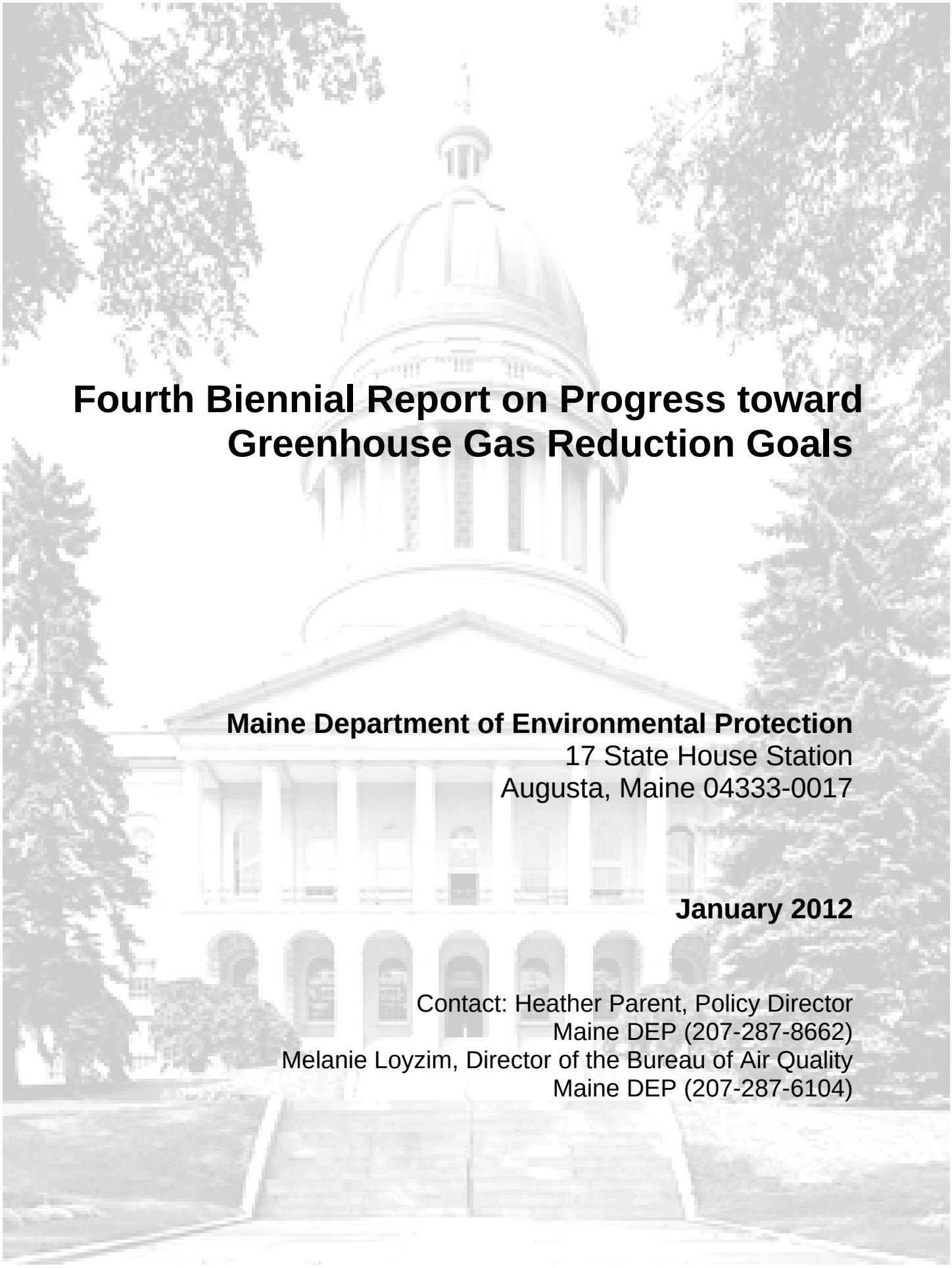

Fourth Biennial Report on Progress toward Greenhouse Gas Reduction Goals

Maine Department of Environmental Protection
17 State House Station
Augusta, Maine 04333-0017

January 2012

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Maine DEP (207-287-6104)

January 1, 2012

Senator Thomas B. Saviello, Chair
Representative James M. Hamper, Chair
Joint Standing Committee on Environment and Natural Resources
2 State House Station
Augusta, ME 04333

RE: Fourth Biennial Report on Progress toward Greenhouse Gas Reduction Goals

Dear Senator Saviello, Representative Hamper, and members of the Joint Standing Committee on Natural Resources,

In 2003, the Legislature established greenhouse gas (GHG) reduction goals for 2010, 2020, and beyond (38 M.R.S.A. §576). The Maine Department of Environmental Protection (the Department) is submitting this report to the Joint Standing Committee on Natural Resources pursuant to 38 M.R.S.A. §578, which requires the Department to evaluate the State's progress towards meeting those reduction goals, and submit a report every two years from 2006 and thereafter.

This report summarizes the findings of the Department's second quantitative evaluation of Maine's progress towards meeting statutory greenhouse gas goals since the development of the original Climate Action Plan in 2004. I am pleased to report that Maine met the goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2010. Maine's gross state product has continued to increase while energy consumption and emissions declined. Preliminary data for 2010 indicates GHG emissions may have increased slightly from 2009 to 2010, however.

The Department's analytical method is consistent with the U.S. Environmental Protection Agency's national inventory development and methods used by other New England States. The Department conducted an extensive analysis of energy consumption information from the Department of Energy, and utilized information from many of Maine's own reporting programs to estimate GHG emissions. The Department is continuing efforts to evaluate the impacts of land use and forestry on net GHG emissions, and to evaluate how many new federal emissions standards proposed and finalized in 2011 will affect future GHG emissions in Maine.

I would be happy to present the report to the Committee at your convenience.

Sincerely,

Melanie Loyzim
Director, Bureau of Air Quality

Report to the Joint Standing Committee on Natural Resources
2nd Session of the 125th Maine Legislature

Fourth Biennial Report on Progress toward Greenhouse Gas Reduction Goals

Executive Summary

The Department of Environmental Protection's analysis of energy consumption, industrial processes, agriculture and waste management found that Maine met the goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2010. Gross statewide GHG emissions increased from 1990 until a peak in 2003, and have steadily declined since. However, preliminary data available to estimate 2010 emissions suggests a slight increase from 2009 to 2010.

The Department's analysis indicates:

- 89% of GHG emissions in Maine are the result of energy consumption, largely produced by combustion of petroleum products.
- From 1990 to 2009, total energy consumption in Maine declined 7% while total GHG emissions only declined 2.5%.
- The Transportation sector produces almost half of all CO_2 emissions in Maine.
- CO_2 emissions from petroleum combustion in the Industrial sector dropped 50% and in the Electric Power sector 85% since 1990.

Additional GHG emission reductions can be achieved by encouraging energy efficiency strategies and replacement of petroleum products with renewable energy sources. New federal standards for vehicle fuel efficiency, electric generating facilities, and boilers are expected to reduce GHG emissions in the coming years. The Department recommends that future GHG emission reduction programs in Maine should focus on reducing petroleum consumption in the residential, commercial and transportation sectors.

