Documentation of ERTAC EGU CONUS Versions 2.5 and 2.5L2

12/10/2016

ERTAC EGU Committee

Contents

1. Introduction

The ERTAC Electricity Generating Unit (EGU) Committee develops reference runs for the continental United States (CONUS). CONUS 2.5 and 2.5L2 are based on 2011 base year continuous emission monitoring (CEM) data and growth factors from the AEO2015 High Oil and Gas Scenario (US Energy Information Administration April 2015). Input files to version 2.5, completed in June 2016, were developed using input received from a significant outreach effort to states and stakeholders. Shortly thereafter, updates from the midwest and northeast prompted a minor revision titled v2.5L2 which was complete in August 2016, using input files current as of August 2016. Both v2.5 and v2.5L2 were run by VA DEQ and IN DEP. The contact person for questions about these run files is Doris McLeod (804-698-4197).

The ERTAC EGU Committee maintains and distributes reference runs for the continental United States (CONUS), including the hourly input, output, summary, and documentation files for each run. These reference runs and complete documentation of the ERTAC EGU Tool is located on the MARAMA web site located here:

http://www.marama.org/2013-ertac-egu-forecasting-tool-documentation

2. ERTAC Input Files

The ERTAC EGU Tool input files are built by the ERTAC leadership committee from a wide variety of existing data. These input files are subject to periodic quality assurance and updating by state agency staff. Agencies provide information on new units and controls, fuel switches, shutdowns and other unit-specific changes. Periodic updates of these input files drive creation of new run versions. The ERTAC EGU tool projects fossil fuel fired units that report emissions to USEPA Clean Air Markets Division (CAMD) and serve a generator of at least 25 MW (there are some exemptions in the North East where units are sized less than 25 MW).

A key data source are the hourly reports of generation and emissions collected by CEM and electronically reported to CAMD by facilities for the base year, in this case 2011. Base year SO_2 and NO_X emission rates (lb/mmbtu) are calculated from this data. Future emission rates are developed from base year rates adjusted to account for state knowledge of expected emission controls, fuel switches, retirements, and new units.

The primary sources of expected future change in generation is the Energy Information Agency (EIA) annual projection of future generation and the National Energy Reliability Corporation (NERC) projection of peak generation rates. This information is available by region and fuel type. Where states have local projections these are preferred over national sources. Future generation by unit is estimated by merging these national, regional and state growth files with state knowledge of unit level changes. Hourly future emissions of NO_X and SO_2 are calculated by multiplying hourly projected future heat input by future emission rates.

ERTAC EGU Tool input files are as follows:

- **Base Year Hourly CEM data** – This file contains hourly generation and emissions data extracted from EPA's CAMD database. In unit-specific situations where base year hourly data need to be modified, the tool allows the user to provide a non-CAMD hourly file, which may be used to adjust or add data to the base year hourly CEM file.
- **Unit Availability File (UAF)** – This file contains unit specific information derived from CAMD NEEDS database, state input, EIA Form 860, and NERC data. This file is maintained by the ERTAC committee and provides information on changes to specific units from the base to the future year. For example, the UAF captures actual or planned changes to utilization fractions, unit efficiency, capacity, or fuels. State/Local/Tribal (S/L/T) agencies have also added information on actual and planned new units and shutdowns.
- **Control File** – This file contains a table of known future unit specific changes to SO_2 or NO_X emission rates (in terms of lbs/mmBtu) or control efficiencies (for example, addition of a scrubber or selective catalytic reduction system). This information is provided by S/L/T agency staff. This file also provides emission rates for units that did not operate in the base year.
- **Seasonal Controls File** – This optional file may be used by S/L/T agencies to enter seasonal or periodic future year emissions rates for specific units for use in future year runs. This file may be used in addition to, or as an alternative to, the Control File.

- **Input Variables File** – This file contains a table of variables used in the projection run. Regions and fuel characteristics are not hardwired into the model. Rather, the regions and their characteristics are specified in the Input Variables File. This file allows the S/L/T agencies to specify variables such as the size, fuel type and location for new units. In addition, the regional scheme and fuel types are specified in this file.
- **Growth Factor File** – This file contains a table of growth factors developed from the EIA Annual Energy Outlook (AEO) and NERC projections or other sources, as appropriate. Electrical generation growth is delineated by geographic region and generating unit type.

3. GROWTH FACTORS

Generation for future years by fuel type are based on growth rates which are differentiated by annual, nonpeak, and peak rates.

