ERTAC EGU Projection Tool: What Can You Do With it?

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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

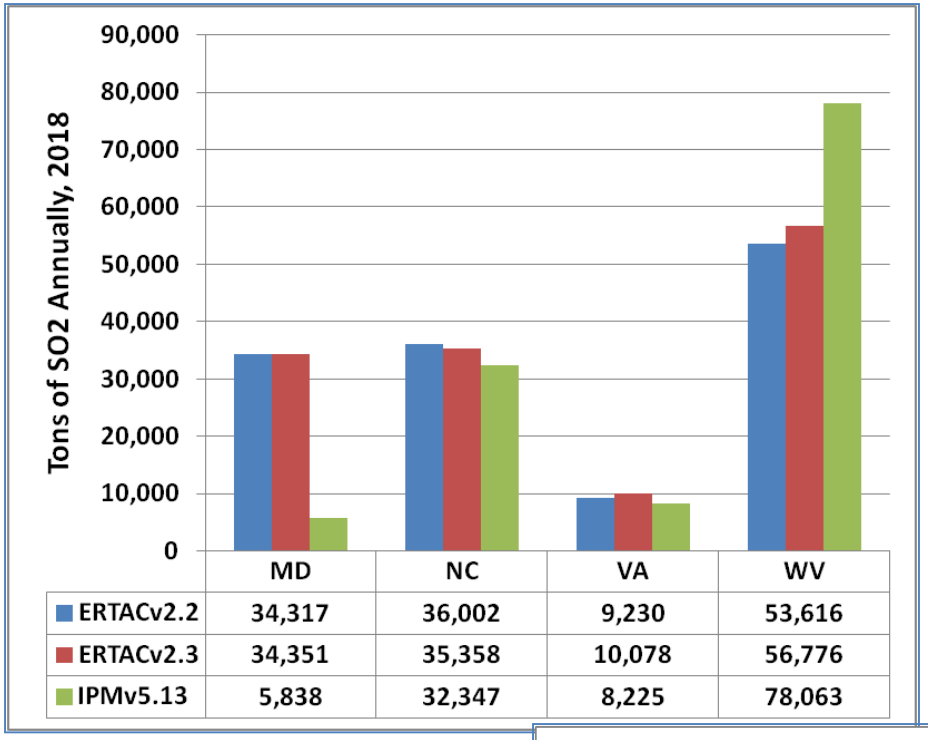
Various Uses of the ERTAC EGU Tool

- Comparing Results to Other Estimations, like IPM
- Estimating the Effects of Regulations, like MATS
- Estimating the Effects of Growth Rate Assumptions
- Updating Results to Include Large, Unit-Specific Changes
- What-If Scenarios
- Improving Base Year (BY) Hourly Data
- Post Processor Development