I. Statute

In 2003, Maine's Act to Provide Leadership in Addressing the Threat of Climate Change (2003 Public Law Chapter 237) established greenhouse gas (GHG) reduction goals for 2010, 2020, and beyond. The Act set a goal for reduction of greenhouse gas emissions within the State, in the short term, to 1990 levels by January 1, 2010. The Maine Department of Environmental Protection (the Department) is submitting this Report to the Joint Standing Committee on Natural Resources pursuant to 38 M.R.S.A. §578, which requires the Department to evaluate the State's progress toward meeting its reduction goals and submit a report of its evaluation by January 1, 2006 and by that date every two years thereafter.

II. Methodology

The Department utilized the U.S. Environmental Protection Agency's (EPA) State Inventory Tool (SIT), augmented with data from state programs, to estimate GHG emissions in Maine. The SIT was developed by EPA to provide states with a comprehensive, standardized approach to estimating GHG emissions. The SIT is an Excel-based tool that uses methods from the Intergovernmental Panel on Climate Change (IPCC) and the U.S. National Greenhouse Gas Inventory. It provides flexibility for states to input state specific data to estimate gross carbon dioxide equivalent (CO_2e) emissions for six greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). The tool estimates GHG emissions from the following categories:

- Energy
- Agriculture
- Industrial Processes
- Waste

The tool is pre-populated with data from several federal agencies. The majority of the inventory data comes from the Department of Energy's Energy Information Administration (EIA). For many of the categories, this information is apportioned to the states from national and regional inventories. For this Fourth Biennial Report, the Department performed a comprehensive analysis of the EIA and solid waste data provided in the tool, and updated it with information from Maine reporting programs.

The EIA released 2009 data for the state of Maine in July 2011. National level data for 2010 was released in October 2011. The Department extended estimates of Maine's GHG emissions to 2010 by using a linear regression analysis with a least squares method.

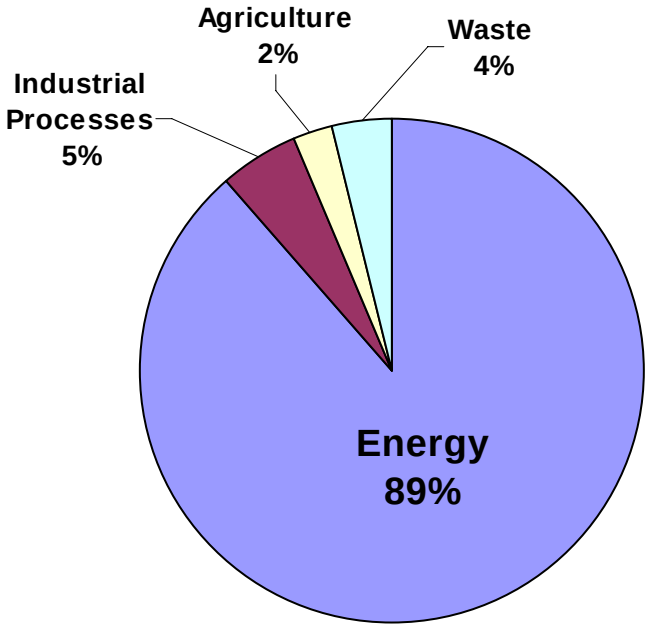
The Department did not estimate emissions or sequestration from Land Use, Land Use Change and Forestry (LULUCF) because EPA's State Inventory Tool does not provide an adequate estimation for the Forest in New England. This is consistent with the approach taken by other New England states for developing GHG inventories at this time. LULUCF will be addressed in future inventories as the methodologies for estimating impacts from these activities improve.

III. Gross GHG Emissions

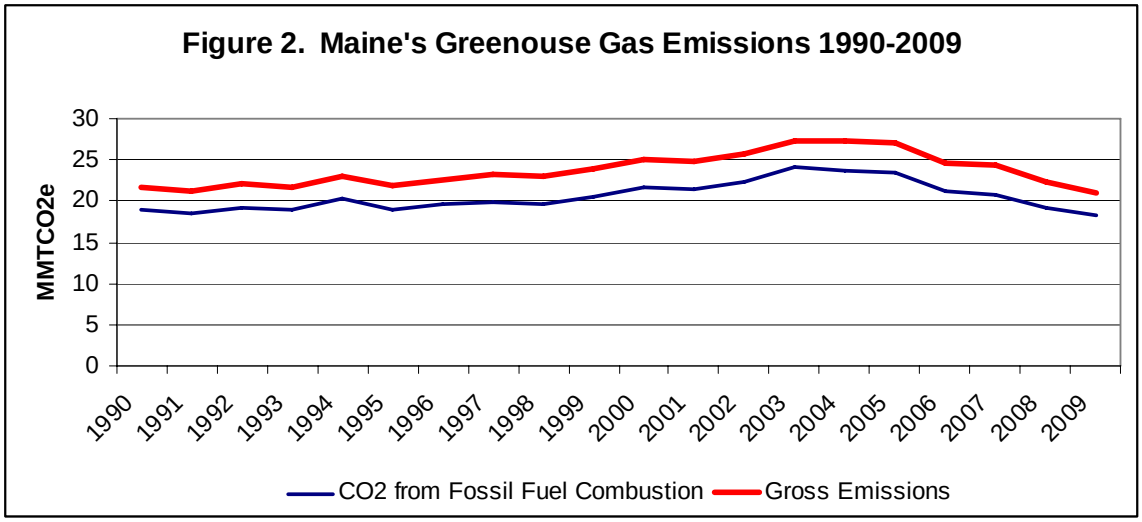
The Department's analysis indicates Maine met its goal of reducing emissions to 1990 levels by January 1, 2010. Total estimated greenhouse gas (GHG) emissions in Maine increased from 21.55 million metric tons of carbon dioxide equivalents ($MMTCO_2e$) in 1990 to a peak of 27.34 $MMTCO_2e$ in 2003, then declined to 21.00 $MMTCO_2e$ in 2009 (Appendix A).

Emissions due to Energy consumption account for 89% of Maine's gross GHG emissions.

Figure 1. 2009 Emissions by Source Category



Emissions from energy consumption include all of the CO_2 emissions from fossil fuel combustion, as well as CH_4 and N_2O. CO_2 emissions from the combustion of fossil fuels alone set the trend for the entire inventory.