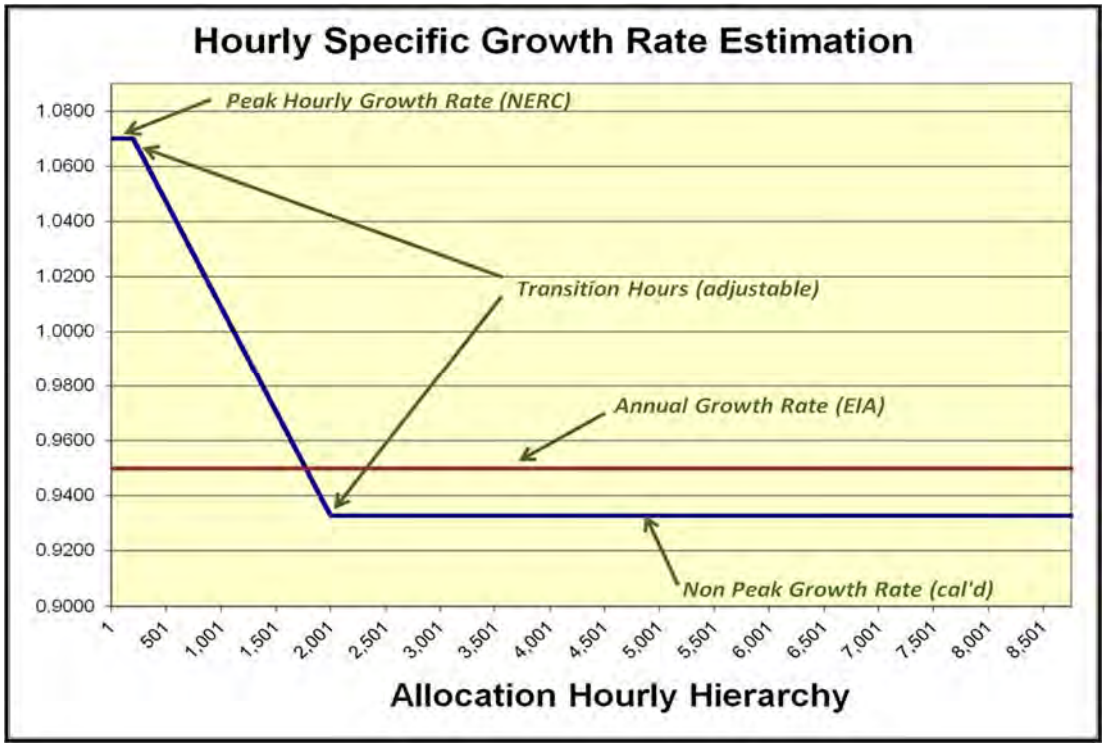
Annual growth rates are provided by EIA in their AEO. Annual average regional growth factors are calculated by dividing AEO future year by base year generation.

Peak growth rates are provided by NERC. The NERC peak growth rates are not delineated by fuel so each fuel has the same peak growth factor.

Nonpeak growth rates are calculated the ERTAC EGU Tool, which adjusts the annual average growth rate to account for the peak hours.

Peak and nonpeak growth is assigned for every hour by ordering all hours of the year by base year utilization. The peak growth factor is assigned by fuel to a limited number of hours with the highest utilization in the base year. Growth is then transitioned gradually to non-peak growth rate. The number of peak and transition hours are differentiated by fuel and region and are assigned in the Input Variables File. Figure 1 shows graphically the relationship between annual, peak and nonpeak growth rates.

Figure 1: Relationship between the annual, peak, and nonpeak growth rates



Finally, growth factors for each hour are developed by adjusting the regional factors to account for activity from new units and shutdowns. The tool then applies the hourly growth factors to the base year hourly generation data to estimate hourly future generation. The tool confirms that unit capacity is never exceeded. Future generation is assigned to units as long as they have capacity available. When available known capacity is fully utilized new units are created if future demand exceeds known capacity.

In some cases states or regions may also choose to replace the EIA/NERC factors with regional-specific growth rates developed from other information sources, along with supporting documentation for those growth rates.

4. NO_X AND SO_2 EMISSIONS

For base year runs, actual CAMD data is averaged to obtain ozone season and non-ozone season emission rates. To obtain future year rates, base year emission rates for existing units are adjusted to account for new control equipment or other changes provided in the input files. New unit emissions, for which states do not provide emission rate data, are estimated based on the 90th percentile best performing existing unit for that fuel type and region. The user may adjust this percentile within the input variables file. These rates are applied to each unit's future generation to calculate NO_X and SO_2 emissions.

5. OUTPUT

The ERTAC tool generates files of hourly generation and emissions for each unit included in the system. In addition, summary files of this hourly data are generated, to facilitate review of the results, as follows:

- Base and future year annual generation (MW-hrs) and heat input (mmbtu)
- Base and future year ozone season generation and heat input
- Base and future year annual NO_X emission (tons) and average emission rate (lbs/mmbtu)
- Base and future year ozone season NO_X emission and average emission rate
- Base and future year annual SO_2 emissions and average emission rate

Post processors are also available in perl and python to generate CO_2 estimates.

6. GEOGRAPHIC REGIONAL SYSTEM

Each EGU included in the model is assigned to a geographic region and fuel type bin in the Unit Availability File.