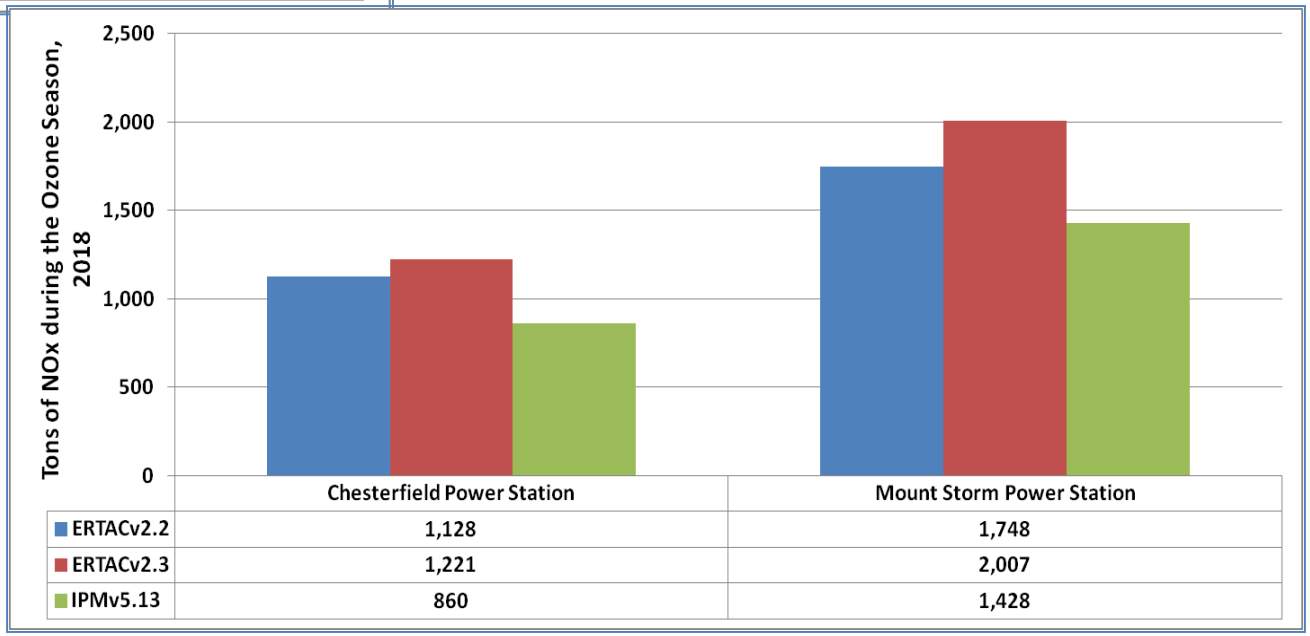
Comparing ERTAC and IPM Results

- IPM-Integrated Planning Model
  - Used by EPA to estimate emissions from the power sector
  - www.epa.gov/airmarkets/programs/ipm/
- ERTAC team has developed comparison spreadsheet at the unit level
- https://www.dropbox.com/sh/fcy982m38k4q40q/AADcI1ze4BnmAnx3Mtw_b8Nma?dl=0

ERTAC vs IPM: By Unit, Facility, State, or Pollutant



	MD	NC	VA	WV
ERTACv2.2	34,317	36,002	9,230	53,616
ERTACv2.3	34,351	35,358	10,078	56,776
IPMv5.13	5,838	32,347	8,225	78,063



	Chesterfield Power Station	Mount Storm Power Station
ERTACv2.2	1,128	1,748
ERTACv2.3	1,221	2,007
IPMv5.13	860	1,428