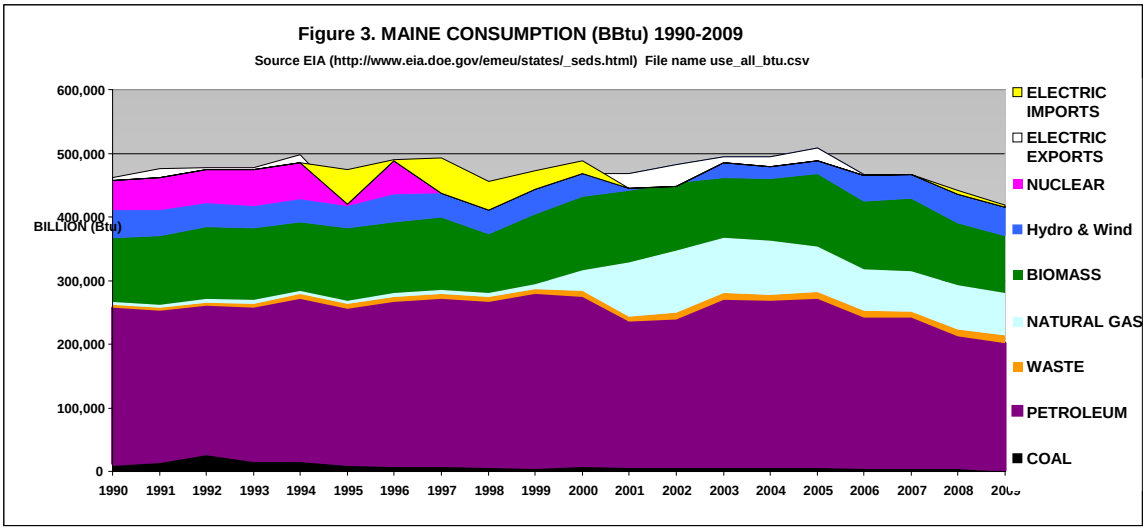


Although emissions of the other GHGs are small in comparison, they still serve as indicators of progress toward mitigation goals. Emissions from the Industrial Process, Agriculture and Waste categories in 2009 were 0.45 $MMTCO_2e$ above 1990 levels. However, emissions from these categories have been declining since a peak in 2003. Approximately 2,000 acres of waste at 397 landfill sites are accounted for in this inventory. Using the calculation methodology in the tool, offset emissions from the flaring and burning of landfill gases were completely consumed by the emissions from capped landfills.

IV. Energy Consumption

The vast majority of Maine's GHG emissions are the result of our demand for, and consumption of, energy. Accounting for GHG emissions from energy consumption is the subject of debate, but for the purposes of this inventory the Department included emissions that occur in Maine and applied EPA and IPCC methods for carbon accounting. The Department accounted for CO_2 emissions from fossil fuel combustion and waste incineration at Maine's waste-to-energy facilities (Appendix B), and treated nuclear power and renewable resources as carbon neutral. Renewable resources include Biofuel (mainly ethanol added to motor gasoline), Biomass (wood, wood waste products including black liquor and sludge), Hydroelectric, Wind, Solar and Geothermal.

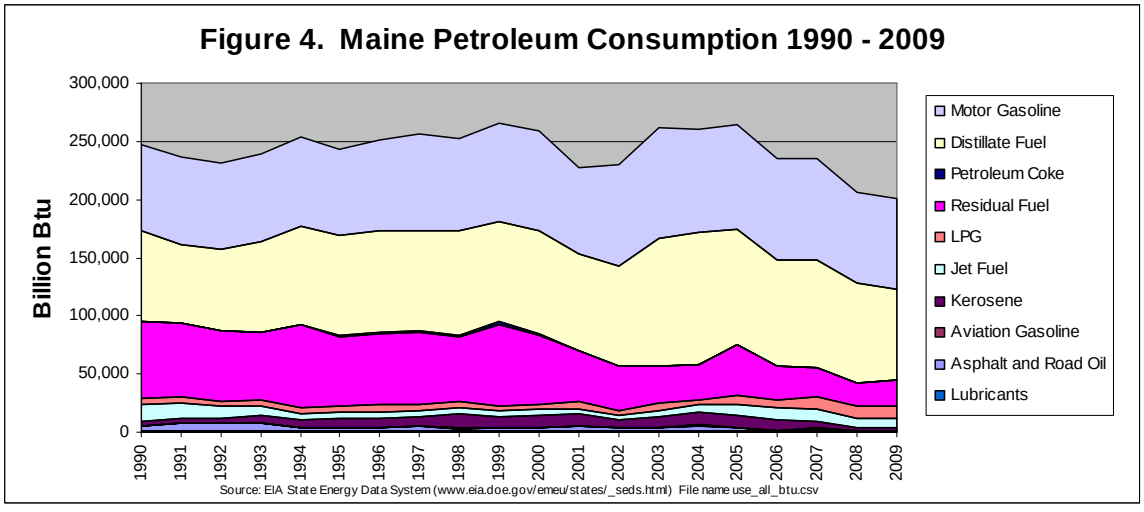
From 1990 to 2009, total energy consumption in Maine declined 7% (Appendix C). Figure 3 illustrates the energy sources used to meet Maine's energy demands, including imported electricity following the closure of Maine's nuclear power facility.



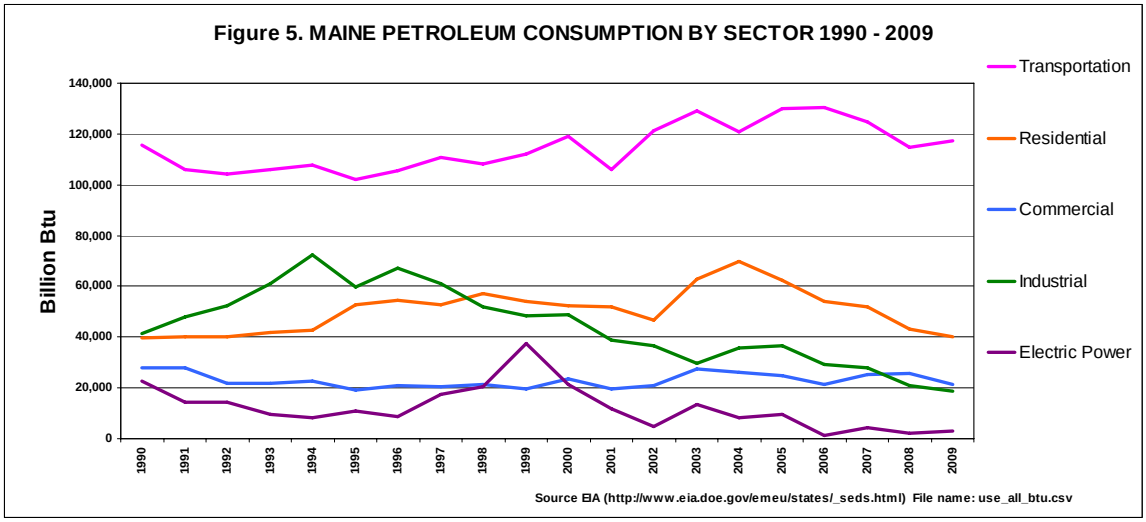
In 1990, 42% of Maine's energy sources were carbon neutral. That decreased to 33% by 2009. Much of this decrease was due to the decommissioning of Maine's Nuclear power plant. Although more energy consumed in Maine comes from carbon-emitting sources now than in 1990, CO_2 emissions have declined because higher carbon emitting petroleum combustion has been offset with lower carbon emitting natural gas.

Petroleum

In 2009, Petroleum Products provided 47% of all energy consumed and accounted for 77% of CO_2 emissions from carbon emitting energy sources. Petroleum Products include: motor gasoline, distillate fuel, petroleum coke, residual fuel, liquefied petroleum gas, jet fuel, kerosene, aviation gasoline, asphalt and road oil, lubricants, petrochemical feedstock's (naphtha's and other oils), pentanes plus, still gas, special naphtha's, unfinished oils, and waxes. Motor gasoline, distillate fuel and residual fuel account for 89% of all Petroleum Products consumed.



