

APPENDIX FIVE

EGU Inventory Methodology and Emissions for
2002, 2007, 2012 and 2020

Overview

The projection of NOx and VOC emissions from electric utility facilities in the nonattainment counties is based on methodology and specific considerations explained in this summary. The emissions are projected for 2012 and 2020 in the nonattainment areas including counties of Door, Kenosha, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan, Washington, and Waukesha.

The utility sector projection is performed on a facility by facility basis and includes emissions from both generating units and other stationary sources supporting facility operations (non-generating units). The growth in generation emissions considers the corporate utility growth in electricity demand and potential dispatch by the regional Midwest Independent Transmission System Operator (MISO) to meet broader demand as applied to baseload, intermediate, and peaking load generation units. Growth in non-generation unit emissions addresses the specific purpose of the unit (backup, emergency generation, etc...). The projection of emissions is based on actual emission rates, existing emission limits, and Wisconsin NOx RACT emission limits.

Electric Generation Units

Growth in Electricity Demand

The growth in electricity consumption by load type (base, intermediate, and peaking) is based on growth rate projections by the Wisconsin Public Service Commission, WPSC (1) and historic growth rates (2). An assessment of the historic growth rates in electricity is presented in Table 1. The electricity demand is for four major utilities accounting for the majority of electricity sales in eastern Wisconsin and is used to represent historic growth of electricity in the nonattainment areas.

Table 1: Growth in Annual Load and Peak Electricity Demand in Eastern Wisconsin

Year	ANNUAL LOAD*			SUMMER PEAK DEMAND*			
	Million kWh	Annual Growth	Average Annual Growth	MW	Annual Growth	Average Annual Growth	
1995	55821	4.6%	2.0%	9833		1.6%	
1996	58408	2.6%		9061	-7.9%		
1997	59946	-0.6%		9313	2.8%		
1998	59563	4.1%		10099	8.4%		
1999	61990	3.4%		10756	6.5%		
2000	64084	-3.7%		10814	0.5%		
2001	61701	9.7%		11645	7.7%		
2002	67698	1.8%		11401	-2.1%		
2003	68886	-0.9%		11688	2.5%		1.2%
2004	68296	3.1%		10981	-6.0%		0.5%
2005	70441	-4.6%	11946	8.8%			
2006	67216	2.9%	12129	1.5%			
2007	69145	4.6%	11698	-3.6%			

* We Energies, Alliant Energy, Wisconsin Public Service Corporation, and Madison Gas and Electric

Summer peak demand represents the instantaneous highest load and corresponds to short-term swings in electricity needs. This variable increment of electricity demand is assumed to be met by combustion turbine peaking generation units. The Wisconsin PSC projects a growth in summer peak demand of 2.35% on an annual basis through 2012. The historic growth shown in Table 1 is calculated to be 2.0%, 1.1%, and 0.4%, respectively from 1995, 2000, and 2002, on an annual average basis. Therefore, 2.35% appears to be a conservative estimate of the annual growth rate for use of combustion turbine peaking units.

The growth in ozone season baseload and intermediate load generation is interpolated from the annual and summer peak electricity demand growth rates. Both of these load types typically grow at rates lower than peaking demand growth. A large portion of annual load growth represents ozone season baseload and to a lesser degree combined cycle usage. Therefore, historically, the growth is assumed to be less than 1.6% and included to some degree in the 2.0% annual load demand. Therefore 2.0% annual growth is used to represent conservative growth in baseload and intermediate load generation units.

The annual growth rates assumed to represent growth in ozone season electricity demand by load type in this analysis are shown in Table 2.

Table 2: Growth in Assumed Ozone Season Electricity Demand by Load Type

Load Type	Baseload	Intermediate	Peaking
Generation Units	Coal and Nuclear	Combined Cycle and Small Gas-Fired Boilers	Combustion Turbines
Annual Electricity Growth	2.0%	2.0%	2.35%

Baseload Unit Emissions

Three utilities have baseload generation units emitting NOx and VOC in the nonattainment areas: We Energies, Alliant Energy, and Manitowoc Public Utility (MPU). The majority of We Energies generation capacity is within the nonattainment area. Whereas Alliant Energy operates one baseload facility in Sheboygan County with addition two large facilities outside of the nonattainment area. Manitowoc Public Utility is a single facility owned and operated by the City of Manitowoc in Manitowoc County. All of the units operated by the utilities are dispatched by MISO.

The baseload emissions on an average summer day basis is determined for each baseload unit as the product of projected ozone season heat input and emission rate divided by 153 days. Projecting the heat input for each utility baseload unit is based on a number of factors and considerations for each corporate utility system as a whole. The steps following in projecting the heat input are outlined below.