The geographic regional system described in Figure 6 and used in versions 2.5 and 2.5L2 is a modified version of the EIA Electricity Market Module (EMM) regional system.

Because the EIA and NERC regions are not identical, adjustment is required to align these regional systems to develop annual and peak growth rates. To match EIA and NERC, a "best fit" NERC regional growth factor is assigned to each EMM region. In the simplest case, where a clear match between EIA and NERC regional schemes exists, for example NPCC-New England, the NERC peak growth rate is assigned to the corresponding EMM region. In more complicated cases, where multiple NERC regions corresponded to a single EMM region, or where regions were organized along substantially different geographic boundaries, the NERC peak growth factors were averaged to generate a growth factor for the (usually larger) corresponding EMM region. As an example, the EIA CAMx region corresponds to two NERC regions, WECC-CALN and WECC-CALS. In this case, the WECC-CALN and WECC-CALS growth factors were averaged and applied to the EIA-CAMx region. Between the CONUS2.5 run and the CONUS2.5L2 run, upper Midwestern boundaries were updated to reflect the changes in the area's power pools. The resulting assignments for coal generation are shown in Figure 2 and Figure 4. The resulting assignments for other fuels are shown in Figure 3 and Figure 5.

Within each region, individual generation units are further delineated into five unit types as follows:

- Coal;
- Oil;
- Natural Gas – Combined Cycle;
- Natural Gas – Single Cycle;
- Natural Gas – Boiler gas.