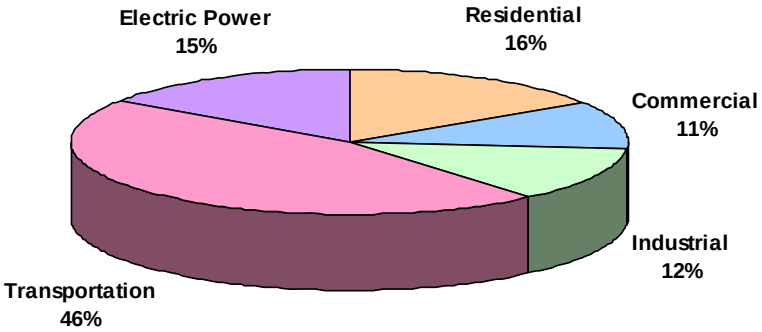
Total consumption of these three fuels has declined more than 200 million gallons since 1990. Since 2003, emissions from petroleum combustion in all sectors have declined by 3.84 $MMTCO_2$ (Appendix B).



Combustion Emissions by Sector

The Department evaluated energy consumption and associated GHG emissions in the five economic sectors defined by the Energy Information Administration – electrical generators, industrial, commercial, residential, and transportation (Appendix D) – because policies and programs for GHG emission reductions often target these sectors separately. Future efforts to reduce GHG emissions should recognize the relative contribution of each sector and how activities within those sectors impact their emissions. Figure 6 illustrates the contribution of each sector to CO_2 emissions in 2009. The Transportation sector produces almost half of all CO_2 emissions in Maine.

Figure 6. Emissions from Combustion Sources by Sector 2009



Electrical Generators

Maine's electric generating facilities consume energy to produce energy for other consumers. Maine's electric utility generators emitted 2.88 $MMTCO_2$ in 2009 (Appendix B). CO_2 emissions from petroleum combustion at electric generating facilities declined 86% since 1990 while their energy consumption only declined 7%. Nuclear power and petroleum have been largely replaced with natural gas, biomass, and waste as energy sources (Appendix E.1). Natural gas combustion accounts for 78% of the CO_2 emissions from this sector. Renewable resources (biomass, hydropower and wind) provided 54% of the energy consumed by these facilities in 2009. Additional information regarding CO_2 emissions from these facilities, as it relates to the Regional Greenhouse Gas Initiative, will be provided by the Efficiency Maine Trust in their annual report for that program.

Industrial

Maine's Industrial Sector emitted 2.32 $MMTCO_2$ in 2009. Although its use has declined, petroleum continues to be the largest source of CO_2 combustion emissions from the Industrial sector because it has a higher carbon emission rate than natural gas. This sector obtained 63% of the energy it consumed from renewable resources, slightly less than in 1990 (Appendix E.2). This decline may be due to increased availability of natural gas, which has higher combustion efficiency and lower criteria pollutant emissions than biomass. Natural gas has also replaced some petroleum consumption by this sector.

Commercial

The Commercial Sector emitted 1.96 $MMTCO_2$ in 2009. Increased use of natural gas has contributed to a 15% reduction in CO_2 emissions from this sector since 1990. However, petroleum continues to account for 77% of itsCO_2 emissions. Most of the energy consumed by Maine's Commercial sector is used for electricity and space heating, with petroleum serving as the largest energy source. In 2009, Maine's waste-to-energy facilities provided 11% of the energy used by this sector. (Appendices C and E.3)

Residential

The Residential Sector emitted 2.98 $MMTCO_2$ in 2009. This sector is highly dependent upon petroleum products, and significantly impacted by fuel price fluctuations. Petroleum accounts for 98% of all the CO_2 emissions from this sector. Emissions from residential petroleum use declined 37% from 2003 to 2009, returning to 1990 levels. The mix of energy sources for the Residential sector has changed little over the last two decades, however (Appendix E.4). It exceeds the Commercial sector in gallons of distillate consumed and is the least served by natural gas. The Department recommends that future programs to reduce GHG emissions include assistance for the Residential sector to decrease petroleum consumption.

Transportation

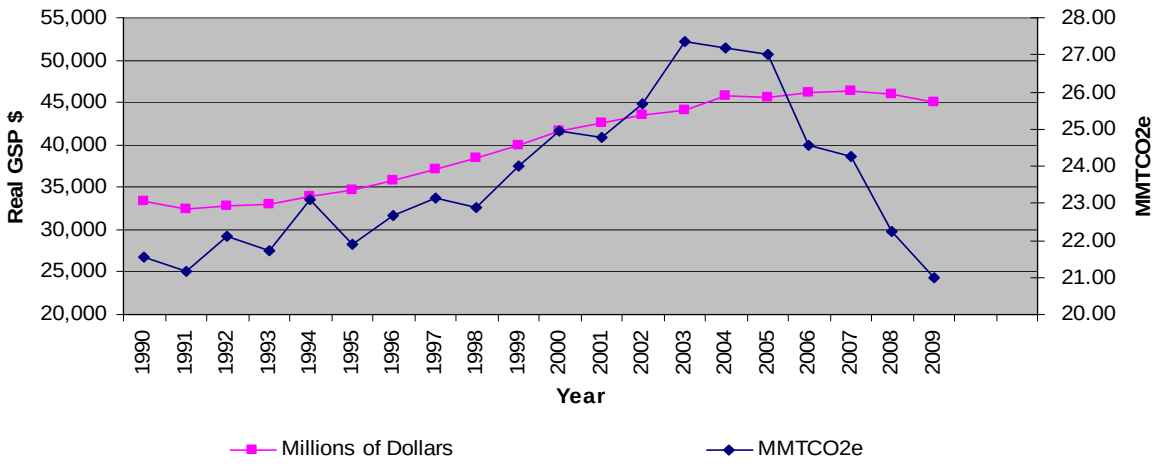
The Transportation Sector emitted 8.51 $MMTCO_2$ in 2009, 46% of total CO_2 emissions (Appendix B). Petroleum accounts for 95% of the energy consumed by the transportation sector and 99% of the CO_2 emissions (Appendices C an d E.5). The Transportation Sector consumed 7% more energy in 2009 than 1990, but total GHG emissions remained steady. CO_2 emissions increased slightly while CH_4 and N_2O declined. This is due to improved fuel efficiency of the vehicle fleet, and increased use of biofuel.

V. Economic Analysis

During development of the *Third Biennial Report* in 2009, the Department questioned how much of the decline in GHG emissions in recent years was caused by economic recession. For this *Fourth Biennial Report*, the Department used real Gross State Product to evaluate the impact of economic conditions on emissions. Real gross state product is a measure of the value of output (all final goods and services) for the state that has been adjusted for inflation (or deflation). According to the Bureau of Economic Analysis, Maine's real gross state product increased through much of the period of 1990 to 2009, suggesting that emissions reductions were not primarily related to economic activity.

Since 1990, Maine's real GSP grew from $33.379 billion to $45.002 billion in 2009[1]. During the same period, energy consumption declined from 456,827 billion Btu to 424,103 billion Btu (Figure 7). From 1990 through 2000, greenhouse gas emissions continued to rise and track very closely with Real GSP. However, beginning in 2004, GHG emissions began to decrease at an accelerating rate.

