

Appendix A. Electricity Supply and Use

Overview

This appendix describes the data sources, key assumptions, and the methodology used to develop an inventory of greenhouse gas (GHG) emissions over the 1990-2005 period associated with the generation of electricity to meet electricity demand in Iowa. It also describes the data sources, key assumptions, and methodology used to develop a forecast of GHG emissions over the 2006-2025 period associated with meeting electricity demand in the state. Specifically, the following topics are covered in this Appendix:

- ❑ *Data sources:* This section provides an overview of the data sources that were used to develop the inventory and forecast, including publicly accessible websites where this information can be obtained and verified.
- ❑ *Greenhouse Gas Inventory methodology:* This section provides an overview of the methodological approach used to develop the Iowa GHG inventory for the electric supply sector.
- ❑ *Greenhouse Gas Forecast Methodology – Reference Case:* This section provides an overview of methodological approach used to develop the Iowa GHG Reference Case forecast for the electric supply sector.
- ❑ *Greenhouse Gas Inventory Results:* This section provides an overview of key results of the Iowa GHG inventory for the electric supply sector.
- ❑ *Greenhouse Gas Forecast Results:* This section provides an overview of key results of the Iowa GHG forecast for the electric supply sector.

Data Sources

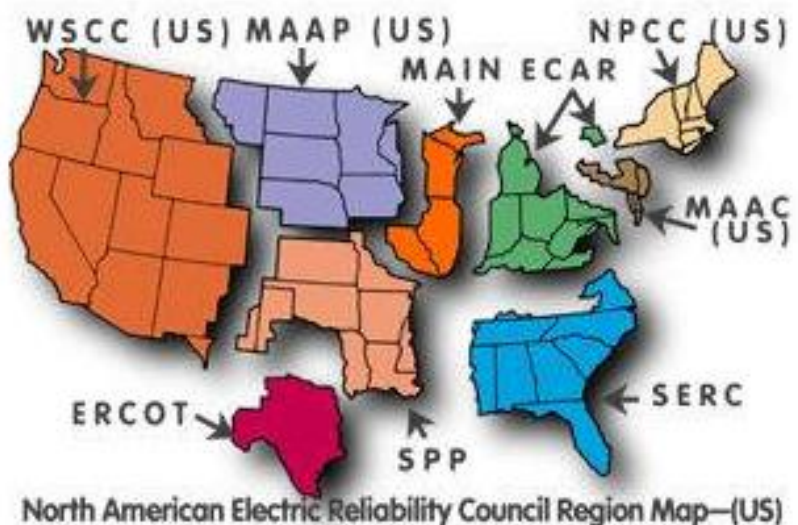
We considered several sources of information in the development of the inventory and forecast of carbon dioxide equivalent (CO₂e) emissions from Iowa power plants. These are briefly summarized below:

- ❑ *Energy Forecast Update.xls.* This spreadsheet provides the electric energy forecast for two utility companies in Iowa – MidAmerican Energy and Alliant-Interstate Power and Light for years from 2007 to 2026.¹ The projections in this spreadsheet are used to estimate Iowa's electricity demand over the period 2008-2025. These two utilities accounted for about 75% of total electricity sales in Iowa in 2005 based on data published by EIA.
- ❑ *EIA-906/920 Monthly Time Series data.* This is a database file available from the Energy Information Administration (EIA) of the US Department of Energy. The information in the database is based on information collected from utilities in Forms EIA-906/920 and EIA-860. Historical data for years 1990-2005 were extracted for Iowa. Year 2005 (forecast base year) data of neighboring states MN, ND, NE, SD, and MT were also collected. Data from these forms provide, among other things, fuel consumption and net generation in power stations

¹ This spreadsheet was provided by Mr. Gordon Dunn of the Iowa Utilities Board (IUB) to Ms. Dan Wei, The Center for Climate Strategies, January 25, 2008.

located in these states by plant type. This information can be accessed from http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html.

- ❑ *Annual Energy Outlook 2007*. This is an output of an EIA analysis using the National Energy Modeling System (NEMS), a model that forecasts electric expansion/electricity demand in the USA. In particular, regional outputs for the Mid-Continent Area Power Pool (MAPP) region was used. The MAPP region is the one in which Iowa is located (see map at right). The MAPP results include forecasts of gross



generation, net generation, combustion efficiency, total sales, on-site usage, transmission and distribution (T&D) losses, and exports/imports through the year 2025. This information is available in supplemental tables that can be accessed directly from <http://www.eia.doe.gov/oiaf/aeo/supplement/index.html>. The source of the above map is http://www.bydesign.com/fossilfuels/crisis/html/NERC_regions_map.html.

- ❑ *Annual Energy Outlook 1996-2006 Editions*. Historical data on gross generation, net generation, total sales, on-site usage, T&D losses, and emission intensities for the MAPP region were extracted for years 1994-2004. The information is available in supplemental tables that can be accessed directly from <http://www.eia.doe.gov/oiaf/archive.html#aeo>.
- ❑ *Monthly Cost and Quality of Fuels for Electric Plants*. This information is available from the Federal Energy Regulatory Commission (FERC). The database relies on information collected from utilities in the FERC-423 form. It was used to determine the share of coal type (i.e., whether bituminous, sub-bituminous, anthracite, or lignite) used in Iowa power plants over the period 1990-2005. It can be accessed directly from <http://www.eia.doe.gov/cneaf/electricity/page/ferc423.html>.
- ❑ *Electric Power Annual 2006*. This information is available from the EIA. The database compiles capacity, net generation, and total retail electricity sales by state. It was used to determine total sales of electricity across all sectors for years 1990 through 2005. It can be accessed directly from http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html.
- ❑ *Energy conversion factors*. This is based on Table A-238 of Annex 6 in the USEPA's 2006 GHG Inventory for the US. The table is entitled "Conversion Factors to Energy Units (Heat Equivalents)". This information can be accessed directly from the following website: <http://www.epa.gov/climatechange/emissions/downloads06/07Annex6.pdf>.