Figure 2: Regional boundaries for coal generation, CONUSv2.5

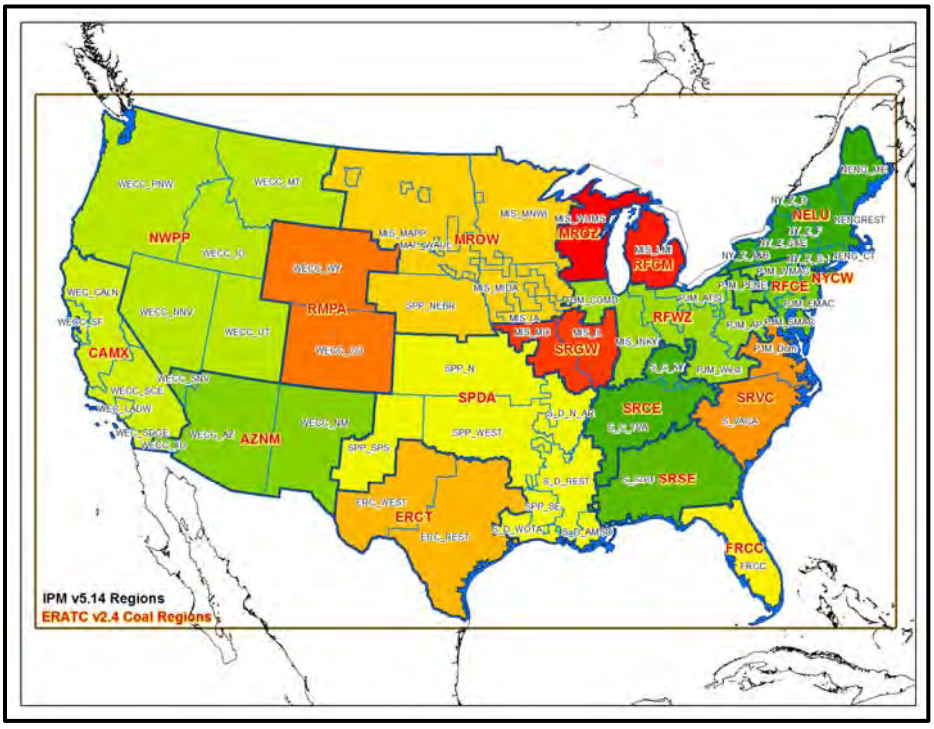


Figure 3: Regional boundaries for fuels other than coal, CONUSv2.5

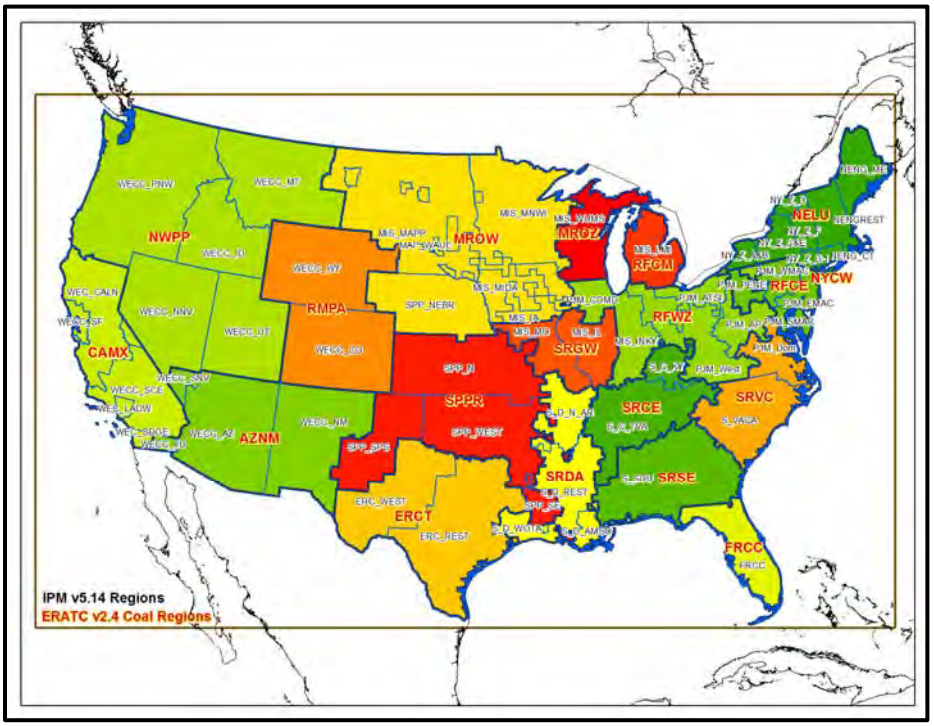


Figure 4: Regional boundaries for coal generation, CONUSv2.5L2

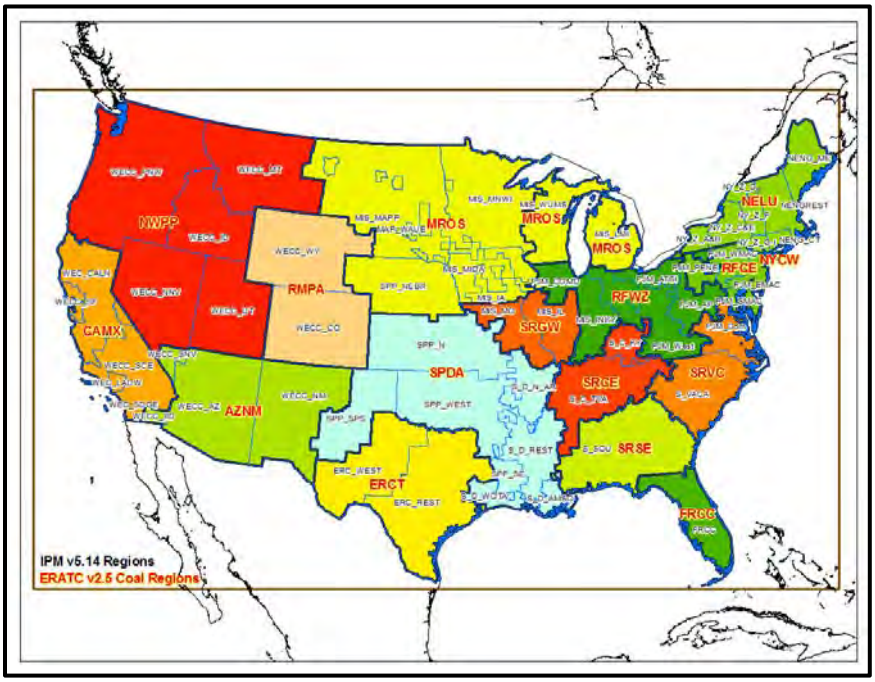


Figure 5: Regional boundaries for fuels other than coal, CONUSv2.5L2

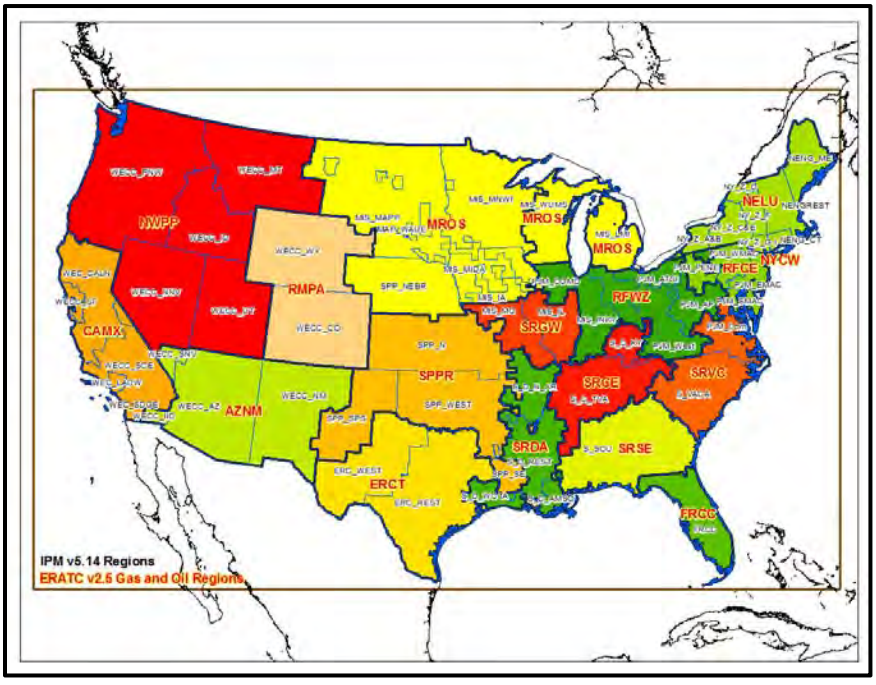


Figure 6: EMM to NERC Crosswalk – ERTAC EGU V2.5 & V2.5L2

EMM Region Number	Fuel	EMM Region Name	ERTAC Regional Code	Single "Best-Fit" NERC Subregion Peak Growth Code
1	Coal, NG, Oil	Texas Regional Entity (ERCT)	ERCT	ERCOT
2	Coal, NG, Oil	Florida Reliability Coordinating Council (FRCC)	FRCC	FRCC
3+4+10	Coal, NG, Oil	MROW(3), MROZ (4)& RFCM(10) from previous runs were combined to form MROS.	MROS	MRO-MAPP / MISO /SPP
5+7+8	Coal, NG, Oil	Northeast Power Coordinating Council / Northeast (NEWE), Upstate New York (NYUP), and Long Island (NYLI) combined to form NELU	NELU	NPCC - NE
6	Coal, NG, Oil	Northeast Power Coordinating Council / NYC Westchester (NYCW)	NEWW	NPCC - NY
9	Coal, NG, Oil	Reliability First Corporation / East (RFCE)	RFCE	PJM / SERC - E
11 (adjusted)	Coal, NG, Oil	Reliability First Corporation / West (RFCW adjusted to move Michigan plants to MROS)	RFWZ	PJM / SERC - E
12	NG, Oil	SERC Reliability Corporation / Delta (SRDA)	SRDA	MRO-MAPP / MISO /SPP
13	Coal, NG, Oil	SERC Reliability Corporation / Gateway (SRGW)	SRGW	MRO-MAPP / MISO /SPP
14	Coal, NG, Oil	SERC Reliability Corporation / Southeastern (SRSE)	SRSE	SERC - SE
15	Coal, NG, Oil	SERC Reliability Corporation / Central (SRCE)	SRCE	MRO-MAPP / MISO /SPP
16	Coal, NG, Oil	SERC Reliability Corporation / Virginia Carolina (SRVC)	SRVC	PJM / SERC - E

EMM Region Number	Fuel	EMM Region Name	ERTAC Regional Code	Single "Best-Fit" NERC Subregion Peak Growth Code