Figure 7. **Total Greenhouse Gas Emissions and Real Gross State Product**

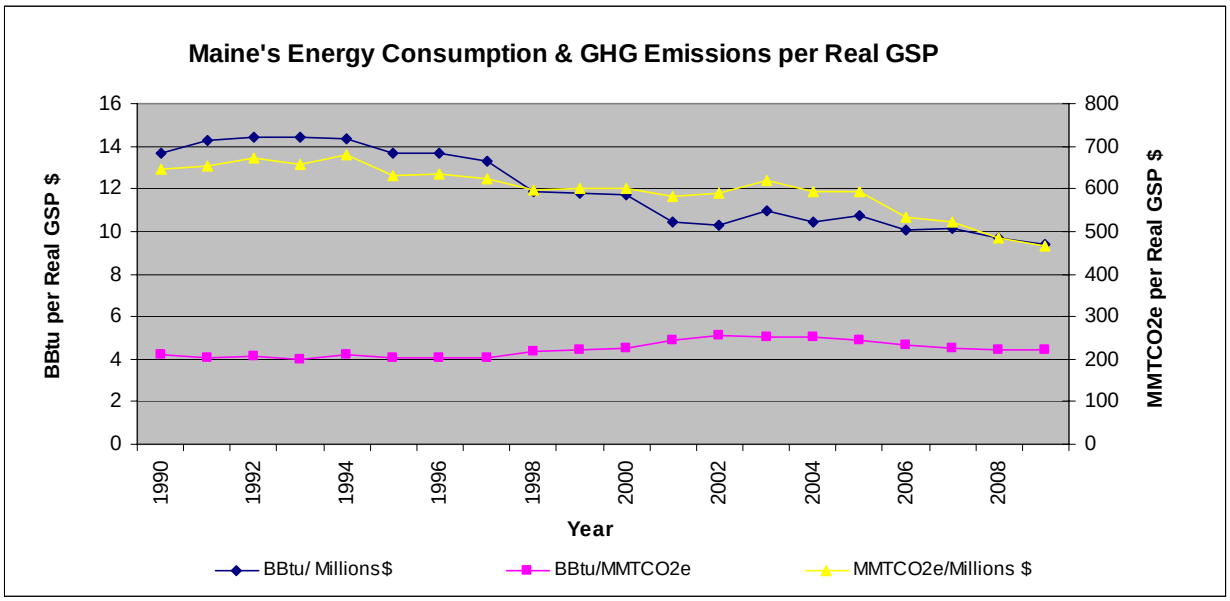


[1] U.S. Bureau of Economic Analysis. Regional Economic Accounts, Gross Domestic Product by State.

www.bea.gov/regional/gsp/

Figure 8 illustrates the relative stability of emissions per unit of heat input while the amount of energy consumed, and GHGs emitted, to generate each dollar in Maine declined over the last decade. This could indicate that Maine is moving toward a more service-oriented economy, and/or Maine's production of goods is becoming more energy efficient.

Figure 8.



VI. Conclusion

This *Fourth Biennial Report* on Maine's progress toward statutory GHG reduction targets provides an updated analysis of gross GHG emissions for the period of 1990-2010. The Department's analysis continues to indicate that Maine met the first statutory reduction target of reducing GHG emissions to 1990 levels by 2010. However, gross GHG emissions in 2009 were only 0.55 $MMTCO_2e$ below the target and preliminary estimates for 2010 suggest the downward trend may not be continuing. Therefore, the Department provides the following recommendations:

- Maine should continue to encourage replacement of petroleum products with carbon-neutral renewable energy sources, which effectively reduce GHG emissions in Maine and support economic growth.
- Future policies and programs should focus on petroleum consumption in the residential, commercial and transportation sectors.

Appendix A
Maine's Greenhouse Gas - CO_2e Emissions

$MMTCO_2e$

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Energy Total	**19.59**	**19.14**	**19.99**	**19.58**	**20.94**	**19.64**	**20.33**	**20.61**	**20.25**	**21.33**
CO_2 from Fossil Fuel Combustion	18.92	18.44	19.26	18.85	20.20	18.90	19.59	19.87	19.54	20.60
Stationary Combustion (CH_4 & N_2O)	0.26	0.28	0.29	0.29	0.28	0.29	0.29	0.28	0.24	0.27
Mobile Combustion (CH_4 & N_2O)	0.41	0.42	0.44	0.45	0.46	0.46	0.46	0.47	0.46	0.46
Industrial Processes Total	**0.86**	**0.85**	**0.91**	**1.01**	**0.99**	**1.12**	**1.12**	**1.23**	**1.29**	**1.30**
Agriculture Total	**0.44**	**0.44**	**0.44**	**0.45**	**0.45**	**0.43**	**0.46**	**0.51**	**0.54**	**0.54**
Enteric Fermentation	0.20	0.20	0.19	0.20	0.20	0.19	0.19	0.19	0.18	0.18
Manure Management	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.10	0.10
Agriculture Soil Management	0.19	0.19	0.19	0.20	0.20	0.19	0.21	0.24	0.26	0.26
Burning of Agricultural Crop Waste	-	-	-	-	-	-	-	-	-	-
Waste Total	0.66	0.71	0.76	0.66	0.72	0.72	0.75	0.79	0.82	0.85
Municipal Solid Waste	0.54	0.60	0.64	0.54	0.60	0.60	0.63	0.67	0.70	0.73
Wastewater	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Gross Emissions	**21.55**	**21.14**	**22.10**	**21.71**	**23.09**	**21.91**	**22.66**	**23.14**	**22.90**	**24.02**

Appendix A. Maine's Greenhouse Gas - CO_2e Emissions (continued)

MMTCO_2e ESTIMATED

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Energy Total	**22.38**	**22.16**	**23.01**	**24.63**	**24.32**	**23.99**	**21.64**	**21.29**	**19.66**	**18.59**	**21.25**
CO_2 from Fossil Fuel Combustion	21.66	21.47	22.37	24.03	23.75	23.41	21.12	20.78	19.15	18.17	20.81
Stationary Combustion (CH_4 & N_2O)	0.28	0.27	0.25	0.24	0.25	0.29	0.26	0.28	0.31	0.23	0.27
Mobile Combustion (CH_4 & N_2O)	0.44	0.42	0.39	0.35	0.32	0.30	0.26	0.23	0.19	0.19	0.17
Industrial Processes Total	**1.27**	**1.26**	**1.26**	**1.23**	**1.30**	**1.32**	**1.34**	**1.37**	**1.26**	**1.10**	**1.10**
Agriculture Total	**0.45**	**0.46**	**0.47**	**0.47**	**0.50**	**0.54**	**0.56**	**0.56**	**0.50**	**0.48**	**0.48**
Enteric Fermentation	0.18	0.18	0.18	0.16	0.17	0.17	0.17	0.16	0.17	0.18	0.18
Manure Management	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
Agriculture Soil Management	0.21	0.22	0.24	0.25	0.28	0.32	0.34	0.34	0.27	0.24	0.24
Burning of Agricultural Crop Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste Total	**0.87**	**0.90**	**0.95**	**1.02**	**1.07**	**1.14**	**1.02**	**1.04**	**0.80**	**0.83**	**0.85**
Municipal Solid Waste	0.75	0.78	0.82	0.89	0.94	1.01	0.90	0.92	0.68	0.71	0.73
Wastewater	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12
Gross Emissions	**24.97**	**24.78**	**25.69**	**27.34**	**27.18**	**27.00**	**24.57**	**24.26**	**22.23**	**21.00**	**23.68**

