ERTAC EGU Projection Tool: Origin and Uses

Combined cycle facility under construction, slated to begin commercial operations in 2018

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Eastern Regional Technical Advisory Committee (ERTAC)

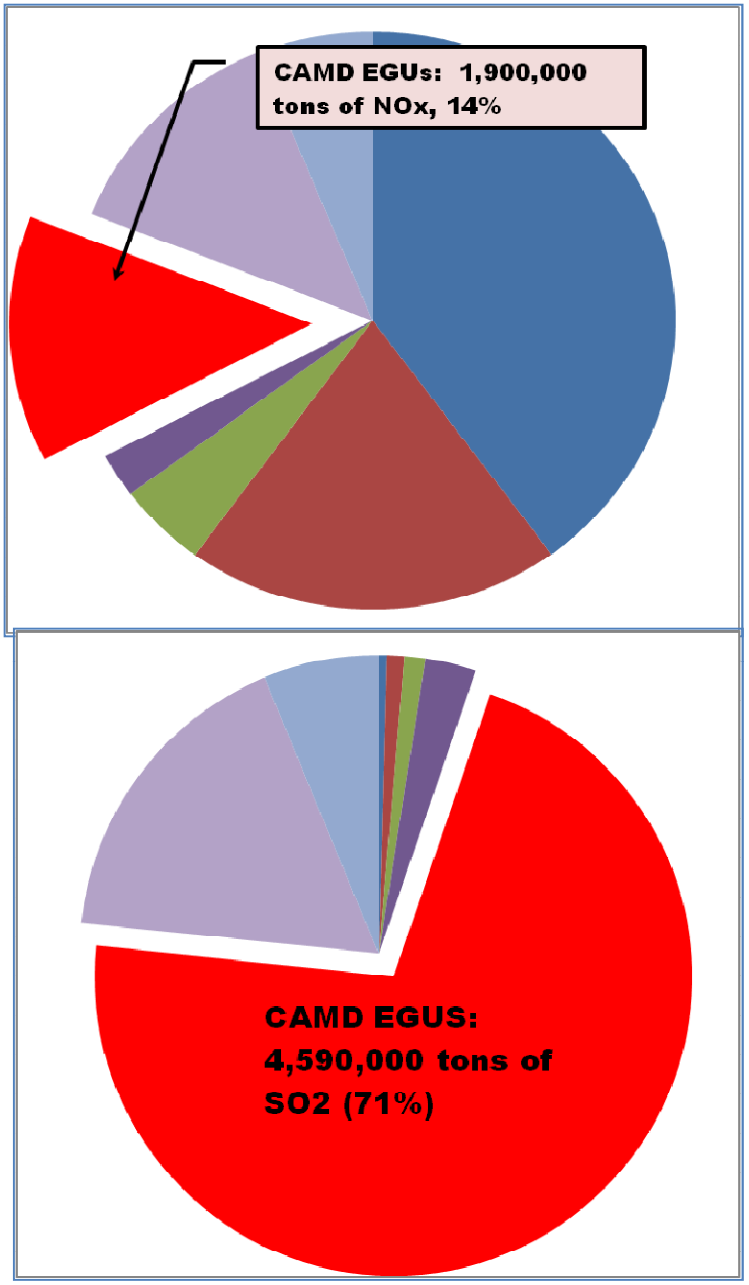
- **ERTAC convenes ad-hoc groups to solve inventory problems**
- **Collaboration:**
  - **States – North East, Mid-Atlantic, Southern, and Lake Michigan**
  - **Multi-jurisdictional organizations**
  - **Industry**
- **ERTAC EGU growth convened 2010**

  Goal: **Build a low-cost, stable/stiff, fast, and transparent model to project electric generating unit (EGU) emissions including reasonable temporal profiles for activity and emissions**

  Uses: **Provide EGU inventories suitable for State Implementation Plan (SIP) submittals and air quality modeling efforts**

EGUs, SIPs, and Air Quality Modeling

- High quality hourly data in electronic format reported under 40 CFR Part 75 for fossil fuel fired units > 25 MWs
  - Activity (heat input, gross load)
  - Emissions (usually NO_X, SO_2, and CO_2)
- Emission contributions of the EGU sector
  - 2011 Clean Air Markets Division (CAMD) data: ≈4,800 unique units
  - 14% of 2011 NO_X inventory
  - 71% of 2011 SO_2 inventory



*Data from 2011 NEI v1

EGUs, SIPs, and Air Quality Modeling

- **Location**
  - **In/out of nonattainment areas?**
  - **May impact a state's ability to redesignate clean areas**
- **Temporal Profiles**
  - **Unit specific hourly activity and emissions data**
  - **Important for high electricity demand day and other episodic air quality events**
- **Future Year (FY) Selection**

How Does The ERTAC EGU Tool Work?