17+18	Coal, NG, Oil	SouthWest Power Pool / North (SPNO) + South (SPSO)	SPPR	MRO-MAPP / MISO /SPP
12+17+18	Coal	SouthWest Power Pool / North (SPNO) + South (SPSO) + Delta (SRDA)	SPDA	MRO-MAPP / MISO /SPP
19	Coal, NG, Oil	Western Electricity Coordinating Council / SouthWest (AZNM)	AZNM	WECC-WECC-SWSG
20	Coal, NG, Oil	Western Electricity Coordinating Council / California (CAMX)	CAMX	WECC-CAMX US
21	Coal, NG, Oil	Western Electricity Coordinating Council / Northwest Power Pool Area (NWPP)	NWPP	WECC-NWPP US
22	Coal, NG, Oil	Western Electricity Coordinating Council / Rockies (RMPA)	RMPA	WECC-WECC-RMRG

7. Details of Versions 2.5 and 2.5L2

Both ERTAC EGU v2.5 and v2.5L2 were built on improvements to prior runs and included updates to the UAF and control file from states received as of April and August 2016 respectively. A summary of the inputs used to develop the ERTAC EGU v2.5 and v2.5L2 runs for the continental United States are shown in Figures 7 and 8 respectively. Details of changes may be found in the change log document called, "Change log 2.5L2 8-11-2016.docx."

Regional Boundaries Growth Rates – Change occurred between v2.5 and v2.5L2

Midwest regional boundaries were updated to create MROS, which combined MROW, MROZ, and RFCM. This change was made between 2.5 and 2.5L2

Growth Rates – Both v2.5 and v2.5L2

Growth factors based on AEO2015 High Oil and Gas scenario were used for the first time in V2.5, and were also used in V2.5L2. The High Oil and Gas scenario was selected instead of the reference case because the transition from coal to natural gas generation has resulted in significant projections of shutdowns of coal fired units. The ERTAC EGU tool could not find enough coal generation capacity in future years to meet the demand projected in the AEO2015 reference case. As a further refinement, the AEO2015 factors were replaced with state provide factors for NYCW and SRVC.