Appendix B Carbon Dioxide Emissions from Fossil Fuels and Waste incineration

$MMTCO_2$	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Residential Total	**2.98**	**2.98**	**3.00**	**3.12**	**3.20**	**3.93**	**4.04**	**3.91**	**4.22**	**4.02**
Coal	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	2.92	2.94	2.94	3.06	3.15	3.88	3.99	3.86	4.17	3.97
Natural Gas	0.03	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
WASTE	-	-	-	-	-	-	-	-	-	-
Commercial Total	**2.30**	**2.26**	**1.86**	**1.85**	**1.89**	**1.59**	**1.75**	**1.74**	**1.81**	**1.71**
Coal	0.08	0.03	0.07	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Petroleum	2.05	2.07	1.59	1.58	1.65	1.38	1.52	1.49	1.56	1.44
Natural Gas	0.09	0.10	0.12	0.12	0.13	0.13	0.14	0.15	0.13	0.14
WASTE	0.08	0.06	0.08	0.09	0.09	0.08	0.08	0.10	0.11	0.13
Industrial Total	**3.37**	**3.99**	**5.35**	**5.05**	**6.28**	**4.91**	**5.24**	**4.65**	**3.96**	**3.76**
Coal	0.52	0.84	1.91	0.98	1.06	0.65	0.53	0.44	0.32	0.27
Petroleum	2.74	3.04	3.33	3.98	5.13	4.16	4.59	4.08	3.52	3.27
Natural Gas	0.11	0.12	0.11	0.09	0.09	0.11	0.12	0.13	0.12	0.22
WASTE	-	-	-	-	-	-	-	-	-	-
Transportation Total	**8.29**	**7.59**	**7.48**	**7.61**	**7.72**	**7.31**	**7.55**	**7.93**	**7.74**	**8.00**
Coal	-	-	-	-	-	-	-	-	-	-
Petroleum	8.29	7.59	7.48	7.61	7.71	7.30	7.55	7.92	7.74	8.00
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00
WASTE	-	-	-	-	-	-	-	-	-	-
Electric Power Total	**2.14**	**1.80**	**1.76**	**1.43**	**1.35**	**1.38**	**1.26**	**1.91**	**2.14**	**3.46**
Coal	0.36	0.57	0.57	0.58	0.57	0.37	0.38	0.39	0.35	0.36
Petroleum	1.69	1.09	1.07	0.72	0.63	0.86	0.71	1.34	1.57	2.85
Natural Gas	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.03
WASTE	0.09	0.12	0.11	0.12	0.14	0.15	0.17	0.17	0.22	0.22
GROSS CO_2 Emissions	**19.08**	**18.62**	**19.45**	**19.05**	**20.43**	**19.13**	**19.83**	**20.13**	**19.88**	**20.95**
Coal	0.98	1.44	2.57	1.63	1.65	1.03	0.92	0.84	0.68	0.64
Petroleum	17.69	16.73	16.41	16.94	18.28	17.57	18.36	18.68	18.56	19.52
Natural Gas	0.24	0.26	0.28	0.27	0.28	0.30	0.31	0.34	0.31	0.44
Waste	0.16	0.18	0.19	0.21	0.23	0.23	0.24	0.27	0.33	0.35

Appendix B. (continued)

$MMTCO_2$	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential Total	**3.89**	**3.87**	**3.48**	**4.65**	**5.19**	**4.62**	**4.01**	**3.84**	**3.21**	**2.98**
Coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Petroleum	3.83	3.81	3.42	4.59	5.12	4.56	3.96	3.77	3.14	2.91
Natural Gas	0.06	0.06	0.06	0.07	0.07	0.06	0.05	0.07	0.06	0.07
WASTE	-	-	-	-	-	-	-	-	-	-
Commercial Total	**2.00**	**1.72**	**1.91**	**2.37**	**2.29**	**2.21**	**1.92**	**2.29**	**2.33**	**1.96**
Coal	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	-	-
Petroleum	1.71	1.41	1.51	1.98	1.90	1.81	1.53	1.82	1.84	1.51
Natural Gas	0.17	0.16	0.29	0.27	0.27	0.27	0.26	0.34	0.33	0.31
WASTE	0.12	0.14	0.11	0.11	0.13	0.13	0.13	0.13	0.16	0.14
Industrial Total	**4.07**	**3.74**	**3.77**	**3.26**	**3.45**	**3.67**	**3.33**	**2.96**	**2.66**	**2.32**
Coal	0.53	0.30	0.21	0.29	0.28	0.30	0.26	0.27	0.24	0.07
Petroleum	3.25	2.57	2.47	1.95	2.27	2.51	2.10	1.88	1.54	1.36
Natural Gas	0.29	0.85	1.00	0.93	0.85	0.81	0.94	0.77	0.86	0.85
WASTE	-	0.02	0.09	0.10	0.06	0.04	0.04	0.04	0.02	0.04
Transportation Total	**8.58**	**7.66**	**8.75**	**9.31**	**8.71**	**9.38**	**9.41**	**9.06**	**8.29**	**8.51**
Coal	-	-	-	-	-	-	-	-	-	-
Petroleum	8.53	7.59	8.70	9.26	8.67	9.35	9.39	9.02	8.24	8.46
Natural Gas	0.05	0.07	0.05	0.05	0.04	0.03	0.03	0.04	0.05	0.05
WASTE	-	-	-	-	-	-	-	-	-	-
Electric Power Total	**3.46**	**4.85**	**4.84**	**4.83**	**4.50**	**3.97**	**2.87**	**3.05**	**3.13**	**2.87**
Coal	0.39	0.43	0.53	0.40	0.40	0.35	0.35	0.33	0.30	0.08
Petroleum	1.63	0.88	0.36	1.01	0.62	0.73	0.08	0.34	0.17	0.24
Natural Gas	1.21	3.33	3.77	3.25	3.26	2.62	2.17	2.12	2.36	2.26
WASTE	0.23	0.21	0.19	0.17	0.22	0.27	0.27	0.26	0.28	0.30
GROSS CO2 Emissions	**22.01**	**21.84**	**22.75**	**24.42**	**24.15**	**23.85**	**21.56**	**21.21**	**19.63**	**18.65**
Coal	0.93	0.73	0.74	0.70	0.68	0.66	0.62	0.61	0.55	0.15
Petroleum	18.95	16.26	16.46	18.78	18.59	18.95	17.05	16.84	14.94	14.48
Natural Gas	1.78	4.47	5.16	4.55	4.48	3.80	3.45	3.33	3.67	3.53
Waste	0.35	0.37	0.38	0.38	0.40	0.44	0.44	0.42	0.47	0.48

Appendix C. Maine Energy Consumption
Source: EIA State Energy Data System
(www.eia.doe.gov/emeu/states/_seds.html)

COAL

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	214	9	8	6	7	5	6	6	6	0	0
Commercial	858	69	67	44	44	45	70	65	57	0	0
Industrial	5533	5687	3203	2286	3115	2973	3219	2780	2937	2633	797
Electric Power	3808	4216	4597	5664	4315	4312	3764	3767	3583	3275	856
Transportation											
COAL	**10,413**	**9,980**	**7,875**	**8,000**	**7,481**	**7,336**	**7,059**	**6,618**	**6,583**	**5,908**	**1,652**