1. Starting Points

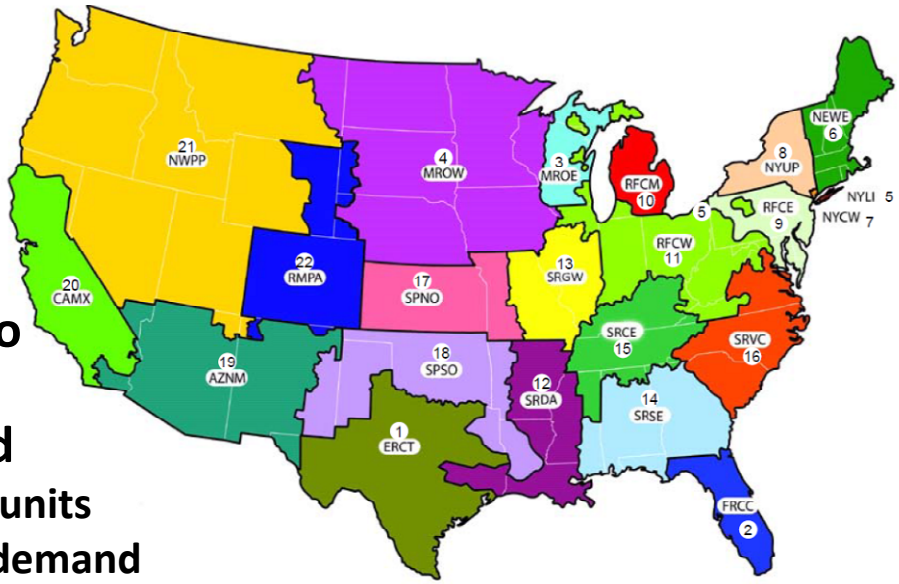
- BY hourly continuous emissions monitoring (CEM) data from CAMD
  - Current base year is 2011
  - BY hourly activity is the basis for FY hourly estimates-generally coincides with BY meteorology
- Regional growth rates (GRs)
  - Annual: Department of Energy (EIA) Annual Energy Outlook (AEO)
  - Peak: North American Electric Reliability Corporation (NERC)

