012	IPL - Sutherland Generating Station	Marshalltown	1.31

Although a greater number of major sources combusted natural gas than coal a shown in Figure 8, the total emissions from coal combustion were still higher because the emission factor for coal is higher than the emission factor for natural gas as shown in Appendix D.



Diversity of Sources

The sources inventoried provide a variety of services and manufacture many different products. Table 8 shows the total greenhouse gas emissions for different industry types.

Table 8: 2007 Greenhouse Gas Emissions from Fossil Fuel Combustion at Major Sources by General Industrial Groupings

Two-Digit SIC	Description	MMtCO2e
49xx	Electric, Gas, and Sanitary Services	41.86
20xx	Food and Kindred Products	4.60
28xx	Chemicals and Allied Products	1.74
32xx	Stone, Clay, Glass, and Concrete Products	1.16
82xx	Educational Services	0.67
33xx	Primary Metal Industries	0.60
35xx	Industrial and Commercial Machinery and Computer Equipment	0.19
30xx	Rubber and Miscellaneous Plastics Products	0.14
36xx	Electronic and Other Electrical Equipment & Components, Except Computer Equipment	0.11
26xx	Paper and Allied Products	0.07
97xx	National Security and International Affairs	0.06
87xx	Engineering, Accounting, Research, Management, and Related Services	0.03
80xx	Health Services	0.03
34xx	Fabricated Metal Products, Except Machinery and Transportation Equipment	0.02
25xx	Furniture and Fixtures	0.02
46xx	Pipelines, Except Natural Gas	0.02
37xx	Transportation Equipment	0.02
24xx	Lumber and Wood Products, Except Furniture	0.02

Key Uncertainties

1. The Department assumed that facilities used a heating value of 1,050 million Btu (MMBtu) per million cubic feet (MMcf) of natural gas as listed on the Department's reporting form. This value was used per Appendix A of EPA's AP-42 Compilation of Air Pollutant Emission Factors[20]. There are several uncertainties with this assumption:
    - The reporting form asked facilities to report their facility-wide natural gas throughput in MMBtu, not MMcf, and as a result the facilities did not report which heating value they used.
    - The Department did not initially include a heating value on the reporting form when it was finalized on December 18, 2007. However, the form was modified on March 7, 2008 to include the heating value.
    - Heating values will vary slightly by supplier, and historical trends show that the natural gas delivered in Iowa is often less than 1,050 MMBtu per MMcf.

[20] 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.

Next Steps or Future Improvements

Discrepancies in natural gas heating values should be further evaluated, and the CEM fuel ratio method should be refined. Greenhouse gas emissions from fossil fuel combustion can also be improved from the four ethanol wet mills by quantifying the amount of fossil fuels combusted for ethanol production versus the amount of fossil fuels combusted to manufacture other products.

Chapter 3: 2007 Greenhouse Gas Emissions from Other Source Categories

Ethanol Wet Mill Fermentation

As discussed in Chapter 2 – Greenhouse Gas Emissions from Dry Mill Ethanol Production, four ethanol wet mills operated in Iowa in 2007. 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. Unlike the dry mills, the Department did not require the wet mills to report separately the quantity of fossil fuels combusted at their facilities just to produce ethanol based on the assumption that it would be too burdensome. This may be a future inventory refinement.

Over 503 million gallons of denatured ethanol were produced, resulting in 1.36 $MMtCO_2e$ of emissions from the fermentation process as shown in Table 9. As discussed in Chapter 2, these emissions are considered to be biogenic and are not counted in Iowa's greenhouse gas emissions total.

Table 9: 2007 Greenhouse Gas Emissions from Ethanol Wet Mills

Plant #:	Facility Name:	Gallons Denatured Ethanol Produced	CO2 from Fermentation (tons)	MMtCO2e from Fermentation
23-01-006	ADM - Clinton	153,834,938	459,637.77	0.42
57-01-080	ADM Corn Processing – Cedar Rapids	241,491,568	721,543.80	0.65
68-09-001	Cargill - Eddyville	36,715,310	109,700.33	0.10
70-01-004	Grain Processing Corporation - Muscatine	71,108,000	212,460.98	0.19
	Total	**503,149,816**	**1,503,342.88**	**1.36**

Portland Cement Production Kilns

The primary sources of greenhouse gas emissions from Portland cement plants are the kilns and fossil fuel combustion. The Department calculated CO_2 emissions from the 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. CO_2 emissions from the kilns were 2.21 MMtCO2e as shown in Table 10.

Table 10: 2007 Greenhouse Gas Emissions from Portland Cement Production Kilns

Plant #:	Facility Name:	Clinker Produced (tons)	CO2 (tons)	MMtCO2e
17-01-009	Holcim (US) Inc. - Mason City Plant	998,495	898,645.50	0.82
82-04-005	Lafarge North America Inc. - Buffalo	993,929	894,536.10	0.81
17-01-005	Lehigh Cement Company - Mason City	717,991	646,191.90	0.59
	Total	**2,710,415**	**2,439,373.50**	**2.21**

Biomass

The Department requested that facilities also report any biomass they combusted in 2007. As shown in Table 11, ten facilities reported combusting a total of 1,351,002.58 MMBtu of biomass such as wood, seed corn, high carbon ash, and oat hulls, resulting in 0.13 $MMtCO_2e$ of greenhouse gas emissions. These emissions are not included in the statewide greenhouse gas emissions total because like ethanol fermentation, they are considered biogenic emissions because the carbon in biomass is of a biogenic origin—meaning that it was recently contained in living organic matter.