PETROLEUM

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	39895	52266	52116	46662	62688	69791	62349	54138	51810	43348	40167
Commercial	27878	23429	19501	20725	27313	25985	25030	21182	25436	25646	21402
Industrial	41635	48770	38605	36830	29716	35558	36836	29097	28112	20998	18584
Electric Power	22502	21414	11753	4757	13442	8307	9709	1093	4535	2330	3155
Transportation	115377	119076	105823	121224	129207	120921	130180	130280	124869	114512	117298
PETROLEUM	**247,287**	**264,956**	**227,799**	**230,198**	**262,366**	**260,561**	**264,103**	**235,792**	**234,761**	**206,834**	**200,607**

NATURAL GAS

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	651	1195	1122	1105	1266	1241	1202	1036	1288	1176	1341
Commercial	1686	3194	3109	5407	5000	5023	5011	4945	6326	6280	5778
Industrial	2034	5576	16491	19391	17950	16496	15804	18260	14942	16646	16530
Electric Power	196	22889	62795	71045	61280	61515	49514	40944	39982	44611	42618
Transportation	5	932	1370	918	898	687	611	520	828	1009	874
NATURAL GAS	**4,572**	**33,785**	**84,886**	**97,865**	**86,394**	**84,963**	**72,142**	**65,705**	**63,366**	**69,722**	**67,141**

BIOFUELS

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	1	2	5	11
Industrial	0	0	0	0	0	0	0	0	0	0	0
Electric Power	0	0	0	0	0	0	0	0	0	0	0
Transportation	0	0	0	0	0	0	385	566	810	4165	5305
BIOFUELS	**0**	**0**	**0**	**0**	**0**	**0**	**385**	**567**	**813**	**4,171**	**5,317**

WASTE

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	0	0	0	0	0	0	0	0	0	0	0
Commercial	2177	2757	2811	3226	3310	3115	3169	3076	3113	3460	3521
Industrial	0	0	468	2579	2930	1374	1048	1032	928	544	905
Electric Power	2459	5321	4270	5695	5094	5473	6321	6346	6288	6215	7377
Transportation	0	0	0	0	0	0	0	0	0	0	0
WASTE	**4,636**	**8,078**	**7,549**	**11,500**	**11,334**	**9,962**	**10,538**	**10,454**	**10,329**	**10,219**	**11,803**

BIOMASS

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	4292	3556	2872	2915	3068	3145	6037	5495	6059	6340	6059
Commercial	933	751	589	557	541	529	964	893	975	1016	1020
Industrial	76963	90083	80983	75554	62981	64198	67220	61128	68158	58408	55180
Electric Power	19040	21136	28761	28064	28532	29330	39829	38528	38660	31840	27647
Transportation	0	0	0	0	0	0	0	0	0	0	0
BIOMASS	**101,227**	**115,526**	**113,205**	**107,090**	**95,122**	**97,202**	**114,050**	**106,044**	**113,852**	**97,604**	**89,906**

Hydro & Wind

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0
Industrial	13982	13221	9660	9529	10471	5644	6250	7725	6863	7509	7400
Electric Power	28568	23409	17672	18628	22020	28734	34655	34710	31064	37711	36977
Transportation	0	0	0	0	0	0	0	0	0	0	0
Hydro & Wind	**42,550**	**36,630**	**27,332**	**28,157**	**32,491**	**34,378**	**40,905**	**42,435**	**37,927**	**45,220**	**44,377**

ALL SECTORS

BILLION (Btu)	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
COAL	10,413	9,980	7,875	8,000	7,481	7,336	7,059	6,618	6,583	5,908	1,652
PETROLEUM	247,287	264,956	227,799	230,198	262,366	260,561	264,103	235,792	234,761	206,834	200,607
NATURAL GAS	4,572	33,785	84,886	97,865	86,394	84,963	72,142	65,705	63,366	69,722	67,141
BIOFUELS	0	0	0	0	0	0	385	567	813	4,171	5,317
WASTE	4,636	8,078	7,549	11,500	11,334	9,962	10,538	10,454	10,329	10,219	11,803
BIOMASS	101,227	115,526	113,205	107,090	95,122	97,202	114,050	106,044	113,852	97,604	89,906
NUCLEAR	51,436	0	0	0	0	0	0	0	0	0	0
Hydro & Wind	42,550	36,630	27,332	28,157	32,491	34,378	40,905	42,435	37,927	45,220	44,377
TOTAL	462,122	468,955	468,646	482,810	495,188	494,402	509,183	467,616	467,630	439,679	420,803
ELECTRICITY	-5,295	19,493	-23,537	-34,553	-10,642	-15,990	-20,709	-1,301	415	5,993	3,300
TOTAL net Electricity	**456,828**	**488,448**	**445,109**	**448,257**	**484,545**	**478,412**	**488,475**	**466,315**	**468,045**	**445,672**	**424,103**

ELECTRICITY EXPORTS	-5,295	0	-23,537	-34,553	-10,642	-15,990	-20,709	-1,301	0	0	0
ELECTRICITY IMPORTS	0	19,493	0	0	0	0	0	0	415	5,993	3,300

Appendix D

- **Electric Power Sector:** An energy-consuming sector that consists of electricity-only and combined-heat-and-power plants within the NAICS (North American Industry Classification System) 22 category whose primary business is to sell electricity, or electricity and heat, to the public. *Note: This sector includes electric utilities and independent power producers.*

- **Industrial Sector:** An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity: manufacturing (NAICS codes 31–33); agriculture, forestry, fishing and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23). Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. *Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities.*

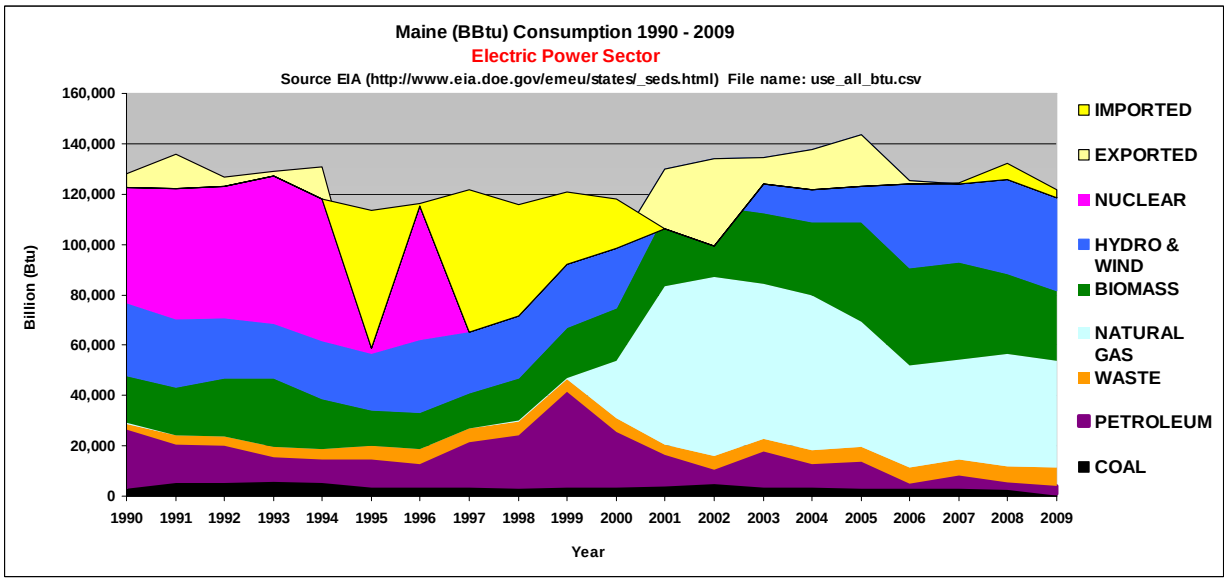
- **Commercial Sector:** An energy-consuming sector that consists of service-providing facilities and equipment of: businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. *Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.*

- **Residential Sector:** An energy-consuming sector that consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters.