2. Information Supplied By States

- New planned units & retirements
- Controls, fuel-switches, other

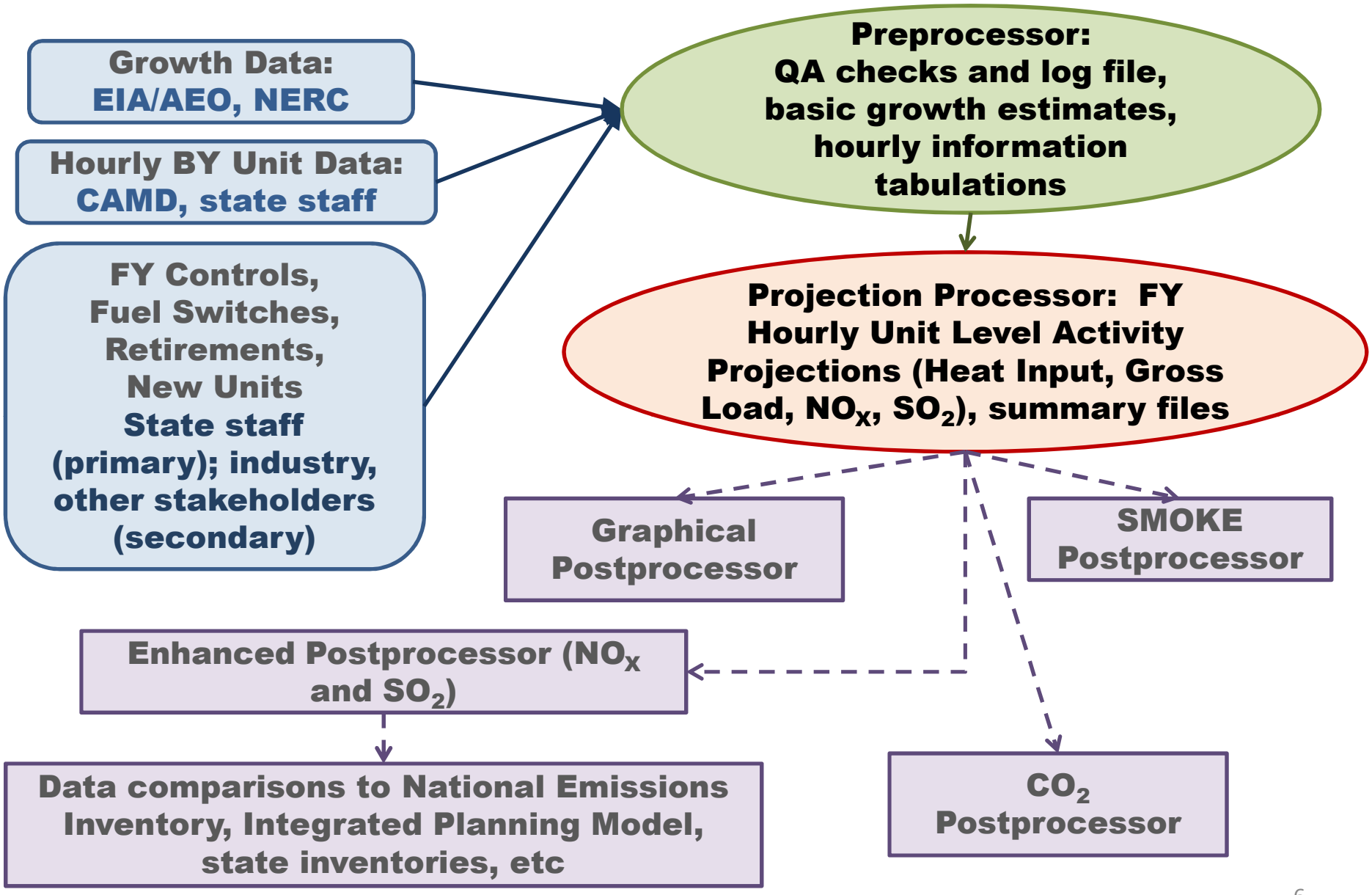
3. Tool Generates FY Hourly Estimates

- Projection in each ERTAC region
- Available regional capacity matched to projected regional demand
- Regional unit capacity never exceeded
  - Unmet demand applied to other available units
  - Generation deficit units (GDUs) created if demand exceeds system capacity



4. Emissions Estimates May Be Converted to SMOKE Format for Air Quality Modeling

Information Development and Flow



ERTAC EGU Tool Projects

Project Title	Project Description	Leads
Mercury and Air Toxics Rule (MATS) Review	Examined emissions estimates from compliance scenarios for the Mercury and Air Toxics Rule	ERTAC EGU Team
Aggressive Retirement Scenario	Emission estimates assuming aggressive retirements or fuel switches of existing units	OTC
High/Low Analysis	Estimated emissions from the use of various AEO growth rate scenarios for fuel costs and availability	ERTAC EGU Team
CO_2 Analyses	Used existing CAMD data, fuel based emission factors, and ERTAC Tool outputs to examine future year emissions of CO_2. Multiple analyses	GA, VA, MD
Regional Analyses	Updating ERTAC Tool inputs to better reflect regional and state data	MI, LADCO, FL, VA, NC, ERTAC EGU Team

Mercury and Air Toxics Rule

- **Tool outputs used to evaluate system compliance with MATS rule**
- **Controls, retirements, fuel switches based on state-supplied information**