Table 11: Greenhouse Gas Emissions from Biomass Combustion

Plant #:	Facility Name:	Fuel Type	Throughput	Units	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
07-01-061	Omega Cabinetry	Wood	5,371.00	MMBtu	523.6725	0.2079	0.0279	0.0008
17-01-005	Lehigh Cement	Seed Corn	463,173.00	MMBtu	59,253.6354	15.3168	2.0422	0.0544
17-01-005	Lehigh Cement	High Carbon Ash	41,520.00	MMBtu	3,862.9888	1.3730	0.1831	0.0037
31-01-021	JELD-WEN, inc. DBA JELD-WEN	Wood	144,495.00	MMBtu	14,088.2625	5.5920	0.7514	0.0130
52-01-005	University of Iowa Power Plant	Wood	382.72	MMBtu	37.3152	0.1483	0.0020	0.0000
52-01-005	University of Iowa Power Plant	Oat Hulls	519,708.06	MMBtu	56,604.11	Unable to calculate – no emission factor		0.0514
57-01-042	IPL – Prairie Creek	Landfill Gas	54,885.50	MMBtu	3,193.7872	0.3568	0.0060	0.0029
57-01-125	BFC Electric Company, LLC	Wood	2,743.50	MMBtu	267.4913	0.1062	0.0143	0.0002
77-01-010	Cargill – Des Moines	Biogas	115,915.8	MMBtu	6,745.1404	0.7535	0.0128	0.0061
82-01-018	Kraft Foods Global Inc. - Davenport	Wood	2,808.00	MMBtu	273.7800	0.1087	0.0146	0.0003
	Total		**1,351,002.58**	**MMBtu**	**144,850.1833**	**23.9632**	**3.0543**	**0.1327**

Other Greenhouse Emissions Reported to DNR

Several facilities reported other sources of greenhouse gas emissions at their facilities such as fuel loading racks, combustion of plastics, combustion of limestone, yeast propagation, enzyme scrubbers, landfill fugitives, etc. These emissions are not included because adequate time was not available to review the calculations, and they are beyond the scope of the inventory, which was limited to greenhouse gas emissions from fossil fuel combustion at major sources and emissions from ethanol production. Future enhancements to this inventory will include these additional categories.

Potential Greenhouse Gas Emissions from Construction Permit Applications

Legislation passed by the General Assembly in 2007 also required that "all applications for construction permits or prevention of significant deterioration permits shall quantify the potential to emit greenhouse gas emissions due to the proposed project."[21] The law became effective on July 1, 2007, and since that time the Department has received over 670 projects with potential greenhouse gas emissions as shown in Table 12.

Table 12: Potential Greenhouse Gas Emissions from Construction Permit Applications*

Time Period	CO2 (tons/yr)	CH4 (tons/year)	N_20 (tons/year)	SF_6 (lb/yr)	PFCs (lb/yr)	HFCs (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 - 7/01/08	14,353,427.76	1,932.22	173.17	0.00	0.00	0.0000	13.11
Total	**31,145,241.66**	**3,753.11**	**346.34**	**3.42**	**0.00**	**0.0046**	**28.45**

** includes biogenic emissions from ethanol fermentation*

It should be noted that *potential emissions* are considered to a theoretical maximum, whereas the emissions data collected for this inventory was calculated directly from the quantities of fossil fuel combusted and gallons of ethanol produced in 2007.

[21] Iowa Code 455B.134

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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.

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 (HFCs), and perfluorocarbons (PFCs).

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.

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

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.

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 (PFCs) – A group of human-made chemicals composed of carbon and fluorine. PFCs 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 2007.

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: Informational Meeting Agenda and Attendance List

Greenhouse Gas Emissions Informational Meeting
Wednesday, October 10, 2007 – 10:30 AM – 12:00 PM
AQB Conference Rooms

AGENDA:

10:30 Welcome and Introductions
10:40 Iowa Greenhouse Gas Legislation
11:00 Inventory Requirements for Calendar Year 2007
11:15 Future Inventory Requirements
11:20 The Climate Registry
11:35 Informal Workgroup Sign-up
11:40 Questions
12:00 Adjourn

Attendees (does not include DNR Air Quality Bureau Staff)*:

Name	Company/Group
Amy Christensen	Iowa Utilities Board
Deb Kozel	Legislative Services Ag
Jack Clark	Iowa Utility Association
Janice McEluain	Alliant Energy
Jeff Myrom	MidAmerican Energy
Jenna Wischmeyer	Alliant Energy
Joe Score	Bunge CB,IA
Karen Adams	POET Biorefining
Lindsey Gordon	Iowa State University
Lisa Schmidt	Thompson Environmental Consulting
Mark Landa	Electric Cooperatives Representative
Marty Jacobs	Zia Engineering & Environ.
Michael Li	Alliant Energy
Nathaniel Baer	Iowa Environmental Council
Nile Lanning	Iowa Climate Change Advisory Council
Rafe Christopherson	POET Biorefining
Shelley Hackett	John Deere
Tommi Makila	DNR, Energy Section
** Several other members of Industry attended by teleconference.*	

Appendix B: 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 2007 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 2008, please print out and mail to DNR.

Emission Year:	**2007**
Facility Name:	
Plant #:	
EIQ #:	

Assumptions:

1 MMcf Natural Gas = 1050 MMBtu, 1 therm Natural Gas = 0.09997612 MMBtu

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

				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
										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 3/7/08 to add natural gs conversion factors.

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2007 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 2008, please print out and mail to DNR.

Emission Year:	**2007**
Facility Name:	
Plant #:	
EIQ #:	

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. 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 2008, please print out and mail to DNR.

Emission Year:		2007		
Facility Name:				
Plant #:				
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

Instructions: Please fill in the green cells with your facility information and yellow cells with your 2007 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 2008, please print out and mail to DNR.