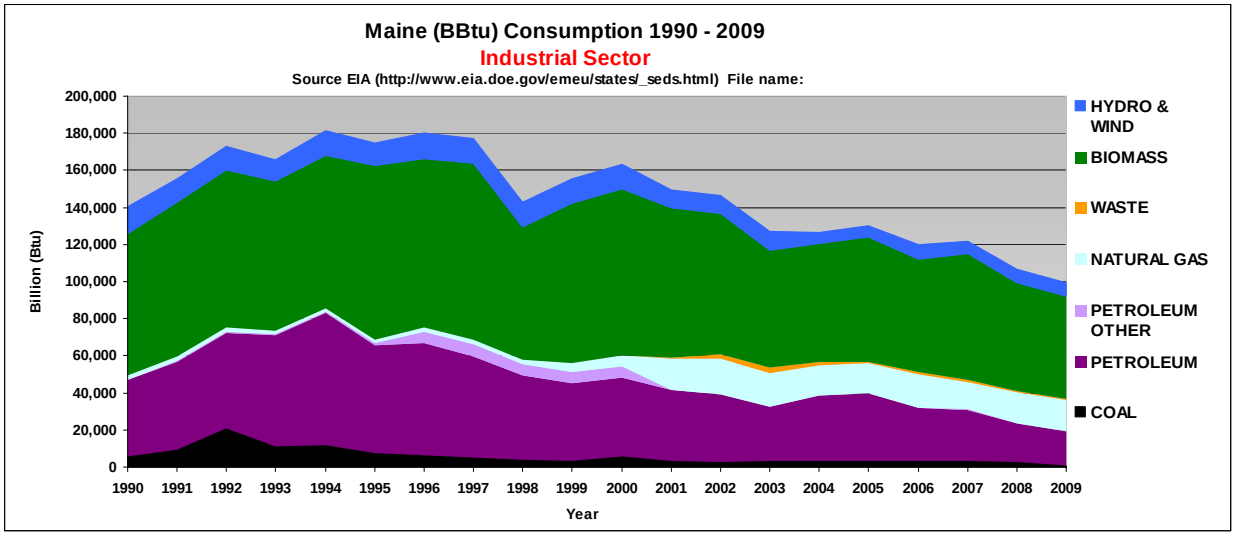
- **Transportation Sector:** An energy-consuming sector that consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts) are classified in the sector of their primary use. In this report, natural gas used in the operation of natural gas pipelines is included in the transportation sector.

Appendix E

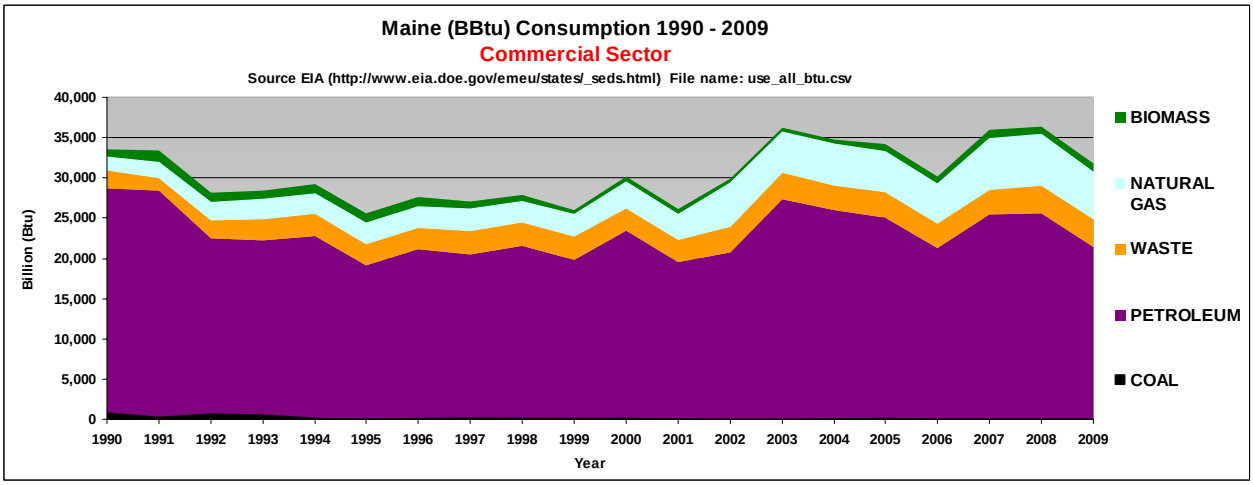
E.1. Electric Power



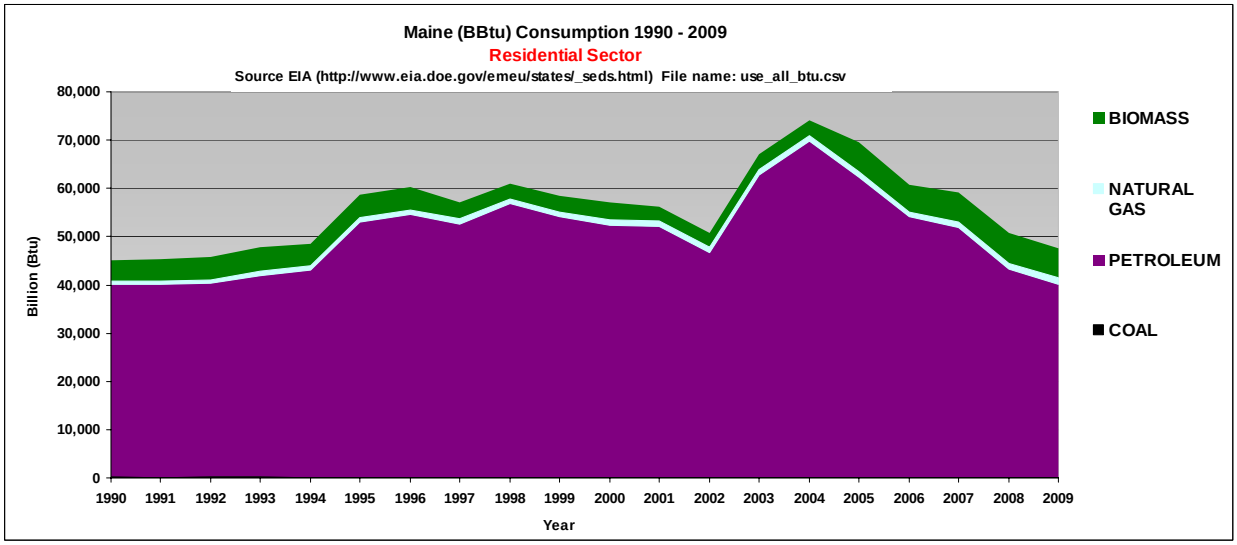
E.2. Industrial



E.3. Commercial



E.4. Residential



E.5. Transportation