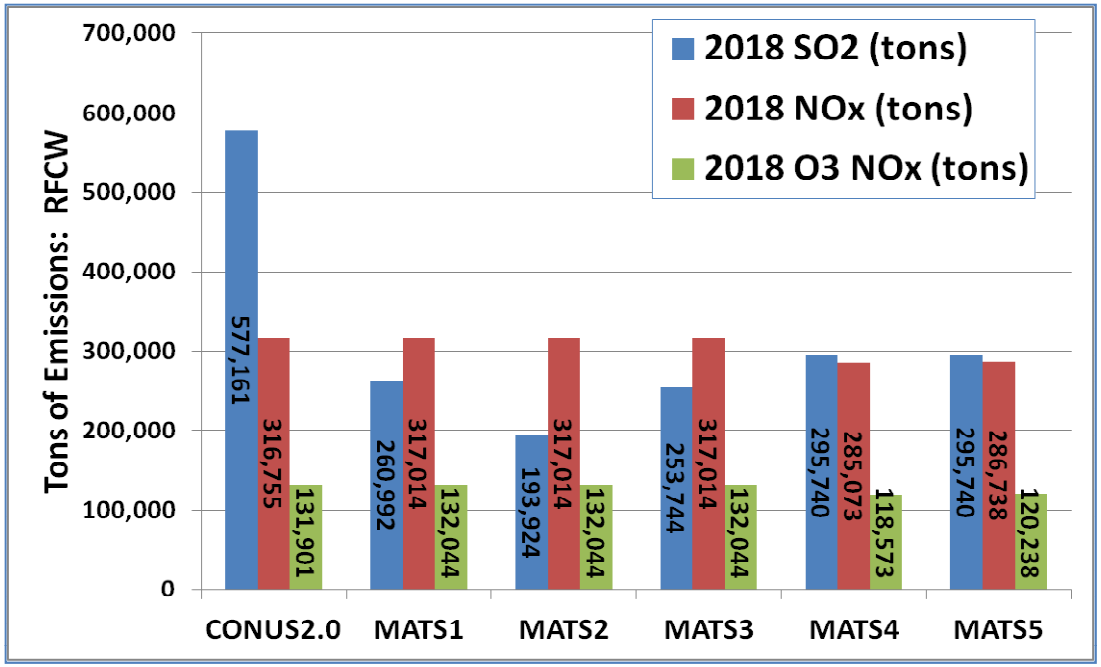
Version Number:	2.0	2.1L1	2.2	2.3
Data As-Of Date	7-18-2013	3-3-2014	4-4-2014	9-24-2014
BY Coal Capacity	383,827 MW	383,384 MW	383,851 MW	383,656 MW
BY Coal Capacity Retired by 12/31/2018	45,698 MW	50,128 MW	56,898 MW	63,884 MW
Gasified Capacity as of 12/31/2018	9,193 MW	9,082 MW	9,063 MW	14,929 MW
BY SO_2 from Retired Coal	1,040,354 tons	1,170,015 tons	1,251,732 tons	1,335,231 tons
Existing Units in FY Meeting 0.2 lbs/mmbtu	187,756 MW	190,532 MW	189,304 MW	190,226 MW
% BY Capacity Compliant	60.8%	62.8%	64.1%	66.2%

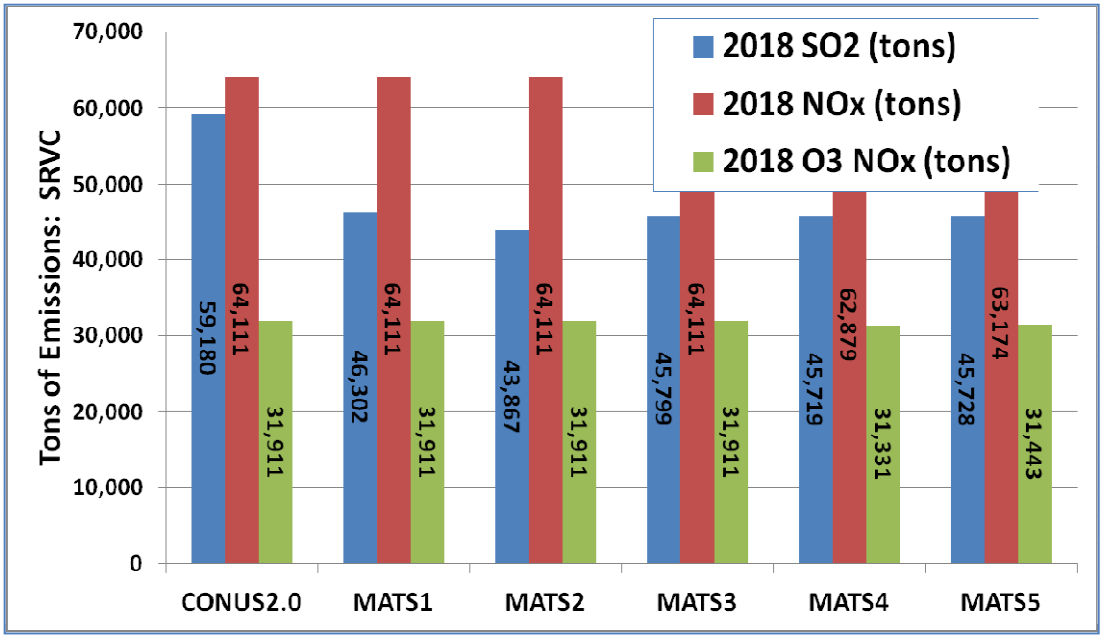
Mercury and Air Toxics Rule

Scenarios examined control assumptions' impact on MATS non-compliant units in the reference case.