- ❑ *Fuel combustion oxidation factors.* This is based on Table A-27 in Annex 2 of the USEPA's 2006 US GHG inventory for the US. This information can be accessed directly from: http://www.epa.gov/climatechange/emissions/downloads06/06_Annex_Chapter2.pdf.
- ❑ *Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emission factors.* For all fuels except Municipal Solid Waste (MSW), these emission factors are based on Annex 2 and Annex 3 of the USEPA's 2006 GHG inventory for the US. This information can be accessed directly from: http://www.epa.gov/climatechange/emissions/downloads06/06_Annex_Chapter2.pdf and <http://www.epa.gov/climatechange/emissions/downloads06/07Annex3.pdf>. For MSW, emission factors are based on the EIA's Office of Integrated Analysis and Forecasting, Voluntary Reporting of Greenhouse Gases Program, Table of Fuel and Energy Source: Codes and Emission Coefficients. This information can be accessed directly from <http://www.eia.doe.gov/oiaf/1605/coefficients.html>.
- ❑ *Global warming potentials.* These are based on values proposed by the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report. This information can be accessed directly from <http://www.ipcc.ch/ipccreports/assessments-reports.htm>.

Greenhouse Gas Inventory Methodology

The methodology used to develop the Iowa inventory of GHG emissions associated with electricity production and consumption is based on methods developed by the IPCC and used by the USEPA in the development of the US GHG inventory. There are four fundamental premises of the GHG inventory developed for Iowa, as briefly described below:

- ❑ The GHG inventory should be estimated based on both the production and consumption of electricity. Developing the production estimate involves tallying up the GHG emissions associated with the operation of power plants physically located in Iowa, regardless of ownership. Developing the consumption estimate involves tallying up the GHG emissions associated with consumption of electricity in Iowa, regardless of where the electricity is produced. As Iowa is a net importer of electricity, these estimates will be different.
- ❑ The GHG inventory should be estimated based on emissions at the point of electric generation only. That is, GHG emissions associated with upstream fuel cycle process such as primary fuel extraction, transport to refinery/processing stations, refining, beneficiation, and transport to the power station are not included.
- ❑ As an approximation, it was assumed that all power generated in Iowa was consumed in Iowa. In fact, some of the power generated in Iowa is exported. However, given the similarity in the average carbon intensity of Iowa power stations and that of power stations in the surrounding MAPP region, the potential error associated with this simplifying assumption is small, on the order of 2%, plus or minus.
- ❑ Several key assumptions were used for making projections of CO₂, CH₄, and N₂O emissions for the electric sector out to 2025. These are summarized in Table A1.

Table A1. Key Assumptions used in the Iowa GHG Forecast

Key Assumptions	2005	2025	Average Annual Growth / Change (%)
Iowa electricity demand (GWh)	42,757	59,057	1.61%
Iowa gross generation (GWh)	43,021	52,947	1.01%
Iowa utility sales to meet Iowa demand (GWh)	40,677	49,292	0.95%
Import sales from MAPP region (GWh)	2,080	9,765	7.35%
Gross generation from MAPP imports (GWh)	2,200	10,490	7.42%
Power plant heat rate (BTU/kWh)			
Coal	11,008	10,405	-0.28%
Nuclear	10,357	10,357	0.00%
Natural Gas	8,561	5,921	-1.44%
Oil	15,481	13,854	-0.45%
Municipal Solid Waste (MSW)	11,253	11,253	0.00%
Biomass	NA	NA	NA
Landfill Gas (LFG)	12,460	8,617	-1.44%
Wind	9,916	9,916	0.00%
Hydroelectric	9,916	9,916	0.00%
Losses (%)			
From on-site usage	0.83%	0.28%	-6.93%
From T&D and on-site usage	5.45%	6.90%	1.59%

There were several steps in the methodology for the development of the electric sector GHG inventory for the period 1990-2005. These are briefly outlined below:

- ❑ Determine the coal quality used in Iowa power stations (i.e., share of anthracite, bituminous, lignite, sub-bituminous, and coal wastes used).
- ❑ Determine gross annual primary energy consumption by Iowa power stations by plant and fuel type.
- ❑ Determine gross annual generation associated with net power imports to satisfy Iowa electricity demand.
- ❑ Multiply gross annual primary energy consumption by Iowa power stations by CO₂e emission factors. This provides an estimate of the Iowa GHG inventory on a production basis.
- ❑ Multiply annual gross generation associated with net power imports by the carbon emission intensity (in units of metric tons CO₂e per megawatt-hour [tCO₂e/MWh]) of the MAPP region. This provides an estimate of the additional GHG emissions associated with meeting Iowa electricity demand in excess of generation from local power plants.
- ❑ Add the emissions associated with net power imports to the production-based emissions. This provides an estimate of the GHG inventory on a consumption basis.

Greenhouse Gas Forecast Methodology – Reference Case

We consider that the most useful methodology for constructing a GHG forecast is one that attempts to build information from the bottom-up. That is, the GHG forecast was developed using detailed State-specific data regarding projected sales, gross in-state generation, supply-side efficiency improvements, planned capacity additions and retirements by plant type/vintage, and changes over time regarding losses associated with on-site use and T&D.