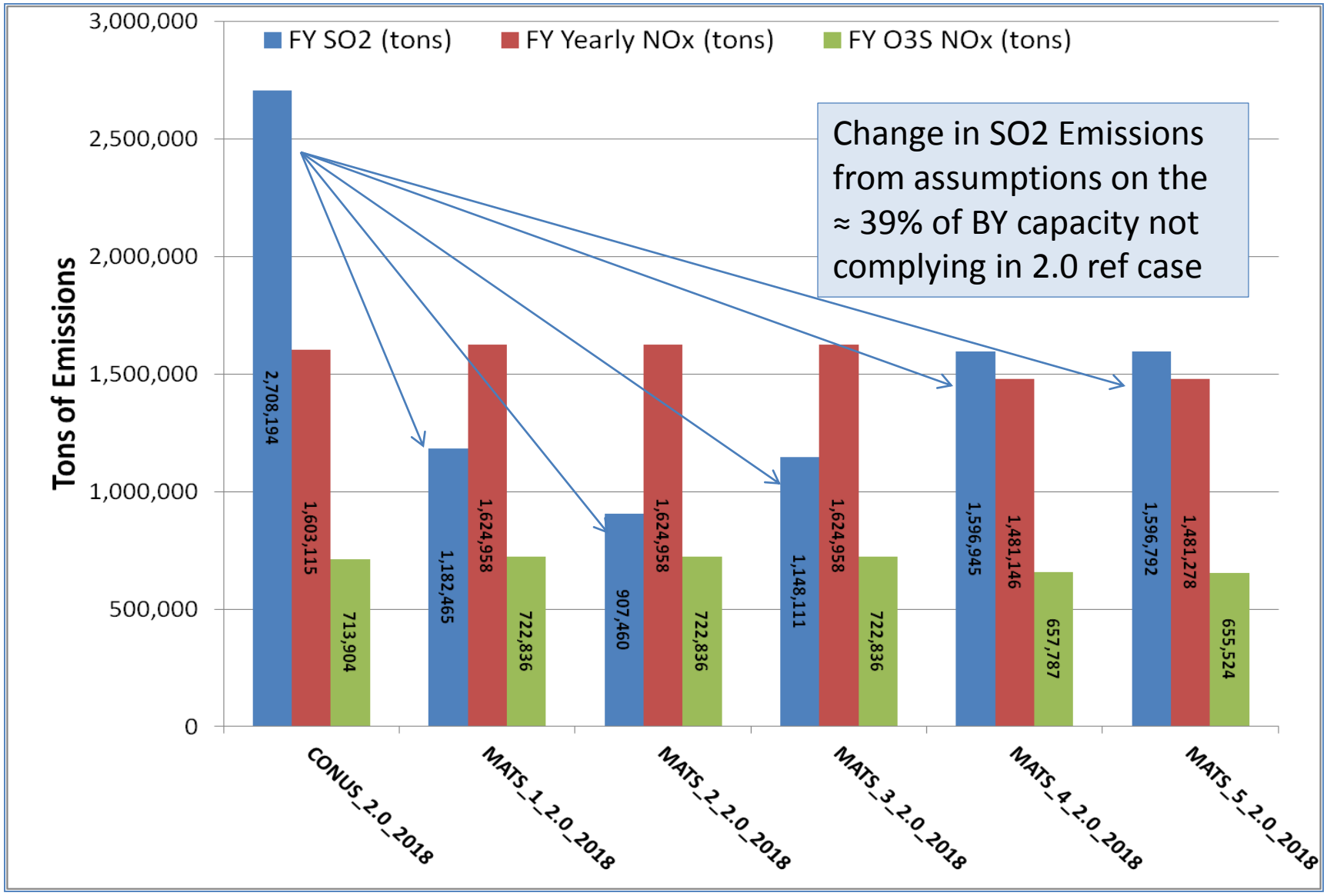
Tabular Formats

	Model Data					
	ERTACv2.2		ERTACv2.3		IPMv5.13	
State	FY Gen (MW-hrs)	FY NOx, tpy	FY Gen (MW-hrs)	FY NOx, tpy	FY Gen (MW-hrs)	FY NOx, tpy
AL	50,737,405	34,703	51,950,354	36,433	50,790,479	35,030
AR	39,809,205	41,285	41,884,162	41,765	32,732,022	36,766
FL	54,670,129	35,234	50,691,474	33,032	50,091,354	30,022
GA	54,527,047	29,658	57,642,832	31,369	54,852,854	23,863
LA	24,702,843	15,243	21,699,664	14,314	8,277,354	7,192
MS	10,244,429	16,235	11,256,415	17,641	10,595,531	10,154
NC	53,314,717	33,989	58,552,139	41,564	57,162,152	27,606
SC	29,336,054	12,290	34,713,739	14,416	20,797,993	9,301
VA	18,079,343	15,578	20,476,660	17,467	16,787,039	14,479
WV	88,651,136	49,920	93,629,905	52,674	86,135,378	48,038
Grand Total	424,072,308	284,137	442,497,344	300,674	388,222,154	242,453

Estimating Emissions Reductions from New Rules : 6 MATS Scenarios

#	Scenario Name	Scenario Description
1	Flat rate option	All units with non-compliant FY emission rates reduced to 0.2 lbs/mmbtu SO_2
2	Capacity option	Units with capacity >/= 400 MW and FY rate >0.2 lbs/mmbtu SO_2 have 90% or 98% applied. Smaller units with non-compliant FY emission rates have emission rates reduced to 0.2 lbs/mmbtu SO_2.
3	Emission rate option	Units with FY rate > 1.0 lbs/mmbtu SO_2 have 90% or 98% control applied. Units with FY rate </= 1.0 lbs/mmbtu SO_2 have 0.2 lbs/mmbtu SO_2 applied.
4	Retirement option	Unit with capacity < 350 MW not meeting 0.2 lbs/mmbtu in the FY are retired. Coal units with a capacity >/= 350 MW and not meeting 0.2 lbs/mmbtu in the FY will have a 30% SO_2 reduction.
5	Fuel switch option	Units with a capacity <350 MW and FY>0.2 lbs/mmbtu switched to gas. Units with a capacity >=350 MW and FY >0.2 lbs/mmbtu have a 30% reduction applied.
6	Retirement/ reduced control	Units with capacity <350 MW and FY>0.2 lbs/mmbtu retired. Units with a capacity >=350 MW and not meeting 0.2 lbs/mmbtu in the FY will have a 15% SO_2 reduction