8 scenarios studied for emissions impacts.

Tool flexibility allowed multiple estimates & approaches for MATS analyses.





CO_2 Analyses

Georgia used FY activity output of ERTAC EGU Tool (1) to estimate unit and state level CO_2 emissions and (2) to evaluate state progress against Presidential CO_2 goals.

- **17% CO_2 reduction from 2005 baseline by 2020**
- **GA explored three approaches for estimating CO2 emission factors.**

	2005	2011	2018
Heat Input (MMBTU)	CAMD HI Data	CAMD HI Data	ERTAC EGU Projection Tool
CO2 Emissions: Method 1 (TPY)	CAMD CO2 Data	CAMD CO2 Data	State derived CO2 EFs from 2005 CAMD
CO2 Emissions: Method 2 (TPY)	CAMD CO2 Data	CAMD CO2 Data	National CO2 EFs -- Coal (0.103) -- Gas (0.058) -- Oil (0.087)
CO2 Emissions: Method 3 (TPY)	National CO2 EFs -- Coal (0.103) -- Gas (0.058) -- Oil (0.087)	National CO2 EFs -- Coal (0.103) -- Gas (0.058) -- Oil (0.087)	National CO2 EFs -- Coal (0.103) -- Gas (0.058) -- Oil (0.087)

*based on ERTAC Reference Run v2.2

State	Change from 2005 to 2011			Change from 2005 to 2018		
	Method 1	Method 2	Method 3	Method 1	Method 2	Method 3
AL	-7.7%	-7.7%	-8.7%	-10.6%	-11.1%	-11.3%
FL	-8.4%	-8.4%	-5.9%	-17.7%	-21.7%	-19.5%
GA	-17.6%	-17.6%	-17.9%	-12.7%	-13.1%	-13.3%
KY	0.7%	0.7%	0.0%	-18.5%	-17.5%	-18.2%
MS	-8.0%	-8.0%	-6.6%	6.2%	3.2%	4.5%
NC	-13.4%	-13.4%	-16.2%	-21.3%	-18.5%	-21.5%
SC	-7.4%	-7.4%	-7.8%	-28.4%	-27.3%	-28.3%
TN	-26.6%	-26.6%	-27.2%	-35.8%	-35.0%	-35.5%
VA	-24.2%	-24.2%	-28.4%	-30.9%	-13.6%	-24.5%
WV	-12.0%	-12.0%	-13.0%	-12.4%	-11.4%	-12.4%
SEMAP	-11.3%	-11.3%	-12.0%	-17.9%	-17.4%	-18.2%

CO_2 Post Processors

- Georgia work and the § 111(d) proposal spurred VA to write a post processor for emission factor calculations
  - For units reporting CO_2 to CAMD in the BY, emission factors based on reported data
  - For units without CO_2 in the BY, code uses fuel based factors
  - Makes assumptions about proposed NSPS applicability for new units
- Maryland working with a contractor to examine/update the VA work and is running a set of scenarios for the Northeast to look at CO_2 emissions from the EGU sector

FRCC Regional Analysis

- **Due to CAMD reporting requirements, some combined cycle units may not report the heat recovery steam generation from their units.**
- **Multiple AEO growth rates were used for FRCC in order to evaluate different economic scenarios**
- **Set up three case studies using the CONUS2.2, 2018, AEO2013 information as the base case**

REF	CONUS 2.2, 2018, AEO2013 base case growth rates
1c	Ref, except "adjusted" the hourly data based on estimated reasonable heat rates
2b	Ref, except used the High Gas, Low Coal growth rates from the High Gas/Low Coal Case Study (AEO cases)
3c	Ref, except "adjusted" the hourly data AND applied the Hi Gas/Low Coal growth rates