While some of this information was available in Iowa, some key data were not available at the time the forecast was prepared. Therefore, it was necessary to use a top-down approach. A top-down approach uses proxy information regarding future gross in-state generation, supply-side efficiency improvements, and changes over time regarding losses. This approach, while less satisfactory for representing state-specific conditions, nonetheless offers an acceptable starting point for exploring projections of GHG emissions from the electric sector in Iowa. The methodological steps used for forecasting CO₂e emissions are described below.

Coal quality. An overview of the methodology applied to forecast quality of coal used in Iowa power stations is briefly summarized below:

- ❑ For the Base Year of 2005, determine the coal quality used in Iowa power stations (i.e., share of anthracite, bituminous, lignite, sub-bituminous, and coal wastes used).
- ❑ For the period 2006 through and including 2025, assume that the coal quality is the same as the Base year.

Total Sales. An overview of the methodology applied to forecast annual sales of electricity to Iowa consumers is briefly summarized below:

- ❑ For the Base Year of 2005, total retail sales in Iowa were 42,757 gigawatt-hour (GWh) based on EIA data.
- ❑ For the years 2006 and 2007, use the MAPP regional projected electricity sales growth rate to the 2005 Iowa retail sales level to get the forecasted sales for Iowa in these two years.
- ❑ For the period 2008 through and including 2025, use in-state electricity sale projections from Iowa-based utilities -- MidAmerican Energy and Alliant-Interstate Power and Light.
- ❑ For the period 2008 through and including 2025, compute the annual growth rate of electricity sales of Iowa-based utilities to Iowa consumers and apply this growth rate to the 2007 retail sale level to forecast annual sales.²

Gross Generation. An overview of the methodology applied to forecast annual gross electricity generation by Iowa power stations is briefly summarized below:

² Electricity sales for the residential, commercial, and industrial (RCI) sectors are used in Appendix B to allocate emissions associated with electricity generation to each sector for comparison to emissions associated with the direct use of natural gas, petroleum, coal, and wood by each sector. Electricity sales for each sector were calculated using the following three steps: (1) calculate the sectoral growth rate in MAPP region from 2006 to 2025; (2) apply the MAPP sectoral growth rate to Iowa Base Year (2005) electricity sales for each sector; and (3) benchmark total sector sales to the control totals that are computed based on Iowa state-specific utility forecasts.

- ❑ For the Base Year of 2005, estimate losses associated with on-site usage of electricity by plant type for Iowa power plants. On-site usage losses were assumed to be equal to the MAPP regional average of 0.8% of gross generation.
- ❑ For the Base Year of 2005, combine actual net electric generation data (i.e., from the inventory) and assumed average on-site losses (i.e., from the MAPP region) to estimate gross generation by plant type.
- ❑ For the period 2006 through and including 2025, estimate total gross generation of Iowa power stations by multiplying the 2005 value of Iowa total gross generation by plant type by the annual growth rate of gross generation in the MAPP region.

Combustion efficiency. An overview of the methodology applied to forecast annual heat rates at Iowa power stations is briefly summarized below:

- ❑ For the Base Year of 2005, estimate gross heat rate of Iowa power stations by dividing the plant type-specific 2005 gross generation estimate by the plant type-specific 2005 gross primary energy consumption estimate.
- ❑ For the period 2006 through and including 2025, estimate the annual average gross plant type-specific heat rate for the MAPP region.
- ❑ For the period 2006 through and including 2025, estimate annual average gross plant type-specific heat rate of Iowa power stations by multiplying the 2005 value of the annual average gross plant type-specific heat rate of Iowa power plants by the annual rate of improvement of gross heat rate in the MAPP region.

Energy use. An overview of the methodology applied to forecast annual primary energy use at Iowa power stations is briefly summarized below:

- ❑ For the Base Year of 2005, establish the actual primary energy consumption for Iowa power plants as reported by the databases used to develop the inventory.
- ❑ For the period 2006 through and including 2025, multiply annual gross generation by annual heat rate for each plant type in Iowa.

Electricity imports. An overview of the methodology applied to forecast annual net electricity imports to meet Iowa demand is briefly summarized below:

- ❑ For the Base Year of 2005 through and including 2025, estimate Iowa utility sales to meet Iowa electricity demand by multiplying the Iowa projected gross generation by one minus the percent losses from on-site usage and T&D (MAPP regional on-site usage rate and T&D loss rate are utilized here).
- ❑ For the Base Year of 2005 through and including 2025, estimate the sales associated with imports as the difference between total sales in Iowa and the total sales by Iowa power stations.
- ❑ For the Base Year of 2005 through and including 2025, estimate the gross generation associated with imports by dividing sales from imports by one minus the percent losses from on-site usage and T&D in the MAPP region.

Carbon dioxide-equivalent emissions from Iowa power stations. An overview of the methodology applied to forecast annual CO₂e emissions is briefly summarized below:

- ❑ For the Base Year of 2005 through and including 2025, estimate total CO₂ emissions from Iowa power stations by multiplying total primary energy use by the CO₂ emission factor and the global warming potential.
- ❑ For the Base Year of 2005 through and including 2025, estimate total CH₄ emissions from Iowa power stations by multiplying total primary energy use by the CH₄ emission factor and the global warming potential.
- ❑ For the Base Year of 2005 through and including 2025, estimate total N₂O emissions from Iowa power stations by multiplying total primary energy use by the N₂O emission factor and the global warming potential.
- ❑ For the Base Year of 2005 through and including 2020, estimate total CO₂e emissions from Iowa power stations by adding the CO₂e of CO₂, CH₄, and N₂O.