Case Study Results (CONUS)



(FY=Future Year, O3S=Ozone Season)

Growth Rate Comparisons

- AEO an excellent source of growth rates
- Reference case information used to develop growth rates for use in CONUS ERTAC runs
- AEO offers other scenarios using different price assumptions for gas and coal
- ERTAC ran a Hi/Lo case study to look at different results for 2018 and 2020
- Data results at MARAMA-FTP://

  ERTACmembers/ERTAC EGU Code/Runs/CONUS-v2.1L1

Hi/Lo Growth Rate Analysis

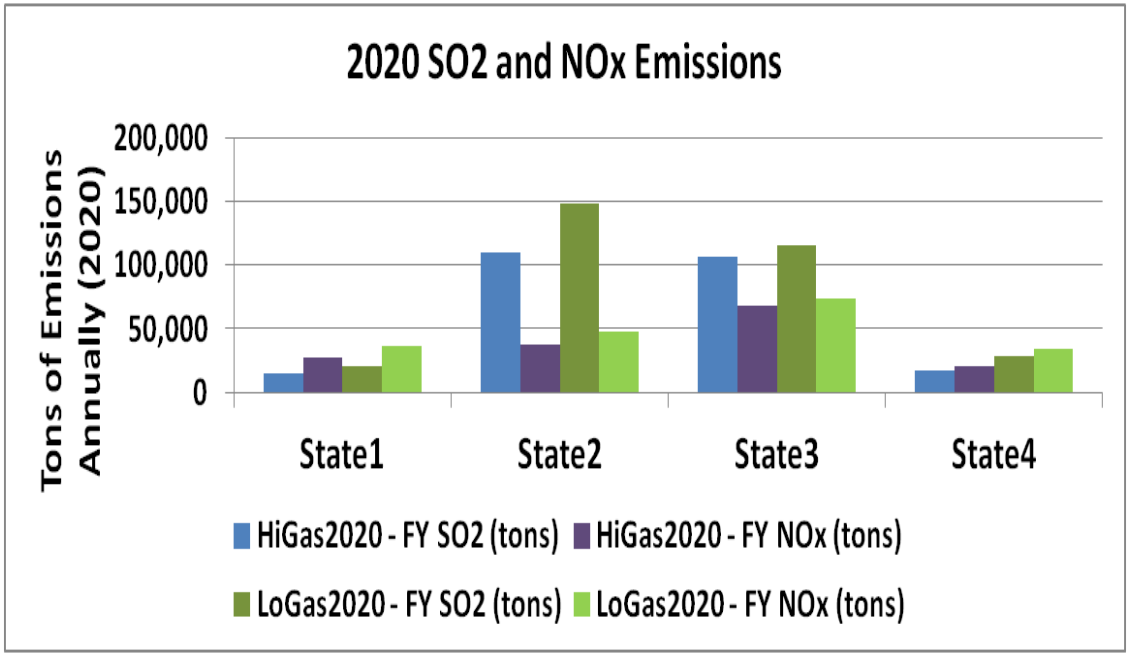
Growth Rates

- **For 2007 and 2011 base years**
- **Out years of 2017, 2018, 2020, and 2025**

NEWE, 2020	Coal	CC & SC Gas	Oil
Reference	0.426	1.057	0.277
Low Coal Prices	1.236	0.856	0.336
Low Gas Prices	0.297	1.294	0.293

