

**Michigan Department of Energy, Labor & Economic Growth**  
**Michigan Public Service Commission**  
**Methods for Calculating Regional Electric Generation**  
**Fuel Mix, Emissions, and Nuclear Waste Disclosure Data**

**Revised: February 2011**

Section 10(r) of Michigan PA 141 of 2000 requires electricity suppliers to disclose customer information related to the suppliers' fuel mix and emissions and requires that electric suppliers use a regional average fuel mix and emissions data when the fuel mix cannot otherwise be determined, along with the regional electric generation fuel mix, emissions, and nuclear waste characteristics. The Michigan Public Service Commission (MPSC) in its June 5, 2001 order, in Case No. U-12487, directed Commission Staff to calculate and make available the regional electricity generation and environmental characteristics to be used by all of Michigan's generation providers. The methods that the MPSC uses to update the regional generation characteristics are described below.

### **Reporting by MPSC Staff**

The MPSC Staff will update the regional generation characteristics information once a year. The update will be completed and made available on the MPSC Web site by November 1st of each year.

The Energy Information Administration (EIA) has revised the data tables it offers, which has necessitated a revision to the methods used for calculating regional electric generation fuel mix and emissions. The method for calculating regional nuclear waste disclosure data has not changed from prior years.

### **Fuel Sources, Emissions, and Nuclear Waste Data Sources**

Data on the kilowatt-hour (kWh) generation by fuel source is published in the EIA's "Electric Power Monthly" (DOE/EIA-0226). The publication is available on EIA's web site at:

[http://www.eia.doe.gov/cneaf/electricity/epm/epm\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html)

Specifically, Table 1.6.B, "Net Generation by State by Sector, Year-to-Date" at ([http://www.eia.doe.gov/cneaf/electricity/epm/table1\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table1_6_b.html)) shows the sources for total generation by state for all sectors, and gives a year-to-date comparison for current year and previous year. Likewise, Tables 1.7.B through 1.13.B and 1.15.B and 1.16.B provide year-to-date breakdowns by fuel source (e.g., coal, gas, oil, nuclear, etc.). From Table 1.6.B, use the % difference in total generation for current year versus previous year, as a basis to prorate the most recently available annual totals for each fuel source type given in the table indicated below.

[http://www.eia.doe.gov/cneaf/electricity/epa/epa\\_sprdshts\\_monthly.html](http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts_monthly.html)

In most cases, the most recently available annual total will lag by one to two years.

Emissions (sulfur dioxide, nitrogen oxides, and carbon dioxide) data and other environmental information are reported using EIA forms EIA-860, "Annual Electric Generator Report" and

EIA-923, “Utility, Non-Utility, and Combined Heat & Power Plant Database.”<sup>1</sup> Emissions data is disseminated annually in the Electric Power Annual report found on the EIA web site at:

[http://www.eia.doe.gov/cneaf/electricity/epa/epa\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html)

The state data tables used to develop the “Electric Power Annual” report, as well as historical data, can be found on the EIA web site at:

[http://www.eia.doe.gov/cneaf/electricity/epa/epa\\_sprdshts.html](http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html)

Specifically, state emission data can be found in the “U.S. Electric Power Industry Estimated Emissions by State (EIA-767, EIA-906, EIA-930 and EIA-923)” data table on the EIA web site at:

[http://www.eia.doe.gov/cneaf/electricity/epa/emission\\_state.xls](http://www.eia.doe.gov/cneaf/electricity/epa/emission_state.xls)

This data lags by one to two years.

Nuclear waste, for purposes of this disclosure, is the amount of nuclear fuel waste produced by the nuclear generation plants in the five-state region. The state level data is available from EIA, as noted on the EIA web site at:

[http://www.eia.doe.gov/cneaf/nuclear/spent\\_fuel/ussnfdata.html](http://www.eia.doe.gov/cneaf/nuclear/spent_fuel/ussnfdata.html)

The database is available on CD-ROM. The database has individual plant information, which is supplied by each utility and the database variable used for the regional calculation is megawatt-days per metric ton of fuel discharged. The data is compiled from EIA Form RW-859. The individual plant waste calculations are weighted to a regional average based on the output of each plant. Nuclear generation by State and by Reactor is available on the EIA web site at:

[http://www.eia.doe.gov/cneaf/nuclear/page/nuc\\_generation/gensum.html](http://www.eia.doe.gov/cneaf/nuclear/page/nuc_generation/gensum.html)

Note that the weighting by generation or plant rating does not yield a nuclear waste figure significantly different than a simple average of the waste levels for each plant for a regional or national level calculation.

The sources for the fuel mix and emissions data is summarized in Table A below.

### **Calculation Method: Fuel Sources**

Generation by fuel type in megawatt-hours (MWh) is summed for the five-state East North Central (ENC) Region (Michigan, Illinois, Indiana, Ohio, and Wisconsin) and includes utility generation plus non-utility generation from the relevant EIA report tables. Total generation is utility generation plus non-utility generation from the EIA report tables.