Carbon dioxide-equivalent emissions from imported electricity. An overview of the methodology applied to forecast annual CO₂e emissions is briefly summarized below:

- ❑ For the Base Year of 2005 through and including 2025, estimate the average annual GHG emission intensity (i.e., metric tons (t) of CO₂, CH₄, and N₂O per MWh of gross generation) for the MAPP region from the data sources described earlier.
- ❑ For the Base Year of 2005 through and including 2025, estimate total CO₂ emissions associated with imported electricity by multiplying the gross generation associated with these imports by the CO₂ emission intensity and the global warming potential.
- ❑ For the Base Year of 2005 through and including 2025, estimate total CH₄ emissions associated with imported electricity by multiplying the gross generation associated with these imports by the CH₄ emission intensity and the global warming potential.
- ❑ For the Base Year of 2005 through and including 2025, estimate total N₂O emissions associated with imported electricity by multiplying the gross generation associated with these imports by the N₂O emission intensity and the global warming potential.
- ❑ For the Base Year of 2005 through and including 2025, estimate total CO₂e emissions associated with imported electricity by adding the CO₂e of CO₂, CH₄, and N₂O.

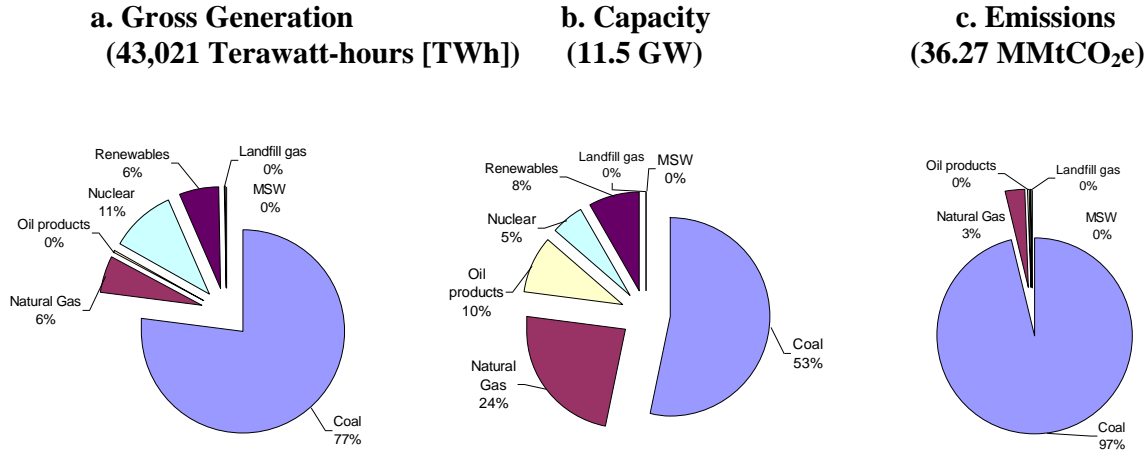
Results

Table A2 and Figure A1 summarize the characteristics of the electric generation system in Iowa, together with a breakdown in generation and emissions for Iowa power stations for 2005. The following subsections provide an overview of the results of the GHG emissions inventory and reference case projections estimated using the methodological approach described above.

Table A2. Summary of Iowa Electric Generator Characteristics for the 2005 Base Year

Type	Fuel	Gross Generation (GWh)	Capacity (MW)	Fuel use (Billion Btu)	Heat rate (Btu/KWh)	Emissions (MMtCO ₂ e)
Steam plants	Non-lignite coal	33,083	6,060	364,184	11,008	34.91
	Lignite coal	0	0	0	0	0.00
	Natural Gas	108	19	1,711	15,894	0.09
	Residual oil	0	0	0	0	0.00
	Diesel oil	23	0	261	11,547	0.02
	Petroleum coke	0	0	0	0	0.00
	LFG	14	0	156	11,278	0.01
	Refuse derived fuel/MSW	27	0	298	11,253	0.01
	Biomass	0	0	0	0	0.00
	Nuclear	4,576	597	47,397	10,357	0.00
		<i>Subtotal:</i>	37,830	6,676	414,007	
Turbines	Natural Gas	93	1,371	1,638	17,595	0.09
	Diesel	102	472	1,564	15,312	0.11
	Landfill Gas	0	0	0	0	0.00
	Waste oils/solvents	0	24	5	20,332	0.00
	<i>Subtotal:</i>	195	1,867	3,207		0.20
Combined Cycle	Natural Gas	2,290	1,245	17,893	7,815	0.96
	Diesel	5	0	44	9,135	0.00
	Landfill Gas	0	0	0	0	0.00
	<i>Subtotal:</i>	2,295	1,245	17,937		0.97
Engines	Natural Gas	4	93	114	28,052	0.01
	Diesel	14	620	198	14,052	0.01
	Landfill Gas	54	6	690	12,761	0.04
	LPG	0	0	0	0	0.00
	<i>subtotal:</i>	72	720	1,001		0.06
Renewable	Wind	1,661	820	16,470	9,916	0.00
	Solar PV	0	0	0	0	0.00
	Hydroelectric	968	131	9,594	9,916	0.00
	<i>Subtotal:</i>	2,629	952	26,064		0.00
All	Total	43,021	11,460	462,216		36.27