Emission Year:	**2007**
Facility Name:	
Plant #:	
EIQ #:	
	CO2
Emission Point ID	**Emissions (tons)**
	0.0000

Appendix C: Greenhouse Gas Emissions Per Dry Mill Ethanol Plant

		Fermentation		Combustion			
Plant #:	**Facility Name:**	**tons CO_2**	**MMtCO2e**	**tons CO2**	**Tons CH4**	**tons N2O**	**MMtCO2e**
24-01-007	AMAIZING ENERGY, LLC – DENISON	158,388	0.14	78,836	9	0	0.07
29-02-012	BIG RIVER RESOURCES, LLC - WEST BURLINGTON	159,802	0.14	91,240	10	0	0.08
99-05-003	CORN LP – GOLDFIELD	147,712	0.13	174,626	21	3	0.16
55-09-003	GLOBAL ETHANOL, LLC - LAKOTA	277,631	0.25	161,538	18	0	0.15
17-01-100	GOLDEN GRAIN ENERGY – MASON CITY	251,095	0.23	134,857	15	0	0.12
73-01-025	GREEN PLAINS RENEWABLE ENERGY, INC – SHENANDOAH	49,857	0.05	25,052	3	0	0.02
10-04-007	HAWKEYE RENEWABLES, LLC – FAIRBANK	363,292	0.33	183,839	21	0	0.17
42-01-019	HAWKEYE RENEWABLES, LLC - IOWA FALLS	306,224	0.28	169,593	19	0	0.15
85-02-017	LINCOLNWAY ENERGY, LLC – NEVADA	149,703	0.14	180,329	22	3	0.16
18-02-006	LITTLE SIOUX CORN PROCESSORS, LP – MARCUS	162,404	0.15	80,713	9	0	0.07
42-08-001	PINE LAKE CORN PROCESSORS LLC – STEAMBOAT ROCK	90,309	0.08	47,244	5	0	0.04
72-03-002	POET BIOREFINING - ASHTON	163,113	0.15	97,826	11	0	0.09
14-03-006	POET BIOREFINING - COON RAPIDS	150,611	0.14	77,080	9	0	0.07
02-05-001	POET BIOREFINING - CORNING	108,220	0.10	61,126	7	0	0.06
74-01-022	POET BIOREFINING - EMMETSBURG	165,994	0.15	91,941	10	0	0.08
94-02-004	POET BIOREFINING - GOWRIE	200,174	0.18	106,363	12	0	0.10
98-07-004	POET BIOREFINING - HANLONTOWN	165,002	0.15	90,482	10	0	0.08
40-02-002	POET BIOREFINING - JEWELL	199,837	0.18	98,163	11	0	0.09
47-05-002	QUAD COUNTY CORN PROCESSORS COOPERATIVE – GALVA	82,996	0.08	45,158	5	0	0.04
84-03-020	SIOUXLAND ENERGY & LIVESTOCK COOP – SIOUX CENTER	71,357	0.06	34,663	4	0	0.03
11-05-004	US BIO – ALBERT CITY	316,658	0.29	163,847	18	0	0.15
34-01-040	VERASUN - CHARLES CITY	241,097	0.22	143,403	16	0	0.13
94-01-073	VERASUN - FORT DODGE	341,529	0.31	200,837	22	0	0.18
06-04-001	XETHANOL BIOFUELS, LLC - BLAIRSTOWN	15,577	0.01	12,616	1	0	0.01
	TOTAL (tons)	**4,338,582**	**3.94**	**2,551,372**	**288**	**10**	**2.32**

Appendix D: 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 2007 throughputs. Then print out the spreadsheet and attach to your paper inventory, or attach electronically to Form 1.0 of your SPARS inventory submittal.

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 MMcf Natural Gas = 1050 MMBtu, 1 therm Natural Gas = 0.09997612 MMBtu

Emission Year:	2007		
Facility Name:			
Plant #:		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)**
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
										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)

Instructions: Please fill in the green cells with your facility information and the yellow cells with your 2007 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:	2007												
Facility Name:													
Plant #:		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:		**2007**
Facility Name:		
Plant #:		
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 2007 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:	**2007**
Facility Name:	
Plant #:	
EIQ #:	

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

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

Appendix E: Greenhouse Gas Emissions Per Major Source Facility

Bolded values were adjusted to use CEMS data.

			Combustion			
Facility #	**Facility Name**	**SIC**	**CO2 (tons)**	**CH4 (tons)**	**N2O (tons)**	**MMtCO2e**
63-01-001	3M (Minnesota Mining & Manufacturing Co.)	2672	15,187.1973	1.6937	0.0286	0.01
79-02-006	A-1 Fiberglass	3089	110.8520	0.0124	0.0002	0.00
92-01-021	ACH Foam Technologies, LLC.	3086	752.8622	0.0841	0.0014	0.00
57-01-080	ADM Corn Processing	2046	326,505.7425	37.3380	2.4514	0.30
23-01-006	ADM Corn Processing - Clinton	2046	1,433,348.0658	166.4900	15.2900	1.31
98-01-003	Advanced Component Technologies	3089	431.5370	0.0482	0.0008	0.00
14-02-003	Ag Processing Inc.	2075	24,671.9503	2.0344	0.1022	0.02
17-01-027	Ag Processing Inc.	2075	7,788.5081	0.2318	0.0764	0.01
71-01-001	Ag Processing Inc.	2075	27.0151	0.0031	0.0001	0.00
74-01-012	Ag Processing Inc.	2075	38.5213	0.0046	0.0002	0.00
97-04-005	Ag Processing Inc.	2075	5,366.6339	0.5990	0.0102	0.00
99-01-001	Ag Processing Inc.	2075	191,986.1516	22.9050	3.2304	0.18
68-09-002	Ajinomoto Heartland, LLC	2048	105,503.2600	11.7806	0.1995	0.10
82-01-002	Alcoa, Inc.	3353	189,773.5562	20.6074	0.4126	0.17
28-01-026	Alliance Pipeline L.P./Manchester 27-A Compressor Station	4922	82,230.9657	9.1854	0.1554	0.07
70-01-050	Allsteel Muscatine Components Plant	2521	8,838.2813	0.9865	0.0168	0.01
85-03-003	American Packaging Corporation	2759	2,325.6437	0.2598	0.0044	0.00
53-01-002	Anamosa State Penitentiary	9223	427.1419	0.0601	0.0045	0.00
51-03-001	ANR Pipeline Company - Birmingham Compressor	4922	47,053.6781	5.2560	0.0889	0.04
93-05-001	ANR Pipeline Company - Lineville Compressor	4922	45,712.5939	5.1062	0.0864	0.04
82-02-031	Arch Mirror North	3231	221.9774	0.0248	0.0004	0.00
77-01-045	Archer Daniels Midland - Des Moines Soybean	2075	144,950.0524	17.3045	2.4633	0.13
56-01-002	Archer Daniels Midland - Keokuk	2041	17,011.3228	1.9002	0.0322	0.02
20-01-018	Astoria Industries of Iowa, Inc.	3713	339.2190	0.0379	0.0006	0.00
59-01-009	Astoria Industries of Iowa, Inc.	3713	184.2263	0.0206	0.0003	0.00
07-01-086	Bertch Cabinet Manufacturing Inc./Oasis Facility	2434	610.5877	0.0682	0.0012	0.00
33-01-020	Bertch Cabinet Manufacturing, Inc./Oelwein Facility	2434	590.7332	0.0660	0.0011	0.00
07-01-063	Bertch Cabinet Manufacturing/Wood Cabinet Facilities	2434	993.0589	0.1109	0.0019	0.00
10-02-008	Bertch Cabinet Mfg., Inc. - Legacy Division	2434	230.4004	0.0257	0.0004	0.00
08-01-002	Besser Quinn Machine & Foundry	3321	656.3832	0.0733	0.0012	0.00
57-01-125	**BFC Electric Company, L.L.C.**	4931	**2,743.5000**	0.0000	0.0000	0.00
07-01-121	Black Hawk County Sanitary Landfill	9511	0.0000	0.0000	0.0000	0.00
82-01-004	Blackhawk Foundry & Machine Co.	3321	14,128.1805	1.4216	0.1597	0.01
26-01-001	Bloomfield Foundry, Inc.	3321	2,526.6395	0.2998	0.0378	0.00
82-02-024	BP - Bettendorf Terminal	5171	24.2187	0.0027	0.0000	0.00
52-07-001	BP - Cedar Rapids Terminal	5171	7.0078	0.0000	0.0000	0.00
77-01-158	BP - Des Moines Terminal	5171	84.6679	0.0064	0.0010	0.00
13-03-007	Brand FX Body Company	3713	6.5056	0.0007	0.0000	0.00
55-03-004	Brand FX Body Company	3713	129.1881	0.0134	0.0002	0.00