- The projected total baseload generation demand for each utility system is calculated by growing the 2005 generation for all baseload units (including nuclear fueled units) by the assumed 2% annual growth rate. The 2005 baseload generation is calculated

using the ozone season heat input reported to the EPA Clean Air Market program (3) by the heat rate for each unit reported to the Energy Information Administration by the utilities (4).

- The existing baseload units are then dispatched to meet the projected electricity demand for the each utility system as a whole. The maximum ozone season capacity is assumed to be 95% for nuclear units, 98% for large coal fired units greater than 1000 mmBtu/hr, 90% for all fluidized bed boilers, and 75% for the remaining smaller coal fired units. If, however, a higher capacity factor is demonstrated by the 2005 through 2008 ozone season data that value is assumed as the maximum. The hierarchy of dispatch is as follows:
 1. Nuclear units.
 2. Units in the nonattainment areas in order of dispatch preference demonstrated by the 2005 to 2008 data.
 3. Units outside of the nonattainment areas in order of dispatch preference demonstrated by the 2005 to 2008 data.
- New baseload units in the utility system are assumed to operate at 95% capacity factor. This is because these units are the most efficient in the system and are assumed to be fully dispatched by MISO to either meet the utility's demand or broader regional demand.

The known new units in the utility systems that were not operating by 2005 are the We Energies elm road pulverized coal units currently under construction, the Manitowoc fluidized bed boiler #9, and 100 MW of added nuclear capacity. No further new generation units appears to be required as the utilities meet the projected demand through the existing and known new units accounted for in the analysis.

- The ozone season NO_x emissions for each emission unit are then calculated using the heat input resulting from meeting electricity demand or operating new units for MISO dispatch. The assumed emission rates are the most stringent of applicable Wisconsin NO_x RACT emission limits, Consent Decree Requirements, or actual 1995 emission rates.
- The ozone season VOC emissions is determined by multiplying the actual 2005 VOC emissions by the ratio of 2005 to projected capacity factors for each generation unit.

Intermediate and Peaking Unit Emissions

The NO_x and VOC emissions for intermediate combined cycle and peaking combustion turbine units are projected solely on growing the each unit's 2005 emissions by the assumed annual growth rates. As stated, the assumed growth rate for combined cycle units is 2.0% and for combustion turbines is 2.35%. No maximum capacity factor limitation is placed on these types of generation units. It is assumed that additional

capacity will be built in the same location at the same emission rates of the existing equipment.

Non-generating Unit Emissions

The non-generating units are comprised of equipment which supports the primary electric generating units at the utility facilities. This equipment consists of emergency generators and backup-boilers. Since this equipment is not typically operated on an anticipated basis or schedule the total emissions are assumed to remain the same across the system.

Results

The 1995 and projected average summer day emissions from electric generating facilities in the ozone nonattainment areas are summarized in Tables 3 and 4. Although the electric generation projection allows for dispatch under MISO in meeting regional electric demands, the total potential NOx decreases slightly from 2007 to 2020. The decrease in NOx is not larger because of the planned addition of the Elm Road Generating Station in Milwaukee County between 2009 and 2010. Although there are no additional VOC controls assumed from current levels, the total VOC emissions increase by less than 1.5 tons per summer day by 2020.

Table 3: Summary of Electric Generating Facility Emissions by Nonattainment Area

County	NOx			VOC		
	Tons per Ozone Season Day			Tons per Ozone Season Day		
	2007	2012	2020	2007	2012	2020
Door	-	-	-	-	-	-
Kenosha	9.97	15.95	16.31	0.57	0.74	1.04
Manitowoc	1.73	2.35	2.35	0.02	0.02	0.03
Milwaukee	22.13	33.16	25.80	0.36	0.62	1.27
Ozaukee	0.69	0.77	0.93	0.05	0.06	0.07
Racine	0.01	0.01	0.01	0.00	0.00	0.00
Sheboygan	12.35	14.44	9.82	0.13	0.22	0.47
Washington	0.42	0.48	0.57	0.03	0.03	0.03
Waukesha	0.25	0.28	0.33	0.01	0.01	0.01
TOTAL	47.55	67.44	56.13	1.17	1.70	2.92

References

- 1) Wisconsin Public Service Commission, 2006, Strategic Energy Assessment 2012- Final Report, February 2007, Docket 5-ES-103, 610, North Whitney Way, Madison, Wisconsin.
- 2) Wisconsin Department of Administration, 2007, Wisconsin Energy Statistics 2006, Division of Energy, 101 East Wilson Street, Madison, Wisconsin.
- 3) USEPA, 2007, Heat input for the 2005 ozone season obtained for the acid rain database, Clean Air Markets Division., <http://cfpub.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard>.
- 4) USEPA, 2006, Heat rates from "NEEDS" database used as input for EPA IPM modeling 3.0., Clean Air Markets Division.