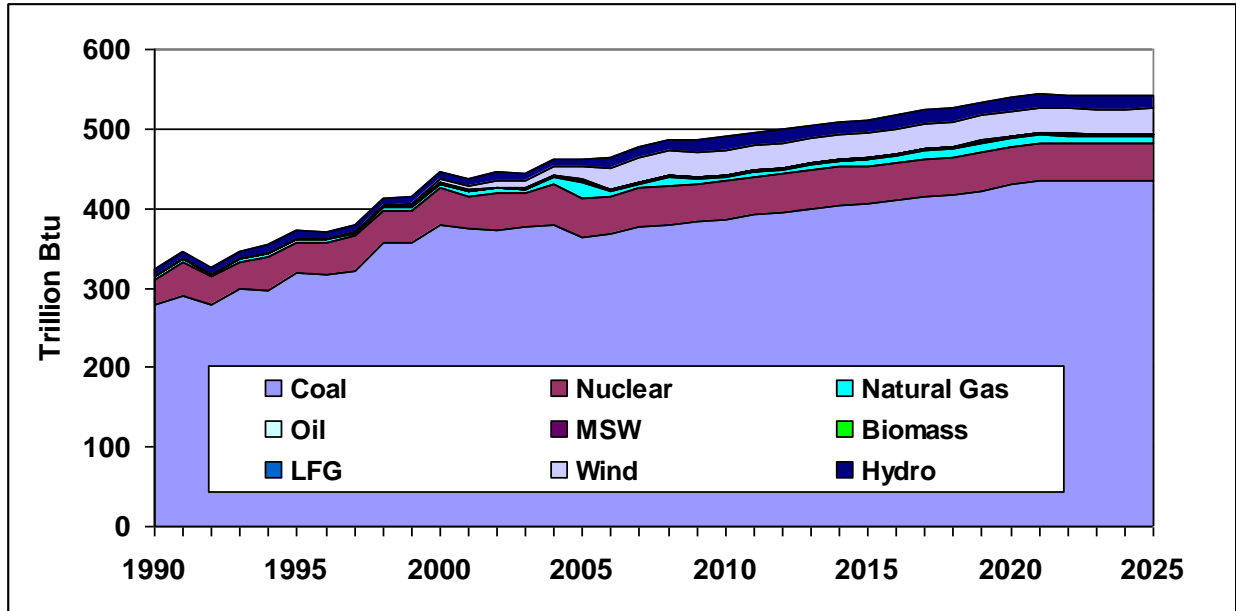
Figure A1. Breakdown of Iowa Generation, Capacity and Emissions – 2005 Base Year



Primary Energy Consumption

Total primary energy consumption associated with electricity generation in Iowa is summarized in Figure A2. Primary energy consumption in Iowa is dominated by coal resources.

Figure A2. Gross Primary Energy Use at Iowa Power Stations

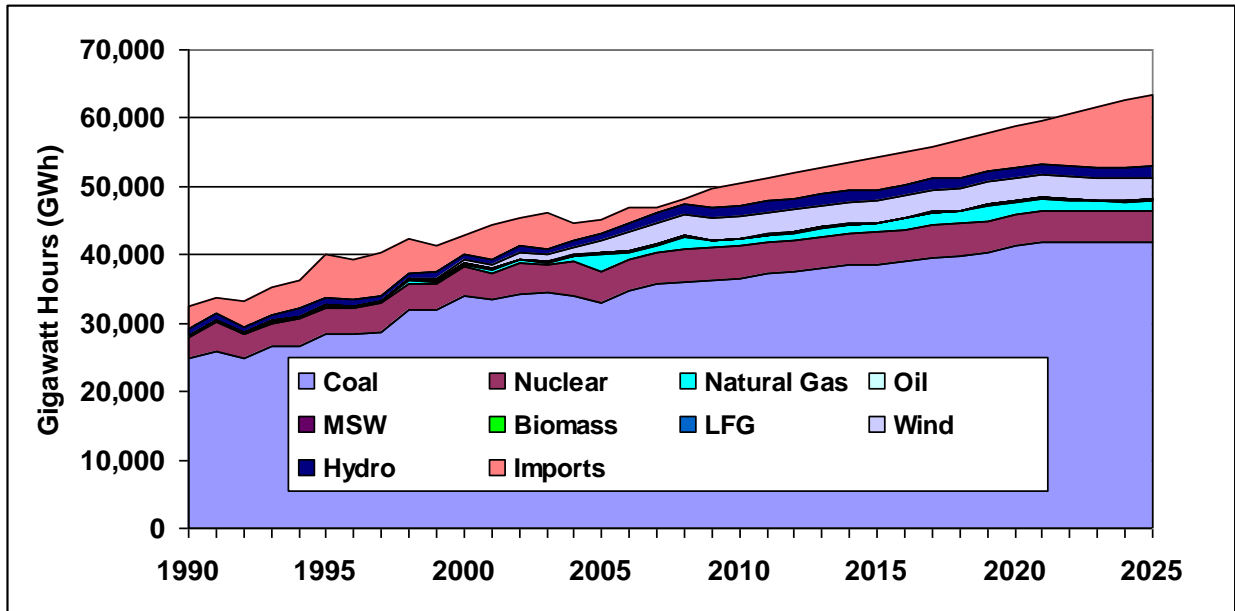


Source: Results shown in this figure are based on the approach described in the text.

Gross Generation

Total gross generation by Iowa power plants is summarized in Figure A3. Gross generation in Iowa is dominated by steam units, which are primarily based on coal fuel.