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
76-01-014	Brand FX Body Company	3713	461.2954	0.0515	0.0009	0.00
78-01-085	Bunge Corporation	2075	119,975.1004	13.4016	0.2268	0.11
86-01-001	Caraustar Mill Group - Tama Paperboard	2631	27,934.7448	3.0793	0.0560	0.03
68-09-001	Cargill Corn Milling - Eddyville	2046	731,102.6581	86.3392	10.5630	0.67
57-01-003	Cargill Soybean East Plant	2075	0.0000	0.0000	0.0000	0.00
57-01-002	Cargill Soybean West Plant - Cedar Rapids	2075	14,318.8133	1.5995	0.0271	0.01
57-01-004	Cargill, Inc.	2046	153,360.6618	18.1326	2.2595	0.14
77-01-010	Cargill, Inc. - Des Moines, IA	2075	30,267.6449	3.3810	0.0572	0.03
42-01-003	Cargill, Inc. - Iowa Falls	2075	50,769.6112	5.6711	0.0960	0.05
97-01-001	Cargill, Inc. - Sioux City	2075	88,844.8993	9.9242	0.1679	0.08
77-10-002	CB&I Constructors, Inc.	3443	5.6475	0.0006	0.0000	0.00
34-01-035	CDI, LLC - Charles City	7532	2.3334	0.0003	0.0000	0.00
95-01-012	CDI, LLC - Forest City	7532	11.7177	0.0013	0.0000	0.00
44-01-024	Ceco Building Systems	3448	821.3519	0.0917	0.0016	0.00
07-02-005	**Cedar Falls Municipal Electric Utility**	4911	**176,716.8286**	18.8086	2.6794	0.16
07-02-005	Cedar Falls Municipal Electric Utility - CTS	4911	64.3000	0.0072	0.0001	0.00
57-01-077	Cedar Rapids WPCF	4952	15,856.8217	1.7712	0.0300	0.01
95-02-012	Central Disposal Systems, Inc.	4953	23,611.7382	2.6389	0.0450	0.02
70-08-003	**Central Iowa Power Coop - Fair Station**	4911	**522,827.8618**	51.5732	7.3641	0.48
88-01-004	Central Iowa Power Coop/Summit Lake Facility	4911	17,986.7036	2.0092	0.0340	0.02
99-05-003	Central Iowa Renewable Energy (CORN) LP	2869	174,626.1579	20.8380	2.9792	0.16
94-01-002	CertainTeed Gypsum	3275	41,027.7721	4.5623	0.0772	0.04
90-07-002	Chariton Valley Resource Conserv. & Dvlpmnt, Inc. - OGS Switchgrass Processing	49	0.0000	0.0000	0.0000	0.00
85-01-006	City of Ames Combustion Turbine	4911	1,104.0304	0.0326	0.0109	0.00
85-01-006	**City of Ames Steam Electric Plant**	4911	**656,209.8806**	64.2132	9.1874	0.60
56-02-021	Climax Molybdenum Company	3339	16,138.8591	1.8309	0.0384	0.01
62-01-001	Clow Valve Company - Foundry	3494	3,207.5201	0.3583	0.0061	0.00
62-01-001	Clow Valve Company - Machine Shop	3321	1,748.2080	0.1953	0.0033	0.00
42-01-018	CMC Joist	3441	828.8133	0.0804	0.0026	0.00
29-01-006	CNH America LLC	3531	8.6790	0.0010	0.0000	0.00
77-01-109	Construction Products, Inc.	3441	1,682.3311	0.1879	0.0032	0.00
21-01-003	**Corn Belt Power Coop/ Wisdom Generation Station**	4911	**134,831.3490**	11.8260	1.6196	0.12
68-09-005	CR-1, L.P. (dba Cargill Nutri-Products)	2833	1,627.1489	0.1818	0.0031	0.00
88-01-021	Creston Bean Processing, LLC	2075	10.9997	0.0012	0.0000	0.00
57-01-082	Cryovac Inc., Sealed Air Corporation	2673	3,126.1996	0.3492	0.0059	0.00
17-01-035	CURRIES Division of AADG, Inc. - 9th Street Facility	3442	1,994.2877	0.2228	0.0038	0.00
17-01-087	CURRIES Division of AADG, Inc. - 12th Street Facility	3442	2,679.1258	0.2993	0.0051	0.00
04-01-002	Curwood, Inc.	2673	20,372.5968	2.2754	0.0386	0.02
51-01-005	Dexter Foundry, Inc.	3321	16,619.8885	1.9570	0.2201	0.02
57-01-045	Diamond V Mills Inc.	2048	5,910.4514	0.6602	0.0112	0.01
46-01-005	Dodgen Industries, Inc.	3711	494.8536	0.0553	0.0009	0.00
45-01-003	Donaldson Company, Inc.	3599	27.5595	0.0024	0.0003	0.00
31-01-035	Dubuque Water Pollution Control Plant	4952	2,067.8727	0.0795	0.0186	0.00
56-02-005	DuPont Performance Coatings	2851	15,155.7601	1.6929	0.0286	0.01
31-01-061	Eagle Window & Door, Inc.	2431	3,274.1390	0.3657	0.0062	0.00
32-01-017	Electrimold	3089	230.9388	0.0252	0.0004	0.00