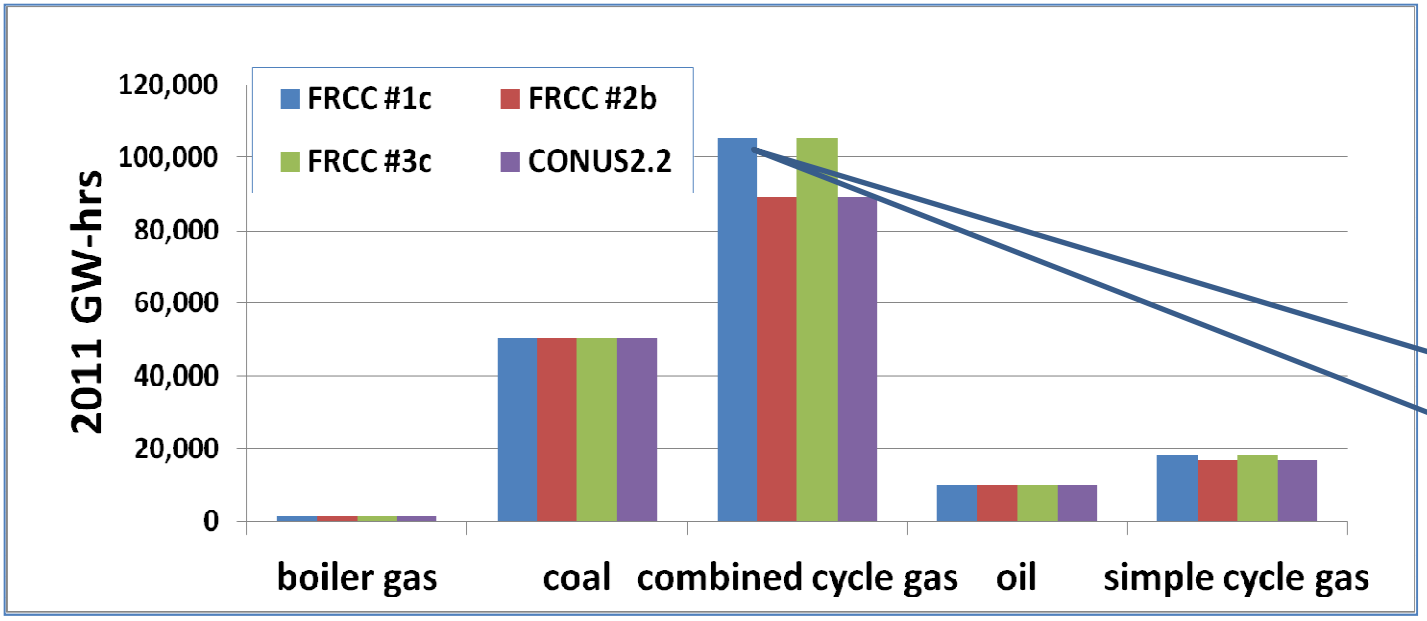
FRCC: Changes to Growth Rates

AEO2013 Reference GRs

Fuel – Unit Type	Annual	Peak
Boiler Gas	1.000	1.007
Coal	0.962	0.969
Combined Cycle	0.894	0.900
Oil	0.093	0.094
Simple Cycle	0.894	0.900