Figure A3. Gross Generation at Iowa Power Stations

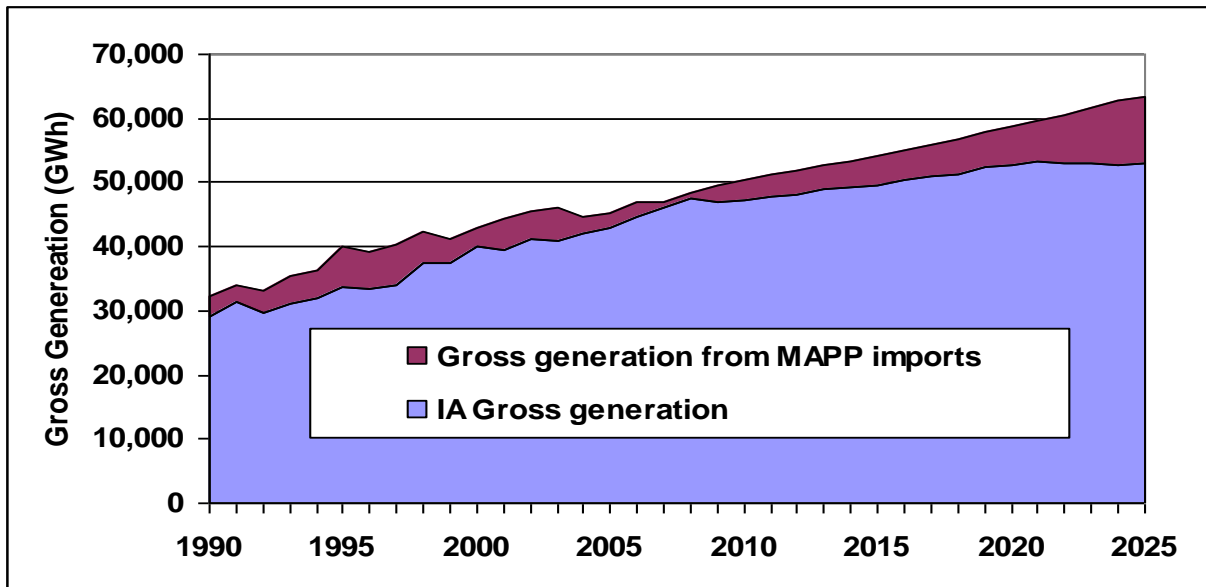


Source: Results shown in this figure are based on the approach described in the text.

Imported Electricity

To meet annual demand for electricity in Iowa, total gross generation by Iowa power plants needs to be augmented by electricity imports. As indicated earlier, it was assumed that this power is imported from the MAPP region. Figure A4 summarizes the gross generation within and beyond Iowa’s border needed to satisfy electricity demand in Iowa.

Figure A4. Composition of Gross Generation to Meet Iowa’s Electricity Demand



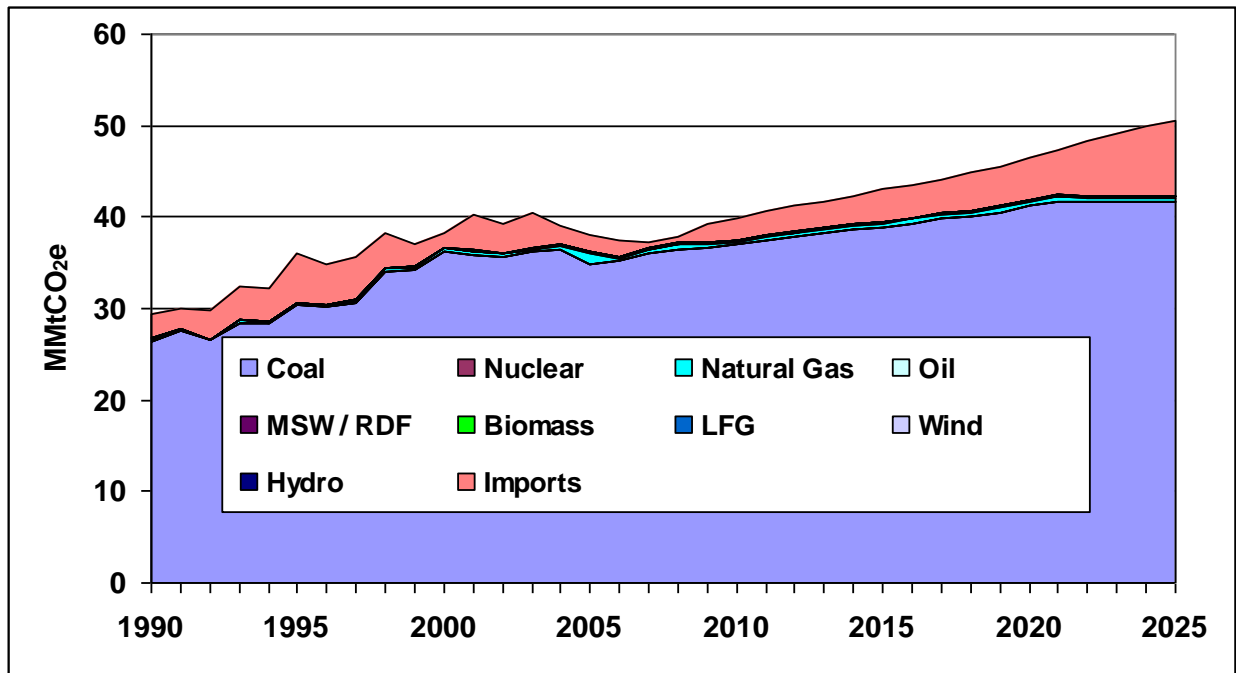
Source: Results shown in this figure are based on the approach described in the text.

Total Gross GHG Emissions

Total emissions associated with generation by Iowa power plants as well as generation by power plants located outside Iowa to meet electricity demand within Iowa are summarized in Figure A5 by fuel type and in Figure A6 by type of plant. Figure A7 compares emissions on a production (in-state generation) and consumption (in-state generation plus imports) basis. Figures A5, A6, and A7 were developed from the emissions data in Tables A3 and A4.