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
40-01-002	Electrolux Home Products	3633	10,575.9271	1.1626	0.0237	0.01
52-02-006	Enterprise NGL Pipeline LC. - Iowa City Terminal	4613	104.2939	0.0116	0.0002	0.00
23-01-004	Equistar Chemicals, LP	2869	799,214.7130	32.6631	0.6027	0.73
88-01-002	Fansteel/Wellman Dynamics	3365	328.1916	0.0367	0.0006	0.00
45-01-009	Featherlite Inc.	3715	2,219.3279	0.2479	0.0042	0.00
73-01-017	Featherlite, Inc. - Shenandoah Operation	3715	487.3412	0.0511	0.0016	0.00
77-01-022	Firestone Ag Tire Company	3011	79,324.1474	8.5127	0.1768	0.07
95-02-001	Fleetguard, Inc. - Cummins Filtration	3714	2,603.5180	0.3093	0.0096	0.00
69-01-020	Fres-co System USA, INC.	2754	2,401.4734	0.2683	0.0045	0.00
49-01-024	Generac Power Systems, Inc. - Maquoketa Iowa Plant	3621	589.7351	0.0332	0.0043	0.00
57-01-012	General Mills Operations, Inc.	2043	50,152.9764	5.4741	0.1120	0.05
94-01-010	Georgia-Pacific Gypsum LLC	3275	41,060.3566	4.5433	0.0836	0.04
70-03-003	Gerdau Ameristeel US Inc. - Wilton Mill	3312	41,236.2299	4.6997	0.1950	0.04
32-02-004	GKN Armstrong Wheels	3714	1,783.5235	0.1992	0.0034	0.00
32-01-016	GKN Armstrong Wheels, Inc.	3523	1,749.1332	0.1954	0.0033	0.00
25-05-008	Glen-Gery Corp./Redfield Plant	3251	9,313.2378	1.0263	0.0190	0.01
70-01-004	Grain Processing Corporation	2046	766,717.1644	90.5412	11.1270	0.70
88-01-017	Green Valley Chemical Corporation	2873	78,107.0607	8.7246	0.1477	0.07
56-02-035	Gregory Manufacturing Co., Inc.	3441	0.0000	0.0000	0.0000	0.00
78-01-012	Griffin Pipe Products Company	3321	23,078.5198	2.5733	0.0435	0.02
56-01-023	Griffin Wheel Company - Keokuk Plant	3325	16,493.6207	1.7260	0.0321	0.02
84-03-015	Groschopp, Inc.	3621	183.2985	0.0205	0.0003	0.00
23-02-013	Guardian Industries Corporation	3211	88,467.4607	9.8802	0.1674	0.08
70-01-005	H.J. Heinz Company, L.P.	2033	11,334.2433	1.2660	0.0214	0.01
35-01-008	Hampton Hydraulics, LLC a Div. of Seabee	3593	1,786.8325	0.1989	0.0034	0.00
17-01-009	Holcim (US) Inc. - Mason City Plant	3241	302,679.7196	35.3341	4.8773	0.28
52-01-003	IAC Iowa City, LLC	3086	5,099.8778	0.5697	0.0097	0.00
03-02-001	Industrial Laminates/Norplex, Inc.	3083	12,983.2451	1.4228	0.0241	0.01
29-01-004	Iowa Army Ammunition Plant	9711	63,739.7612	7.6113	1.0871	0.06
52-01-053	Iowa City Sanitary Landfill	4959	61.8151	0.0107	0.0011	0.00
77-01-175	Iowa E.P.S. Products, Inc.	3086	1.0306	0.0001	0.0000	0.00
77-01-142	Iowa Methodist Medical Center	8062	36,649.2785	4.0769	0.0709	0.03
85-01-007	Iowa State University (Power Plant)	8221	386,346.6191	45.4831	6.4976	0.35
85-01-007	Iowa State University	8221	5,019.1130	0.5628	0.0101	0.00
85-01-062	IPL - Ames Diesels Station	4911	0.0000	0.0000	0.0000	0.00
29-02-003	IPL - Burlington Agency Street Combustion Turbines Station	4911	2,533.8434	0.2604	0.0069	0.00
29-01-013	**IPL - Burlington Generating Station**	4911	**1,555,398.0848**	166.8229	23.7656	1.42
04-01-003	IPL - Centerville Combustion Turbines	4911	36,541.2524	1.0753	0.3584	0.03
31-01-017	**IPL - Dubuque Generation Station**	4911	**453,888.2826**	47.8057	6.7776	0.41
17-02-016	**IPL - Emery Generating Station**	4911	**734,324.1491**	83.7851	1.4262	0.67
79-01-022	IPL - Grinnell Combustion Turbines Station	4911	1,054.7565	0.1176	0.0020	0.00
03-03-001	**IPL - Lansing Generating Station**	4911	**2,091,955.4010**	235.1291	33.6065	1.91
17-01-066	**IPL - Lime Creek Combustion Turbines Station**	4911	**38,248.9421**	1.1305	0.3768	0.03
23-01-014	**IPL - M.L. Kapp Generating Station**	4911	**1,260,787.8975**	147.8021	21.1045	1.15