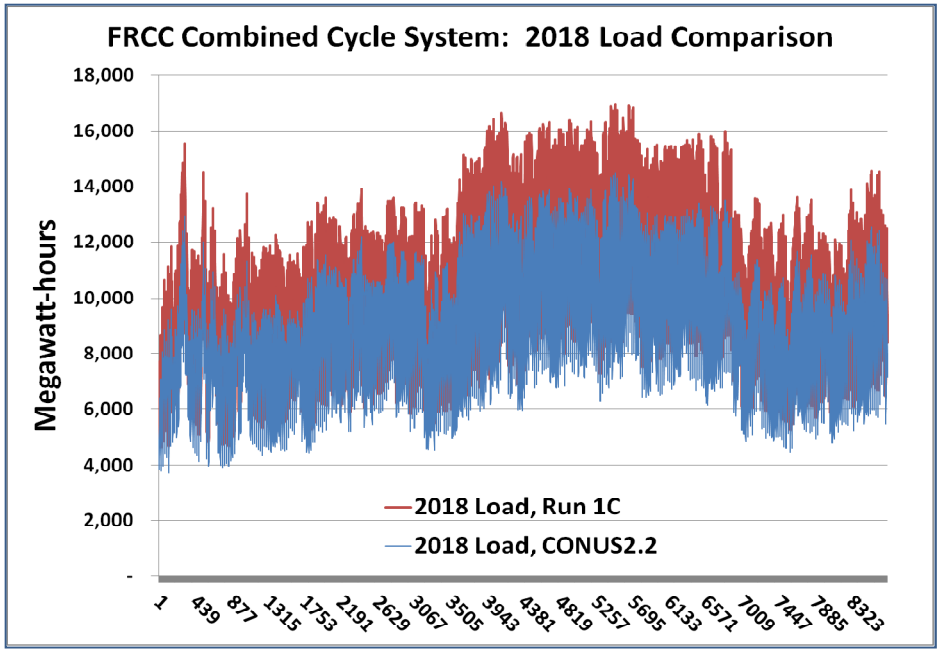
AEO2013 High Gas/Low Coal GRs

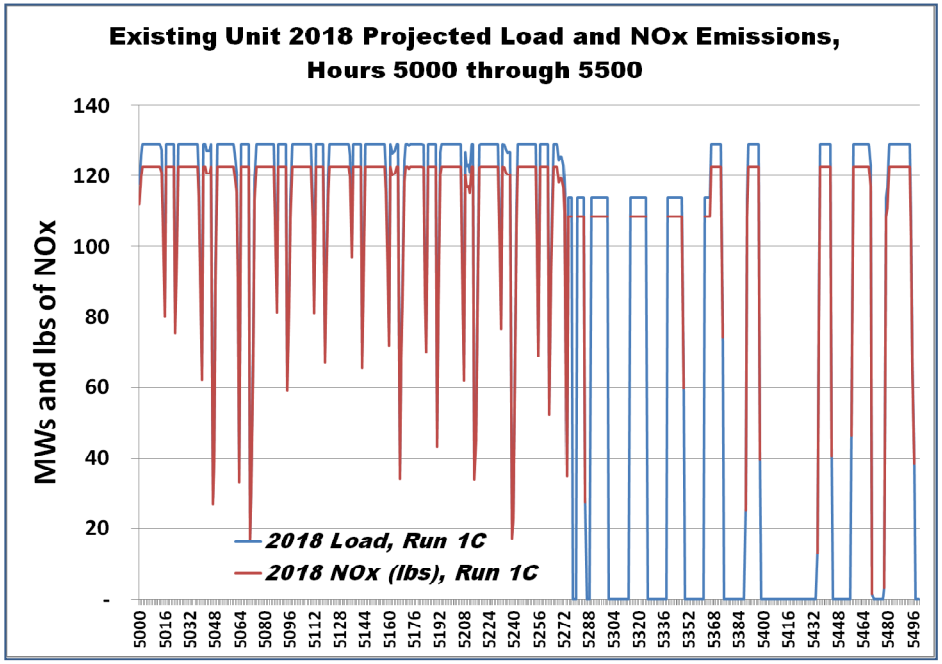
Fuel – Unit Type	Annual	Peak
Boiler Gas	1.000	1.007
Coal	0.522	0.526
Combined Cycle	1.165	1.174
Oil	0.071	0.071
Simple Cycle	1.165	1.174



FRCC: Changes to Base Year CAMD Data

An increase of about 16,000 GW-hrs in BY 2011





FRCC System Analysis

ERTAC Tool Provided:

- **Multiple Activity Units**
  - **Heat input, gross load output**
  - **NO_X, SO_2, & CO_2 emissions**
- **Different Resolutions**
  - **Continental US, regional, state, unit**
  - **Annual, seasonal, monthly, hourly**

Upcoming Projects & Current Efforts

Project Title	Project Description	Leads
CO_2 Analyses	Multiple analyses with existing CAMD data, fuel based emission factors, and ERTAC tool outputs to examine future year emissions of CO2, esp. 111(d) goal accomplishment scenarios.	GA, VA, MD
Green House Gas Building Block #2 Post Processor	Development of a post processor that allows the user to increase the utilization of combined cycle units to evaluate the Building Block #2 goals in the proposed 111(d) CO_2 rule.	VA
Baltimore SIP Modeling	ERTAC tool outputs from CONUS2.3 used with the ERTAC to SMOKE post processor feeding the air quality modeling effort in the Baltimore moderate ozone nonattainment area.	OTC, MARAMA, MD
Regional Modeling Comparisons	Comparisons of air quality predictions derived from various approaches for EGU estimations.	LADCO
CONUS2.4	Stakeholder comment period opened March 2015. EGU outputs expected to be ready summer 2015.	ERTAC EGU Team







Any Questions?