On a consumption basis, emissions were about 38.01 MMtCO_{2e} in 2005 and are projected to increase to about 50.50 MMtCO_{2e} in 2025, representing an overall increase of about 33% during this 20-year period. Iowa was a net importer of electricity since 1990 and is projected to continue to be a net importer of power through 2025.

Figure A5. Total Gross GHG Emissions Associated with Iowa Electric Demand by Fuel Type



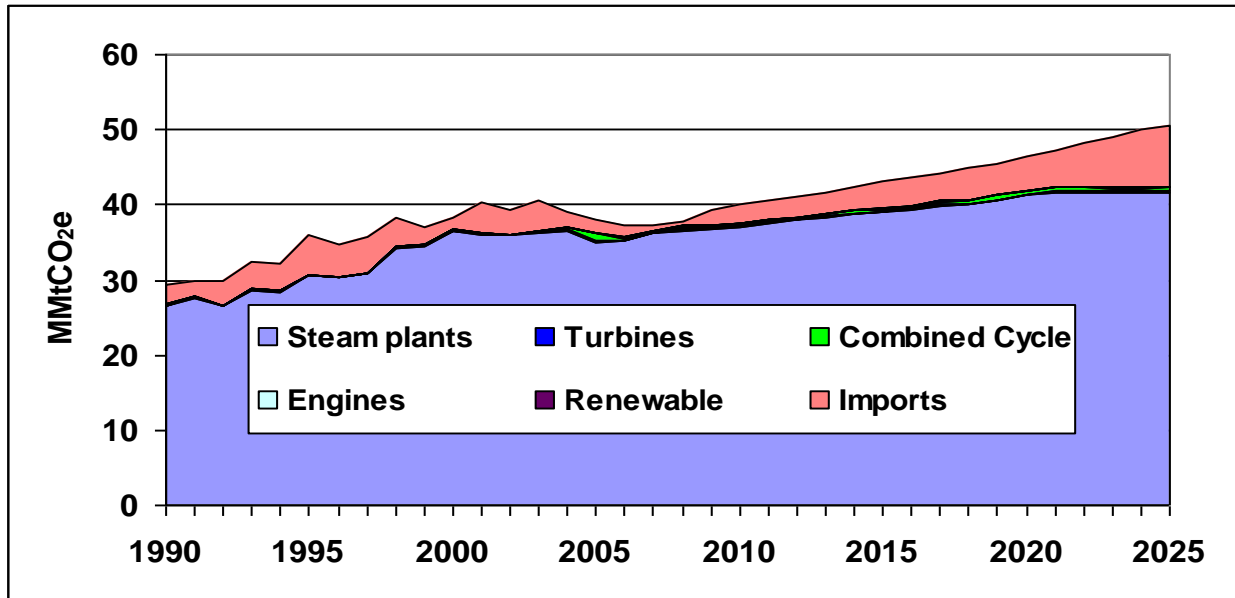
Source: Results shown in this figure are based on the approach described in the text. LFG = landfill gas, MSW = municipal solid waste, RDF = refuse-derived fuel.

Table A3. Total Gross GHG Emissions Associated with Iowa Electric Demand by Fuel Type (MMtCO₂e)

Fuel Type	1990	1995	2000	2005	2010	2015	2020	2025
Electricity - Consumption Based	29.5	36.1	38.2	38.0	40.0	43.0	46.5	50.5
Net Imported Electricity	2.78	5.48	1.51	1.74	2.46	3.58	4.51	8.18
Electricity - Production Based	26.7	30.6	36.7	36.3	37.5	39.5	41.9	42.3
Coal	26.5	30.4	36.3	34.9	37.0	38.9	41.2	41.7
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Natural Gas	0.17	0.21	0.24	1.15	0.31	0.40	0.58	0.48
Oil	0.05	0.06	0.10	0.15	0.12	0.11	0.14	0.13
MSW	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LFG	0.00	0.00	0.01	0.05	0.01	0.02	0.02	0.02
Wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Results in this table based on the approach described in the text.

Figure A6. Total Gross GHG Emissions with Iowa Electric Demand by Plant Type



Source: Results shown in this figure are based on the approach described in the text.

Table A4. Total Gross GHG Emissions Associated with Iowa Electric Demand by Plant Type (MMtCO₂e)

Plant Type	1990	1995	2000	2005	2010	2015	2020	2025
Electricity - Consumption Based	29.5	36.1	38.2	38.0	40.0	43.0	46.5	50.5
Net Imported Electricity	2.78	5.48	1.51	1.74	2.46	3.58	4.51	8.18
Electricity - Production Based	26.7	30.6	36.7	36.3	37.5	39.5	41.9	42.3
Steam plants	26.6	30.6	36.5	35.0	37.1	39.0	41.3	41.7
Turbines	0.05	0.07	0.11	0.20	0.12	0.11	0.15	0.14
Combined Cycle	0.00	0.00	0.01	0.97	0.26	0.34	0.49	0.41
Engines	0.01	0.01	0.03	0.06	0.02	0.03	0.04	0.03
Renewable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Results in this table based on the approach described in the text.

¹ Fuels combusted by steam plants in Iowa include coal, natural gas, distillate (diesel), petroleum coke, landfill gas, municipal solid waste, and nuclear.