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
90-07-001	**IPL - Ottumwa Generating Station**	4911	**4,664,793.7943**	524.8264	75.0476	4.26
57-01-042	**IPL - Prairie Creek Generating Station**	4911	**1,653,102.5203**	173.3255	24.1456	1.51
57-01-040	**IPL - Sixth Street Generating Station**	4911	**448,192.0542**	51.2983	6.3183	0.41
64-01-012	**IPL - Sutherland Generating Station**	4911	**1,435,739.1002**	122.7988	17.7293	1.31
70-08-002	IPSCO Steel Inc. - Montpelier Works	3312	182,970.5240	20.4529	0.3502	0.17
31-01-021	JELD-WEN, inc. dba JELD-WEN	2493	3,211.1151	0.3552	0.0064	0.00
82-01-043	John Deere Davenport Works	3531	6,653.7224	0.6281	0.0227	0.01
77-01-035	John Deere Des Moines Works	3523	25,413.9102	2.6998	0.0643	0.02
31-01-009	John Deere Dubuque Works	3531	100,774.5935	11.9600	1.6774	0.09
07-01-091	John Deere Engine Works	3519	6,332.3109	0.4779	0.0342	0.01
07-01-010	John Deere Foundry Waterloo	3321	19,662.2422	2.1765	0.0379	0.02
90-01-003	John Deere Ottumwa Works	3523	7,782.4546	0.8428	0.0172	0.01
07-01-087	John Deere Product Engineering Center	3523	21,771.3519	2.9368	0.1946	0.02
07-01-077	John Deere Waterloo Works	3523	21,518.2658	2.1679	0.0537	0.02
07-01-085	John Deere Waterloo Works	3523	8,936.5552	0.8852	0.0225	0.01
69-01-023	Johnson Controls Battery Group, Inc.	3399	2,283.6549	0.2551	0.0043	0.00
75-01-018	Kaneb Pipe Line Operating Partnership LP - Le Mars	4613	0.0000	0.0000	0.0000	0.00
30-02-010	Kaneb Pipe Line Operating Partnership LP - Milford	4613	0.0000	0.0000	0.0000	0.00
60-01-012	Kaneb Pipe Line Operating Partnership LP - Rock Rapids	4613	0.0000	0.0000	0.0000	0.00
56-01-025	Keokuk Steel Castings, A Matrix Metals Company LLC	3325	22,606.8150	2.5253	0.0427	0.02
41-03-003	Kiefer Built, LLC	3499	711.8790	0.0795	0.0013	0.00
94-01-005	Koch Nitrogen Company	2873	221,860.9166	24.7821	0.4194	0.20
82-01-018	Kraft Foods Global, Inc – Davenport Plant	2013	196,563.9192	21.9556	0.3716	0.18
82-04-005	Lafarge North America Inc.	3241	300,557.9985	30.8100	4.4061	0.27
17-01-005	Lehigh Cement Company - Mason City	3241	193,419.0303	22.7070	3.2003	0.18
64-01-009	Lennox Manufacturing, Inc.	3585	5,433.3988	0.6050	0.0107	0.00
85-02-017	Lincolnway Energy, LLC	2869	180,328.9015	21.5357	3.0765	0.16
82-01-015	Linwood Mining & Minerals Corporation	3274	134,854.3385	16.1071	2.2642	0.12
52-01-037	LOPAREX, Inc.	2672	13,188.4493	1.4732	0.0249	0.01
77-01-114	Magellan Pipeline Company, L.P. - Des Moines Terminal	4613	2,673.0740	0.2986	0.0051	0.00
31-01-034	Magellan Pipeline Company, L.P. - Dubuque Terminal	4613	0.0000	0.0000	0.0000	0.00
94-07-001	Magellan Pipeline Company, L.P. - Fort Dodge Terminal	4613	4.7138	0.0000	0.0000	0.00
17-02-002	Magellan Pipeline Company, L.P. - Mason City Terminal	4613	62.7870	0.0070	0.0001	0.00
30-02-004	Magellan Pipeline Company, L.P. - Milford Terminal	4613	0.0000	0.0000	0.0000	0.00
97-01-118	Magellan Pipeline Company, L.P. - Sioux City Terminal	4613	1,801.7753	0.0640	0.0167	0.00
07-01-040	Magellan Pipeline Company, L.P. - Waterloo Terminal	4613	347.1615	0.0388	0.0007	0.00
15-01-014	MAHLE Engine Components USA, Inc.	3714	953.9786	0.1063	0.0019	0.00
49-01-013	Maquoketa Municipal Electric Utility	4911	3,127.9950	0.2116	0.0192	0.00