Outputs

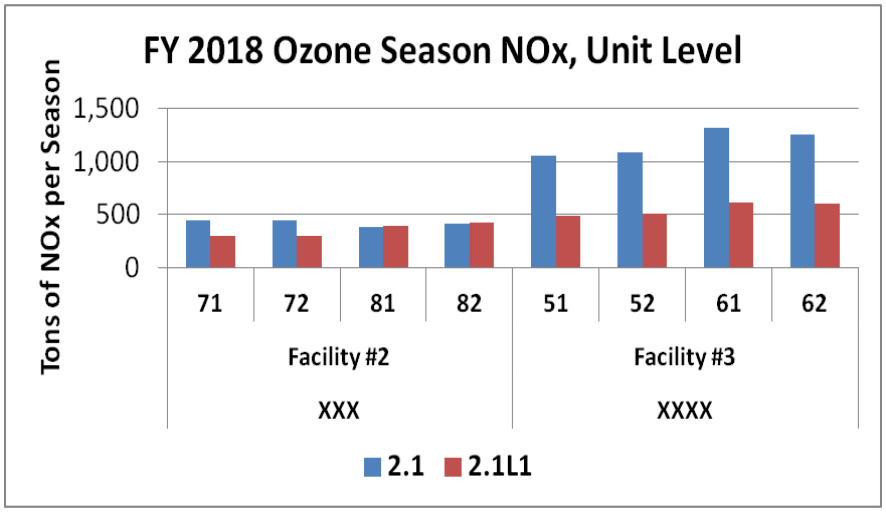
- **Unit level activity estimates**
- **Unit level SO2 and NOx estimates**
- **May be compared by unit or region**



Analyze Results of Unit Specific Changes

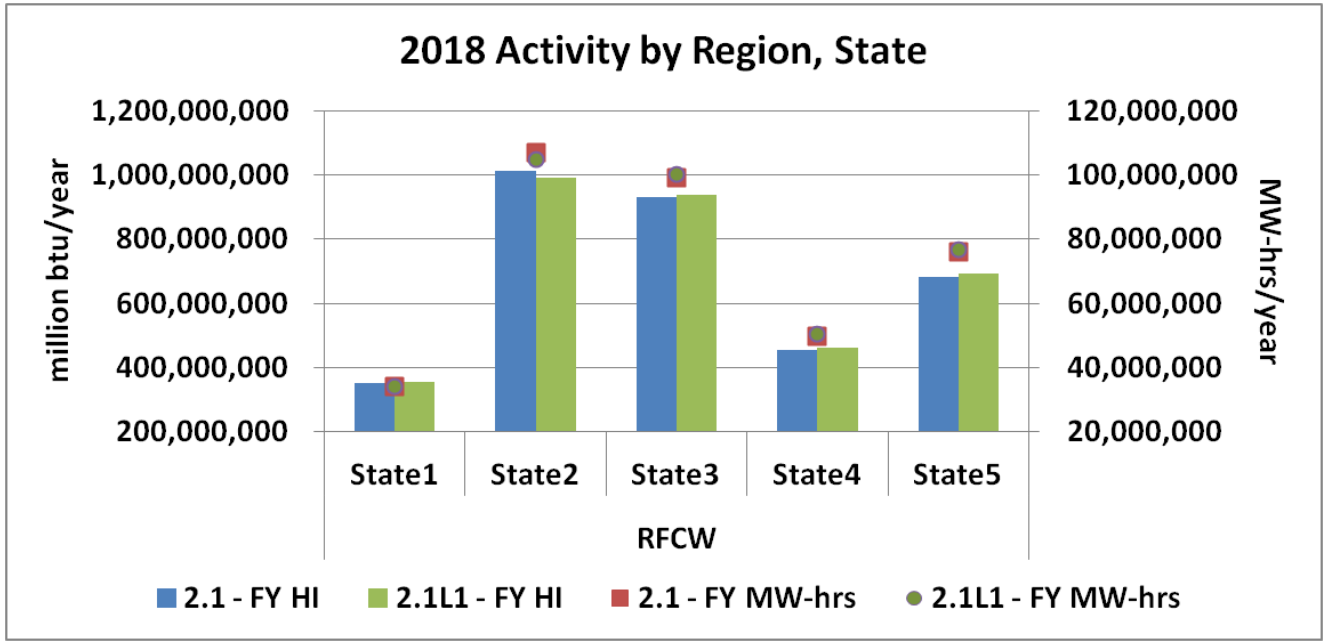
- ERTAC Team put together CONUS 2.1
- LADCO was informed shortly thereafter of significant changes to several midwestern coal fired units
- Lots of interest in possible activity and emissions ramifications
- LADCO ran CONUS2.1L1 to assess the results
- Took about a month to get the 2.1L1 answers