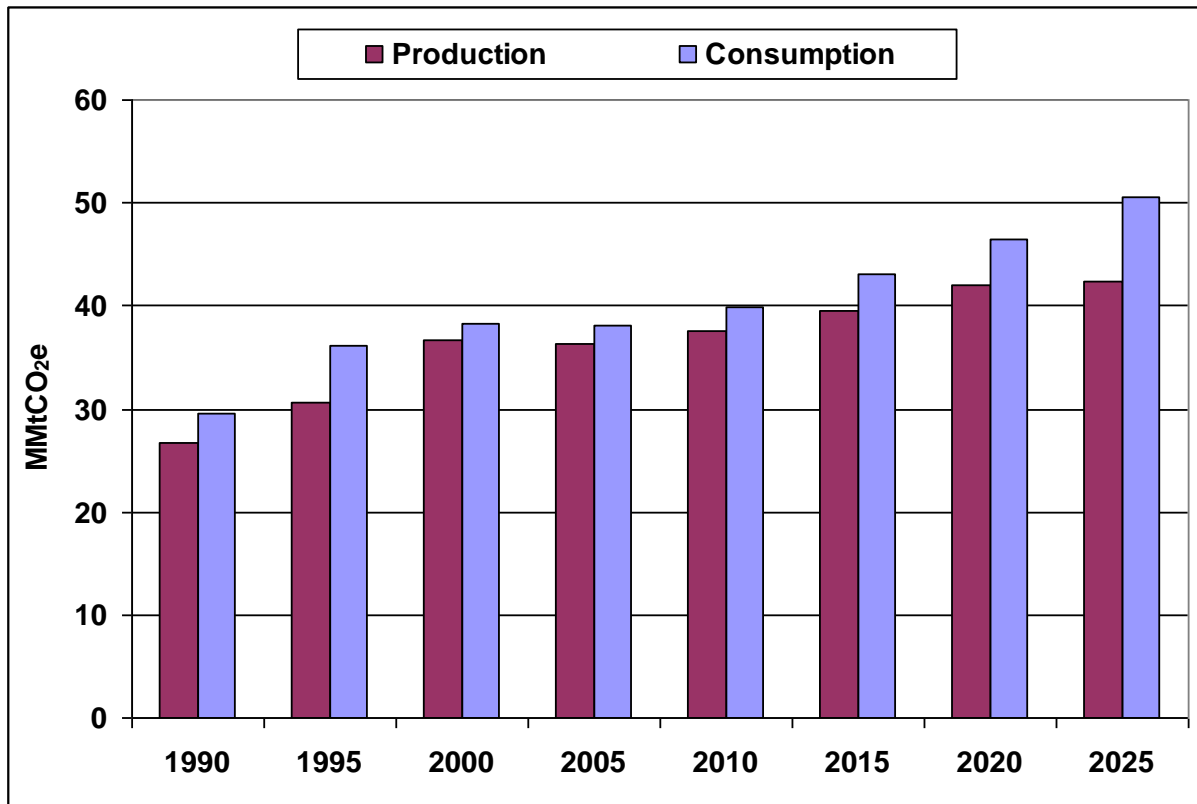
² Fuels combusted by turbines in Iowa include natural gas, diesel, and waste oils/solvents.

³ Fuels combusted by combined-cycle plants include natural gas and diesel.

⁴ Fuels combusted by internal combustion engines include natural gas, diesel, and landfill gas.

⁵ Renewable fuels include wind and hydroelectric.

Figure A7. Electricity Generation Gross GHG Emissions – Production and Consumption Basis (1990-2020)



Source: Results shown in this figure are based on the approach described in the text.

Electricity consumption emissions are the sum of emissions associated with in-state electricity production and net imported electricity.

Key Uncertainties

Key sources of uncertainty underlying the estimates above are as follows:

- The methodologies used in this initial preliminary analysis rely on state-specific data on electricity generating units available from the EIA for the historical estimates of GHG emissions. The forecast relies primarily on EIA data available from the AEO2007 forecast for the MAPP region. The reference case projections do include electricity energy forecasts for the two largest utility companies in Iowa (together they accounted for about 75% of total electricity sales in Iowa in 2005), which are used to estimate projected annual growth rate in electricity sales in Iowa. This approach is a top-down approach to estimating historical and future emissions. Future work should focus on improving the inventory and forecast by compiling data that enable a bottom-up approach (unit-by-unit or contract basis) to estimating emissions for the electricity supply sector.
- Electricity on-site usage and T&D loss estimates were used to convert gross generation in the forecast to sales to meet the state's demand. The estimated Iowa utility sales to the customers were less than estimates of electricity demand throughout the forecast period indicating that Iowa will need to import electricity to fulfill electricity demand that cannot be met by in-state generators. The on-site usage and T&D loss estimates are taken from the EIA AEO2007 for the MAPP region. Improvements to these estimates (based on input from the state's utilities) could help to get more accurate emissions associated with imported electricity.
- There are uncertainties associated with the statewide fuel mix, emission factors, and conversion factors (to convert electricity from a heat input basis to electricity output) that should be reviewed and revised with data that is specific to Iowa power generators.
- For combined heat and power facilities that generate and sell electricity to the power grid, emissions associated with the fuel they burn are included in the commercial and industrial fuel use sector (see Appendix B). The fuel use associated with these facilities is aggregated by fuel and sector and, therefore, cannot be broken out easily so that they can be reported under the electricity supply and use sector. Future work could include an assessment to determine how best to isolate emissions associated with combined heat and power facilities.
- Fuel price changes influence consumption levels and, to the extent that price trends for competing fuels differ, may encourage switching among fuels, and thereby affect emissions estimates. Although the effects of fuel price changes on the supply and demand of electricity are included in the EIA regional modeling used for this initial analysis, unanticipated events that affect fuel prices could affect the electricity forecast for Iowa.