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
48-05-001	Maytag Appliances - Whirpool Corporation - Amana Division	3632	86,198.0737	9.5073	0.1633	0.08
50-01-002	Maytag Newton Laundry Products - Plant 2	3633	26,011.4427	2.9867	0.0859	0.02
70-01-025	McKee Button Company	3965	120.7035	0.0135	0.0002	0.00
11-01-029	Meridian Mfg. Group	3443	1.4961	0.0002	0.0000	0.00
07-02-023	MetoKote Corporation - Plant 15	3479	5.1411	0.0006	0.0000	0.00
07-01-111	MetoKote Corporation - Plant 24	3479	3.4258	0.0004	0.0000	0.00
77-14-002	Metro Methane Recovery Facility	4953	7.9281	0.0001	0.0000	0.00
77-14-003	Metro Park East Sanitary Landfill	4953	26.0448	0.0036	0.0003	0.00
56-01-008	METZELER Automotive Profile Systems	3061	5,349.4450	0.5975	0.0101	0.00
52-01-032	Mid-America Pipeline - Iowa City NGL Station	4619	11,978.4610	0.4123	0.2061	0.01
52-02-001	MidAmerican Energy Co. - Coralville Turbines	4911	872.3687	0.0974	0.0016	0.00
07-01-038	MidAmerican Energy Co. - Electrifarm Turbines	4911	34,905.6252	3.8528	0.0705	0.03
97-04-010	**MidAmerican Energy Co. - George Neal North**	4911	**6,871,341.0000**	792.5428	112.7571	6.28
97-04-011	**MidAmerican Energy Co. - George Neal South**	4911	**4,878,758.0000**	593.4942	84.8135	4.46
63-01-017	MidAmerican Energy Co. - Knoxville Power Station	4911	140.2877	0.0041	0.0014	0.00
58-07-001	**MidAmerican Energy Co. - Louisa Station**	4911	**4,005,365.0000**	477.1419	68.0144	3.66
34-01-023	MidAmerican Energy Co. - Merl Parr CTs	4911	1,024.8377	0.1145	0.0019	0.00
77-13-002	**MidAmerican Energy Co. - Pleasant Hill CTs/Greater Des Moines Energy Center**	4911	**508,330.4700**	56.3164	0.9566	0.48
77-01-054	MidAmerican Energy Co. - River Hills Turbines	4911	2,228.8776	0.2489	0.0042	0.00
82-02-006	**MidAmerican Energy Co. - Riverside Station**	4911	**1,017,345.0000**	122.5378	17.2777	0.93
73-01-018	MidAmerican Energy Co. - Shenandoah Power Station	4911	163.5385	0.0048	0.0016	0.00
77-09-002	MidAmerican Energy Co. - Sycamore Turbines	4911	5,855.8022	0.6360	0.0128	0.01
78-01-026	**MidAmerican Energy Co. - Walter Scott Jr. Energy Center**	4911	**9,995,197.0000**	1,158.0977	165.6650	9.14
07-01-133	MidAmerican Energy Co. - Waterloo Lundquist Power Station	4911	170.0918	0.0050	0.0017	0.00
31-02-002	Modernfold Inc.	2542	449.2466	0.0502	0.0008	0.00
70-01-008	Monsanto Company - Muscatine (6909)	2879	104,638.5646	13.4026	1.6972	0.10
70-01-008	Monsanto Company - Muscatine (6909)	2879	2,413.3139	0.2696	0.0046	0.00
56-01-013	Morse Rubber, LLC	3069	670.0022	0.0748	0.0013	0.00
70-01-054	Multiserv Plant 52 - IPSCO Montpelier	3295	0.0000	0.0000	0.0000	0.00
70-01-011	**Muscatine Power & Water**	4911	**2,399,858.3902**	266.1831	38.0070	2.19
78-01-092	National Cooperative Refinery Association	5171	0.0000	0.0000	0.0000	0.00
65-04-001	Natural Gas Pipeline Co. of America/Station 107	4922	75,822.0355	8.4696	0.1433	0.07
91-06-001	Natural Gas Pipeline Co. of America/Station 108	4922	70,219.8224	7.8438	0.1327	0.06
54-10-001	Natural Gas Pipeline Co. of America/Station 109	4922	73,767.8703	8.2401	0.1394	0.07
63-01-013	Natural Gas Pipeline Co. of America/Station 198	4922	55,651.2576	6.2164	0.1052	0.05
58-04-002	Natural Gas Pipeline Co. of America/Station 199	4922	5,404.8618	0.6037	0.0102	0.00
58-02-007	Natural Gas Pipeline Co. of America/Station 204	4922	18,116.3683	2.0237	0.0342	0.02
92-10-001	Natural Gas Pipeline Co. of America/Station 205	4922	2,279.0114	0.2546	0.0043	0.00