2.1 vs 2.1L1-Results



Emissions Data

- Allows comparison of emissions based on midwest changes
- Unit, facility, state, and regional levels



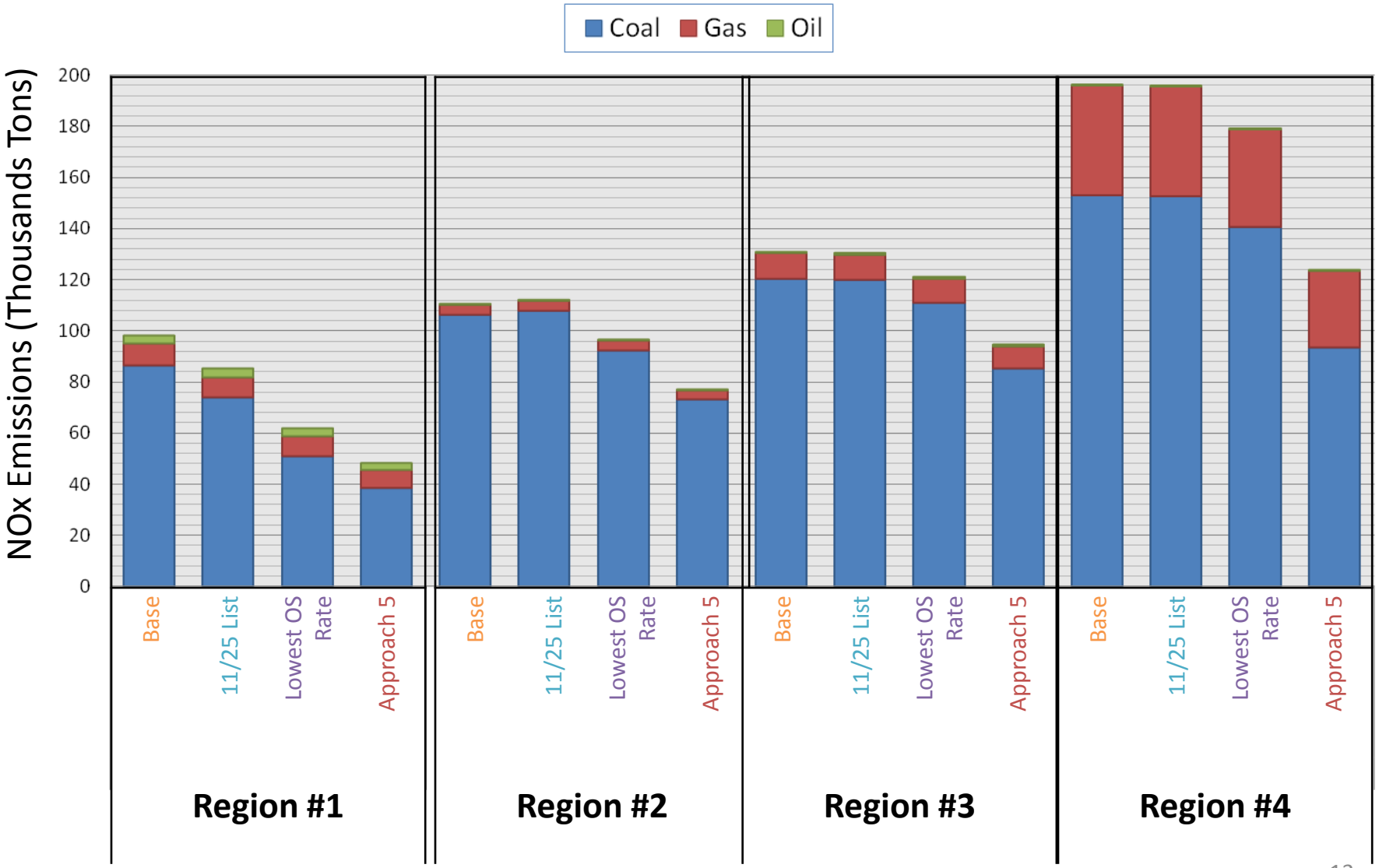
Activity Data

- Changes in activity can also be compared
- Unit, facility, state, and regional levels