Input Variables file– both v2.5 and v2.5L2

No Change.

Non-CAMD Hourly file– Change occurred between v2.5 and v2.5L2

In the time between v.2.5 completion and the v2.5L2 runs, an issue was identified for units with abnormal or missing base year hourly data. These units were not being processed into the future year. To correct this issue, a small subset of units with little or no base year activity were assigned one hour of reasonable, minimal activity in the nonCAMD hourly file for the 2.5L2 run to ensure processing. This improvement had negligible impact on base year data.

Unit Availability File and Controls File/Seasonal Controls File– Change occurred between v2.5 and v2.5L2

Numerous detailed corrections and adjustments to these files were made for both v2.5 and v2.5L2 based on comments received from states regarding the configuration, characteristics, and utilization estimates of their units. Details are documented in the Run Log.

8. Prior Runs and Adjustments

Prior reference runs files and documentation using 2011 base year data are posted on the MARAMA website and are summarized as follows:

v2.4 – Run was complete in August, 2015, using input files current as of July 2015, and run by VA DEQ. As occurred with v2.3, growth factors are based on AEO2014

v2.3 – Run in October 2014. This run included major updates to the UAF and Control files received as of August 24, 2014. This is the first use of growth rates from AEO2014.

v2.2 – Run in June 2014. Same as v2.1. This run included major updates to the UAF and Control files received as of March 31, 2014. This is the first use of the new code 1.01. Growth rates were from AEO2013.

v2.1L1 – Run in April 2014. Same as 2.1 except this run included updates from Midwest to UAF and control file for Indiana, Illinois, Wisconsin, Michigan and Ohio primarily for coal fired units received dated March 3, 2014.

v2.1 – Run in March 2014. This run included updates to the UAF and control file from several states. UAF updated with adequate data to calculate an ERTAC heat rate. Negative values in CAMD replaced with zero. An adjustment to implement zero growth for the Boiler gas was included. Combustion turbines and combined cycle units were adjusted in the 2.1 factors to account for the boiler-gas generation.

v2.0 – Run in January 2014. This run was the first using base year 2011. In addition, the Midwest states provided updates to the UAF and control files. These updates were completed by the Northeast in prior runs.

Many adjustments made to prior runs still pertain to v2.5 and v2.5L2 runs are re-iterated in the following text.

Prior Regional Agregation and Boundary Adjustments

SPDA - Three AEO regions, **SRDA , SPPN** and **SPPS,** were aggregated for the coal fuel type only. These regions comprise Southwest Power Pool and SERC Delta (aka SERC West). Much of the aggregated region is linked or at least coordinated for reliability and power wholesaling into MISO and is referred to as MISO South. The primary utility causing the regional footprint adjustments is Entergy. It has one controlled grid connection with the rest of MISO and much better integration with SPP (OK and KS). Growth factors for the combined SPDA region were derived from a capacity weighted average of the three units as shown in the spreadsheet called **Simple Tables Growth for combined SPP plus SRDA.xlsx**.

NELU - Three AEO regions: **NYUP, NEWE, NYLI** were aggregated for all fuel types to deal with very small coal facility growth patterns and gas and oil boiler GDU issues. The agencies involved agree that NYCW, which is a small region in the area, should be grown uniquely to address oil-fired, must-run units that make up a portion of the inventory in that area. Growth factors for the combined NELU region were derived from a capacity weighted average of the three units as shown in the spreadsheet called "Northeast_Composite_AEO2014_2015 07282015.xlsx". Peak forecasts from NY-ISO and ISO-NE are very similar and are relatively straightforward to aggregate.

Prior Growth Rate File adjustments:

RFCM - RFCM Boiler Gas, Combined Cycle, and Single Cycle annual and peak growth rates were updated using the spreadsheet titled "Updated AEO2014 GR for RFCM CC and RFCM AEO2015 GR.xlsx", tab "RFCM AEO2015"

SRVC - NC provided annual and peak growth rates in the June 30, 2015 memo from the SC, NC, VA, and WV air directors to ERTAC (March 31, 2016 email Paula Hemmer to Doris McLeod).

SRSE - SRSE, peak growth rates were based on the 7/20/2015 email from Bob Lopez to Byeong Kim with the subject "SRSE Peak Growth Rates":

Figure 7: SRSE Peak Growth

Fuel/unit type in SRSE	Peak growth rate	Transition hours
Coal	0.8	400/4000
Combined cycle	1.45	400/4000
Simple cycle	1.00	10/50
Boiler gas	1.45	200/4000

MROS and RFWZ - Growth for MROS and RFWZ came from the spreadsheet called "Summary for MROZ and RFWZ for CONUS2.5L.xlsx." Peak rates above 1.3 were set at 1.3 based on Bob Lopez's email dated 7/23/2015.

CAMX – Peak rates for Combined Cycle were set equal to the annual rates in all years.