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
82-01-089	Nichols Aluminum - Casting	3353	58,938.8928	6.5833	0.1115	0.05
82-01-017	Nichols Aluminum - Davenport	3353	8,515.9668	0.9513	0.0161	0.01
41-02-005	Northern Natural Gas Company - Garner LNG Plant	4922	4,240.1236	0.4731	0.0081	0.00
78-04-006	Northern Natural Gas Company - Oakland	4922	40,881.0616	4.5665	0.0773	0.04
08-03-004	Northern Natural Gas Company - Ogden	4922	76,807.1785	8.5793	0.1452	0.07
18-06-002	Northern Natural Gas Company - Paullina	4922	1.9388	0.0002	0.0000	0.00
25-05-002	Northern Natural Gas Company - Redfield	4922	44,499.8860	4.6719	0.1125	0.04
41-02-005	Northern Natural Gas Company - Ventura	4922	20,678.3847	2.3093	0.0391	0.02
07-01-057	Northern Natural Gas Company - Waterloo	4922	40,884.6671	4.5666	0.0773	0.04
82-01-141	NST Landfill Gas of Iowa, Inc.	4953	0.0000	0.0000	0.0000	0.00
78-01-017	Omaha Standard, Inc.	3713	0.3177	0.0000	0.0000	0.00
07-01-061	Omega Cabinets Ltd.	2434	3,379.3843	0.3775	0.0064	0.00
14-01-010	Pella Corporation - Carroll Division	2431	1,264.5880	0.1408	0.0024	0.00
62-03-003	Pella Corporation - Pella Division	2431	9,840.2811	1.0987	0.0186	0.01
73-01-012	Pella Corporation - Shenandoah Operations	2431	346.9942	0.0385	0.0007	0.00
84-03-018	Pella Corporation - Sioux Center Operations	2431	979.3973	0.1092	0.0019	0.00
85-03-007	Pella Corporation - Story City Division	2431	543.6124	0.0605	0.0010	0.00
63-02-005	Pella Municipal Power Plant	4911	137,146.2233	16.2866	2.3323	0.13
57-01-025	Penford Products Co.	2046	91,366.6635	10.2044	0.1729	0.08
57-01-095	PMX Industries Inc.	3351	21,203.6459	2.3301	0.0427	0.02
14-03-006	POET Biorefining - Coon Rapids	2869	77,079.9905	8.6095	0.1458	0.07
30-01-012	Polaris Industries, Inc.	3799	41.7110	0.0007	0.0000	0.00
94-07-004	Praxair, Inc. - Fort Dodge, IA Carbon Dioxide Plant	2813	0.0000	0.0000	0.0000	0.00
90-01-023	Praxis Companies, LLC	3088	0.8123	0.0001	0.0000	0.00
77-01-174	Principal Life Insurance Company	6311	971.6695	0.1114	0.0027	0.00
01-01-004	Quad/Greenfield, LLC	2893	1,660.8066	0.1855	0.0031	0.00
57-01-027	Quaker Manufacturing LLC	2043	8,766.5563	0.9793	0.0166	0.01
57-01-226	Red Star Yeast Company, LLC	2099	0.0000	0.0000	0.0000	0.00
29-01-079	Riley Industrial Painting	3479	371.3347	0.0399	0.0010	0.00
56-01-009	Roquette America, Inc.	2046	407,178.0830	47.8343	5.4023	0.37
82-01-121	Scott County Landfill	4953	696.0627	0.0928	0.0070	0.00
77-01-169	Siegwerk USA Inc.	2893	0.0000	0.0000	0.0000	0.00
94-01-040	Silgan Containers Mfg. Corp. - Fort Dodge	3411	896.5508	0.1001	0.0017	0.00
56-02-030	Silgan Containers Mfg. Corp. - Fort Madison	3411	266.2193	0.0297	0.0005	0.00
97-04-001	Sioux City Brick & Tile Company	3251	9,404.4350	1.0505	0.0178	0.01
82-02-004	Sivyer Steel	3325	15,091.5765	1.6858	0.0285	0.01
55-01-002	Snap-On Tools Manufacturing Company	3499	6,414.1500	0.7100	0.0100	0.01
63-08-001	South Central Iowa Solid Waste Agency (SCISWA)	4953	483.7349	0.0674	0.0049	0.00
53-02-008	Star Building Systems	3448	1,250.8679	0.1284	0.0041	0.00
41-02-011	Stellar Industries, Inc.	3713	615.8797	0.0670	0.0012	0.00
40-01-014	Tasler, Inc. - EPS	3086	5,424.1977	0.6058	0.0103	0.00
97-01-030	Terra Nitrogen - Port Neal Complex	2873	256,645.2493	28.6681	0.4852	0.23
70-01-006	The Hon Company-Oak Steel Plant	2521	12,119.9296	1.3538	0.0229	0.01
77-01-003	Titan Tire Corporation	3011	46,319.2170	4.1170	0.1690	0.04
65-01-005	Trajet Products, Inc.	3087	0.0000	0.0000	0.0000	0.00

Facility #	Facility Name	SIC	CO2 (tons)	CH4 (tons)	N2O (tons)	MMtCO2e
18-01-002	Tyson Deli, Inc.	2013	8,007.5259	0.8945	0.0151	0.01
07-01-071	Tyson Fresh Meats, Inc.	2011	41,565.3749	4.6279	0.0815	0.04
70-01-048	Union Tank Car Co.-Muscatine	4741	0.0000	0.0000	0.0000	0.00
25-02-001	United Brick & Tile - Adel Plant	3251	24,540.5062	2.8094	0.1803	0.02
29-06-001	United States Gypsum Company	3275	86,539.4988	9.6667	0.1636	0.08
94-01-017	United States Gypsum Company	3275	36,885.1572	4.1202	0.0697	0.03
52-01-005	University of Iowa Main Campus and Hospitals	8221	5,924.3600	0.6721	0.0143	0.01
52-01-005	University of Iowa Main Power Plant	8221	215,269.9393	25.2161	3.3041	0.20
07-02-006	University of Northern Iowa - Main Campus	8221	666.2885	0.0754	0.0015	0.00
07-02-006	University of Northern Iowa - Power Plant	8221	114,648.7669	10.1375	1.4586	0.10
12-04-005	Unverferth Manufacturing Co. Inc.	3523	1,789.0315	0.0000	0.0000	0.00
85-01-017	USDA - NADC	8733	19,969.2819	2.1702	0.0436	0.02
85-01-056	USDA - National Veterinary Services Laboratories	8734	14,534.8262	1.6227	0.0276	0.01
63-02-004	Vermeer Manufacturing Company	3531	1,604.0935	0.1840	0.0074	0.00
84-01-002	Vogel Paint & Wax Co., Inc.	2851	995.2236	0.1112	0.0019	0.00
68-09-006	Wacker Chemical Corporation	2046	10,469.7310	1.1695	0.0198	0.01
09-01-013	Waverly Light & Power - North & South Plants	4911	960.6849	0.0528	0.0071	0.00
40-01-003	Webster City Diesel Turbine	4911	46.1664	0.0014	0.0005	0.00
05-04-002	**Western Minnesota Municipal Power Agency - Exira Station**	4911	**38,172.7015**	4.2881	0.0797	0.03
29-01-012	Winegard Company	3663	829.7312	0.0927	0.0016	0.00
34-01-027	Winnebago Industries, Inc. - Charles City	3716	1,066.5645	0.1191	0.0020	0.00
95-01-001	Winnebago Industries, Inc. - Forest City	3716	10,440.5662	1.1662	0.0197	0.01
35-01-010	Winnebago Industries, Inc. - Hampton	3716	1,186.0286	0.1325	0.0022	0.00
17-01-068	Woodharbor Doors and Cabinetry	2434	1,269.1239	0.1418	0.0024	0.00
98-01-006	Woodharbor Doors and Cabinetry - Northwood Facility	2431	801.6836	0.0896	0.0015	0.00
16-01-004	Xerxes Corporation	3089	308.6355	0.0240	0.0014	0.00
	Total		**56,994,318**	**6,413**	**820**	**52.06**