Table 4: Emissions by County and Electric Facility Unit Type

NOx EGU Emissions Estimate

FIPS	County	2007					2012				
		Baseload	Intermediate	Peaking	Misc/Backup	Total	Baseload	Intermediate	Peaking	Misc/Backup	Total
55029	Door	-	-	-	-	-	-	-	-	-	-
55059	Kenosha	8.26	0.16	1.50	0.05	9.97	14.04	0.18	1.68	0.05	15.95
55071	Manitowoc	1.72	-	0.01	0.00	1.73	2.33	-	0.01	0.00	2.35
55079	Milwaukee	20.77	0.01	1.35	-	22.13	31.63	0.01	1.52	-	33.16
55089	Ozaukee	-	0.03	0.66	-	0.69	-	0.04	0.74	-	0.77
55101	Racine	-	0.01	-	-	0.01	-	0.01	-	-	0.01
55117	Sheboygan	12.23	-	0.12	-	12.35	14.31	-	0.13	-	14.44
55131	Washington	-	-	0.42	-	0.42	-	-	0.48	-	0.48
55133	Waukesha	-	0.25	-	-	0.25	-	0.28	-	-	0.28
TOTAL		42.97	0.47	4.06	0.05	47.55	62.31	0.52	4.56	0.05	67.44

FIPS	County	2018					2020				
		Baseload	Intermediate	Peaking	Misc/Backup	Total	Baseload	Intermediate	Peaking	Misc/Backup	Total
55029	Door	-	-	-	-	-	-	-	-	-	-
55059	Kenosha	14.04	0.20	1.93	0.05	16.22	14.04	0.21	2.01	0.05	16.31
55071	Manitowoc	2.33	-	0.02	0.00	2.35	2.33	-	0.02	0.00	2.35
55079	Milwaukee	23.97	0.01	1.75	-	25.73	23.97	0.01	1.82	-	25.80
55089	Ozaukee	-	0.04	0.85	-	0.89	-	0.04	0.88	-	0.93
55101	Racine	-	0.01	-	-	0.01	-	0.01	-	-	0.01
55117	Sheboygan	9.67	-	0.15	-	9.82	9.67	-	0.16	-	9.82
55131	Washington	-	-	0.55	-	0.55	-	-	0.57	-	0.57
55133	Waukesha	-	0.31	-	-	0.31	-	0.33	-	-	0.33
TOTAL		50.00	0.58	5.24	0.05	55.88	50.00	0.61	5.47	0.05	56.13

VOC EGU Emissions Estimate

FIPS	County	2007					2012				
		Baseload	Intermediate	Peaking	Misc/Backup	Total	Baseload	Intermediate	Peaking	Misc/Backup	Total
55029	Door	-	-	-	-	-	-	-	-	-	-
55059	Kenosha	0.51	0.04	0.02	0.00	0.57	0.67	0.05	0.02	0.00	0.74
55071	Manitowoc	0.01	-	0.00	0.00	0.02	0.02	-	0.00	0.00	0.02
55079	Milwaukee	0.36	0.00	0.01	-	0.36	0.62	0.00	0.01	-	0.62
55089	Ozaukee	-	0.00	0.05	-	0.05	-	0.00	0.06	-	0.06
55101	Racine	-	0.00	-	-	0.00	-	0.00	-	-	0.00
55117	Sheboygan	0.11	-	0.02	-	0.13	0.20	-	0.02	-	0.22
55131	Washington	-	-	0.03	-	0.03	-	-	0.03	-	0.03
55133	Waukesha	-	0.01	-	-	0.01	-	0.01	-	-	0.01
TOTAL		0.99	0.06	0.12	0.00	1.17	1.51	0.06	0.13	0.00	1.70

FIPS	County	2018					2020				
		Baseload	Intermediate	Peaking	Misc/Backup	Total	Baseload	Intermediate	Peaking	Misc/Backup	Total
55029	Door	-	-	-	-	-	-	-	-	-	-
55059	Kenosha	0.89	0.05	0.02	0.00	0.97	0.96	0.06	0.03	0.00	1.04
55071	Manitowoc	0.03	-	0.00	0.00	0.03	0.03	-	0.00	0.00	0.03
55079	Milwaukee	1.10	0.00	0.01	-	1.11	1.26	0.00	0.01	-	1.27
55089	Ozaukee	-	0.00	0.06	-	0.07	-	0.00	0.07	-	0.07
55101	Racine	-	0.00	-	-	0.00	-	0.00	-	-	0.00
55117	Sheboygan	0.38	-	0.02	-	0.41	0.45	-	0.02	-	0.47
55131	Washington	-	-	0.03	-	0.03	-	-	0.03	-	0.03
55133	Waukesha	-	0.01	-	-	0.01	-	0.01	-	-	0.01
TOTAL		2.40	0.07	0.15	0.00	2.62	2.69	0.07	0.16	0.00	2.92