SRGW - Peak growth rate for oil set to 2.0 to ameliorate an extreme value, per LADCO.

MROS CAMX; NWPP; RFWZ, SRCE, SRGW - Combined Cycle peak growth rates were set to 1.3 to reduce the number of GDUs created solely for peak hour demand deficits based on LADCO, Wisconsin, and Michigan input.

Prior Input Variable adjustments

CAMX, SRVC, SRSE, FRCC, and NEWE changed to 75th percentile for new Combined Cycles and Simple Cycles.

Prior NonCAMD Hourly File adjustments

MI and FL supplied updated gross load data for combined cycle units that did not report power produced from steam generation in the BY CAMD data.

Negative emissions and load values are replaced with zero.

Added a full year of data for

- ORIS 8906 (Astoria) Unit IDs 30, 40, and 50—summed reheat and superheat reported data to create the pseudo units.
- ORIS 7839 (Ladysmith) Unit 5, which is equivalent to that reported in 2011 for 7838 (Remington) Unit 5. 7838, 5 does not exist. This is a 2011 CAMD reporting error.

Figures 7 and 8 summarize the inputs to v2.5 and v2.5L2.

1. References

US Energy Information Administration 2015, *Annual Energy Outlook 2015 with Projections to 2040*, accessed from <https://www.eia.gov/forecasts/archive/aeo15/pdf/0383(2015).pdf>.

Figure 8: Inputs to ERTAC EGU v2.5L2 Projection Runs

ERTAC File Name	Description	Run Notes
OVERVIEW	Version: 2.5	Run by ERTAC EGU leadership. Completed May 2016
	Code: 1.01	
	Base Year: 2011	Major update to UAF & Controls. State and stakeholder feedback. Submittal deadline: March 2016.
	Future Years: 2017, 2018, 2019, 2021, 2023, 2028, 2030	Major update to annual growth factors from EIA2014 to EIA2015, High Oil and Gas scenario (HOG). Peak growth based on NERC 2013
camd_hourly_base.csv	Hourly CAMD CEM data	No changes to the ertac_hourly_noncamd.csv file between 2.4 and 2.5
ertac_hourly_noncamd.csv	Hourly CEM data replacing data in CAMD	CONUSv2.5_05052016_ertac_hourly_noncamd.csv
ertac_initial_uaf.csv	Unit Availability File	CONUSv2.5ref_20XX_05052016_ertac_initial_uaf.csv
ertac_control_emissions.csv	Annual Control File	CONUSv2.5ref_20XX_05052016_ertac_control_emissions.csv
ertac_seasonal_control_emissions.csv	Seasonal Control File	C1.01CONUSv2.5_20XX_ertac_seasonal_control_emissions.csv
	Seasonal controls provided by GA and PA (Brunner Island Units 1, 2 & 3 have lower NOX and SO2 rates during the ozone season to represent NG firing.)	
ertac_growth_rates.csv	Growth Files (XX denotes year, example 17 = 2017)	CONUSv2.5ref_20XX_05052016_ertac_growth_rates.csv
	ANNUAL GROWTH rates spreadsheet supplied by T. Shanley of MI DEQ called AEO2015 ESD2015 GRs.xlsx. Adjustments to AEO Growth Rates for specific regions are as follows:	
		MROS and RFWZ annual growth rates provided by Bob Lopez (MI) as shown in spreadsheet FullTranslationWI_Regions_AdjustmentAEO2014.xlsx,
		SRVC - Peak and annual growth rates supplied by NC in 6/30/2015 memo from SC, NC, VA and WV air directors to LADCO.
		NYCW - 2017 GRs supplied by NY in memo to MARAMA dated 2-11-2016. 2018, 2019, 2021, 2023, 2028, and 2030 GRs supplied by NY in memo to MARARA dated 3-31-2016.
	PEAK GROWTH Rate spreadsheet supplied by T. Shanley (MI) called Gas_Adj_AEO2014_NERC2013 Growth Rates v4 method 1 and method2.xlsx, tab Gas-Adj Ref2014 M1 . Exceptions to NERC2013:	
		SRGW peak growth rate for oil was set to 2.0 to ameliorate an extremely high peak rate, per LADCO.
		SRSE peak GRs and transition hours adjusted for Coal, CC, SC, BG as in Lopez (MI) email to Byeong Kim (GA) 7/20/2017 with subject "SRSE Peak Growth Rate Adjustments"
		COMBINED CYLE GAS: Ameleoration of GDUs created solely for Peak hour demand deficits
		MROS combined cycle peak growth rate set to 1.3 and transition hours peak->formula set to 200, formula-> nonpeak set to 2000 based on LADCO, WI, and MI input. All other transition hours remain at default levels.
		CAMX, ; NWPP; RFWZ; SRCE; SRGW Combined cycle gas peak 2028 GR set to 1.3 and transition hours set to 200 and 2000.
Regional Scheme	EMM to NERC Crosswalk	Version1
ertac_input_variables.csv	Input Variables File (XX denotes year, example 17 = 2017)	CONUSv2.5_20XX_05052016_ertac_input_variables.csv
group_total_listing.csv	Aggregation scheme for multi-state caps	C1.01CONUSv2.5_20XX_05052016_group_total_listing.csv
state_total_listing.csv	Aggregation scheme for state level caps	C1.01CONUSv2.5_20XX_05052016_state_total_listing.csv