The portions for each fuel are calculated and presented as a percentage of total generation. Data is presented as whole number percentages and rounded to the nearest whole number. Fuel percentages

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<sup>1</sup> Starting in 2007, forms EIA-860 and EIA-923 collected most of the data formerly collected on forms EIA-767 and EIA-906.

that are less than 0.5 percent shall be given as less than 0.5 percent, and not rounded to zero. If the sums of the individual fuel type percentages do not total 100 percent, the fuel type with the largest percentage (currently coal) shall be adjusted so that the sum of percentages yields a total of 100 percent.

For each fuel type, the regional percentage is calculated by the following formula:

$$\text{Fuel type percentage} = \text{ENC Generation by fuel type} / \text{ENC Total generation}$$

### **Calculation Method: Emissions**

Emissions values for sulfur dioxide, nitrogen oxides, and carbon dioxide are summed for the states of Michigan, Illinois, Indiana, Ohio, and Wisconsin to calculate the regional total. This data is reported in metric tons, which are converted to pounds by multiplying the totals by the value 2204.6 (2204.6 pounds per metric ton).

To calculate pounds of emissions per MWh, as required in PA 141, the emissions data is divided by the total electric generation by fossil fuel sources (coal, petroleum, and gas) in the five-state region.

For each emission type, the regional emissions are calculated by the following formula:

$$\text{Emissions per MWh} = \text{ENC Emissions} / \text{ENC Total fossil fuel generation}$$

### **Calculation Method: Nuclear Waste**

The nuclear waste calculation is an estimate of the average pounds of nuclear fuel discharged per MWh generated for the nuclear plants for the five-state region. The EIA database includes the variable "burn rate" (megawatt-days of thermal energy produced per metric ton of nuclear fuel discharged) for every nuclear fuel bundle removed during the entire operating life of each nuclear plant in the nation.

For the nuclear waste calculation, the burn rate for the most recent operating cycle is used, and at the current time this would be no later than EIA's last survey year of 1998. The fuel cycle for each plant is different, so the most recent cycle for each plant in EIA's database will generally cover approximately two years of data.

A simple average of the burn rate for the discharged fuel is calculated first. For example, the database shows that Detroit Edison's Fermi II nuclear plant data was in its sixth fuel cycle, and that 222 fuel bundles had been removed by the time the reporting period to EIA had ended, with a simple average burn rate of 31,241 megawatt-days per metric ton of fuel discharged.

The simple averages for each plant are then weighted by the generation of the plant relative to the total nuclear generation in the region. This calculation yields a weighted average of the burn rate for the region.

This regional average burn rate is the thermal output of the nuclear fuel and must be converted to electric energy. The Staff conversion assumes the national average heat rate for nuclear generation, which is 10,678 Btu/kWh, or an efficiency of 0.328. (Source: EIA estimate for the year 2004.)

*Regional average burn rate \*0.328 = Regional MWD/Mtu, where:*

*MWD = megawatt-days of electric generation,*

*Mtu = metric ton of nuclear fuel discharged.*

The regional MWD figure is then converted to pounds per MWh by applying the following factors:

*Megawatt-day = 24 megawatt-hours;*

*Metric ton = 2,204.6 pounds*

**Table A**  
**Data Sources and Historic Periods**  
**Regional Average Electric Power Generation Sources and Emissions**

<b>Fuel Source</b>	<b>Regional Average Data Source</b>	<b>Table</b>	<b>Historic Data Period</b>
Coal	EIA "Electric Power Monthly"	Table 1.7.B	Recent 12 months
Nuclear	EIA "Electric Power Monthly"	Table 1.12.B	Recent 12 months
Gas	EIA "Electric Power Monthly"	Tables 1.10.B and, 1.11.B	Recent 12 months
Oil	EIA "Electric Power Monthly"	Tables 1.8.B and 1.9.B	Recent 12 months
Hydroelectric	EIA "Electric Power Monthly"	Tables 1.13.B	Recent 12 months
Renewable Fuels	EIA "Electric Power Monthly"	Tables 1.14.B	Recent 12 months
Biofuel	EIA "Electric Power Monthly"	2001 - Present Net Generation by State by Type of Producer by Energy Source	Recent 12 months
Biomass	EIA "Electric Power Monthly"	2001 - Present Net Generation by State by Type of Producer by Energy Source	Recent 12 months
Solar	EIA "Electric Power Monthly"	2001 - Present Net Generation by State by Type of Producer by Energy Source	Recent 12 months
Wind	EIA "Electric Power Monthly"	2001 - Present Net Generation by State by Type of Producer by Energy Source	Recent 12 months
Wood	EIA "Electric Power Monthly"	2001 - Present Net Generation by State by Type of Producer by Energy Source	Recent 12 months

<b>Emission/Waste</b>	<b>Regional Average Data Source</b>	<b>Table</b>	<b>Historic Data Period</b>
Sulfur Dioxide	Electric Power Annual	Estimated Emissions by State	Calendar Year
Carbon Dioxide	Electric Power Annual	Estimated Emissions by State	Calendar Year
Oxides of Nitrogen	Electric Power Annual	Estimated Emissions by State	Calendar Year
High-Level Nuclear Waste	EIA database: RW859ALL1998 (ON CD-ROM)	--	Last Fuel Cycle ending 2002

Note: Michigan's region for this presentation is comprised of Michigan, Illinois, Indiana, Ohio, and Wisconsin, as ordered by the Michigan Public Service Commission in Case No. U-12487 on June 5, 2001.

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