Figure 9: Summary of Inputs to ERTAC EGU v2.5L2 Model Run

ERTAC File Name	Description	Run Notes
OVERVIEW	Version: 2.5L2	Run by VA DEQ - Doris McLeod and IN DEP - John Welch in Aug-Sep 2016
	Code: 1.01	
	Base Year: 2011	Update to UAF, Controls, and nonCAMD hourly. States only feedback. Submittal deadline: August, 2016.
	Future Years: 2017, 2023	No change growth factors other than those needed to support the new MROS region
camd_hourly_base.csv	Hourly CAMD CEM data	
ertac_hourly_noncamd.csv	Hourly CEM data replacing data in CAMD	C1.01CONUSv2.5L2_ertac_nonCAMD_hourly.csv
	Updates include adding one hour of reasonable, minimal data to approximately 44 units that Emily Bull (MDE) identified as missing in output files to allow the tool to process these units fully.	
ertac_initial_uaf.csv	Unit Availability File (XX denotes year, example 17 = 2017)	C1.01CONUS2.5L2_20XX_ertac_initial_uaf.csv. Updates include state inputs and regional boundaries for MROS.
ertac_control_emissions.csv	Annual Control File (XX denotes year, example 17 = 2017)	CONUSv2.5L2ref_20XX_05052016_ertac_control_emissions.csv
ertac_seasonal_control_emissions.csv	Seasonal Control File (XX denotes year, example 17 = 2017)	C1.01CONUSv2.5L2_20XX_ertac_seasonal_control_emissions.csv
	Seasonal controls provided by VA, GA, PA (Brunner Island Units 1, 2 & 3 have lower NOX and SO2 rates during the ozone season to represent NG firing.) and MD & NJ (MD & NJ seasonal controls new to V2.5L)	
ertac_growth_rates.csv	Growth Files (XX denotes year, example 17 = 2017)	CONUSv2.5ref_20XX_05052016_ertac_growth_rates.csv
	ANNUAL GROWTH rates spreadsheet supplied by T. Shanley of MI DEQ called AEO2015 ESD2015 GRs.xlsx. Adjustments to AEO Growth Rates for specific regions are as follows:	
		shown in spreadsheet FullTranslationWI_Regions_AdjustmentAEO2014.xlsx,
		SRVC - Peak and annual growth rates supplied by NC in 6/30/2015 memo from SC, NC, VA and WV air directors to LADCO.
		NYCW - 2017 GRs supplied by NY in memo to MARAMA dated 2-11-2016. 2018, 2019, 2021, 2023, 2028, and 2030 GRs supplied by NY in memo to MARARA dated 3-31-2016.
	PEAK GROWTH Rate spreadsheet supplied by T. Shanley (MI) called Gas_Adj_AEO2014_NERC2013 Growth Rates v4 method 1 and method2.xlsx, tab Gas-Adj Ref2014 M1 . Exceptions to NERC2013:	
		SRGW peak growth rate for oil was set to 2.0 to ameliorate an extremely high peak rate, per LADCO.
		SRSE peak GRs and transition hours adjusted for Coal, CC, SC, BG as in Lopez (MI) email to Byeong Kim (GA) 7/20/2017 with subject "SRSE Peak Growth Rate Adjustments"
		COMBINED CYLE GAS: Ameleoration of GDUs created solely for Peak hour demand deficits
		RFCM, MROZ, and MROW combined cycle peak growth rate set to 1.3 and transition hours peak->formula set to 200; formula-> nonpeak set to 2000 based on LADCO, WI, and MI input. All other transition hours remain at default levels.
		CAMX, ; NWPP; RFWZ; SRCE; SRGW Combined cycle gas peak 2028 GR set to 1.3 and transition hours set to 200 and 2000.
	EMM to NERC Crosswalk	Changes made to upper midwestern boundaries to reflect changes in the regional power pools
ertac_input_variables.csv	Input Variables File (XX denotes year, example 17 = 2017)	C1.01CONUSv2.5L2_20XX_ertac_input_variables.csv
group_total_listing.csv	Aggregation scheme for multi-state caps (XX denotes year, example 17 = 2017)	C1.01CONUSv2.5L2_20XX_group_total_listing.csv
state_total_listing.csv	Aggregation scheme for state level caps (XX denotes year, example 17 = 2017)	C1.01CONUSv2.5L2_20XX_state_total_listing.csv