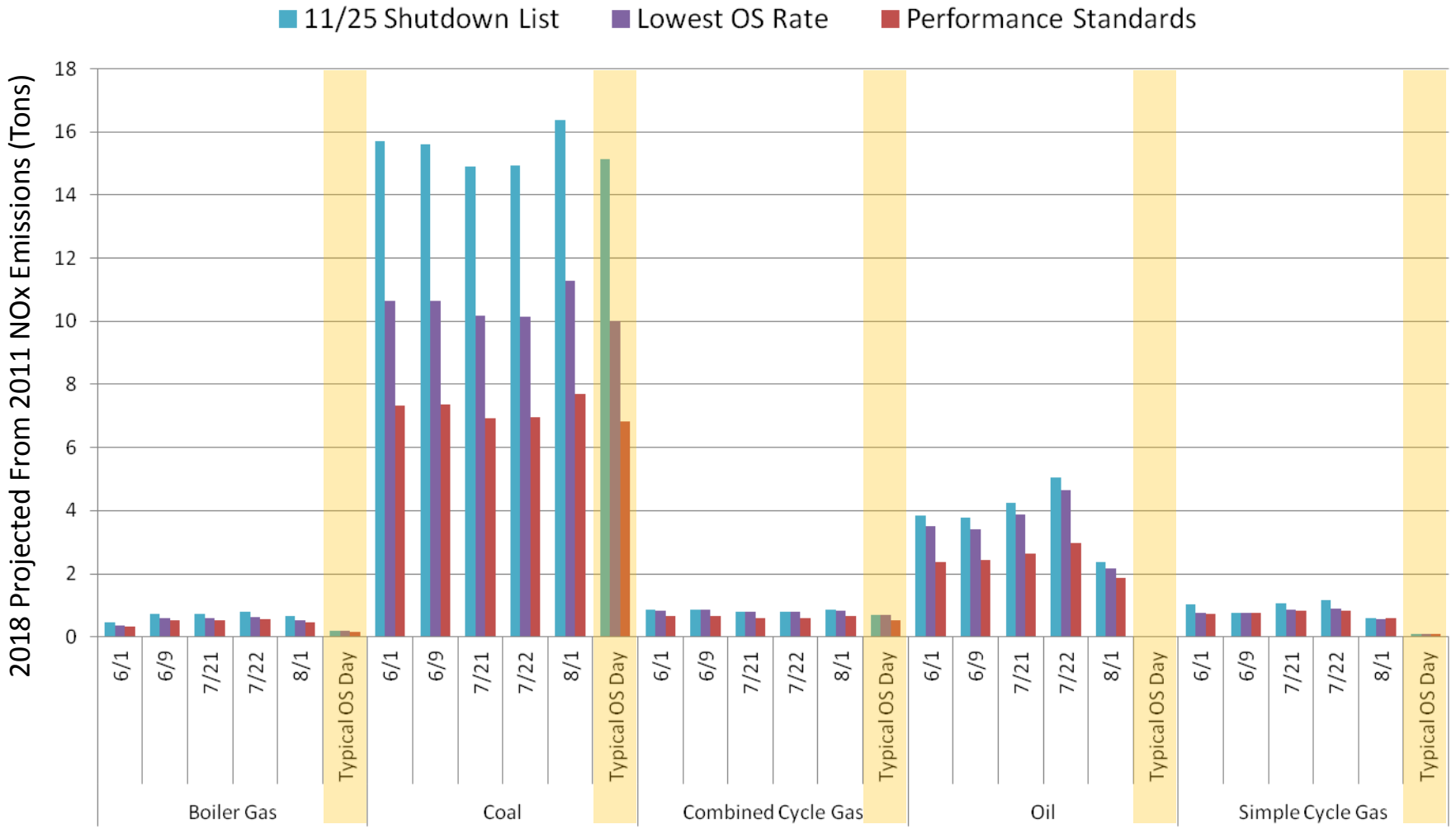
What-If Scenarios

- OTC Aggressive Retirements
  - Facilities will often announce retirements prior to states knowing about the impending unit changes
  - Press releases, web pages, industry journals, etc.
  - What happens to future year activity and emissions if all units noted as retiring by any media outlet actually do retire?
- Control assumptions
  - What happens when control devices are assigned a minimum efficiency or rate?
  - What happens when control devices are assigned an optimal efficiency or rate?

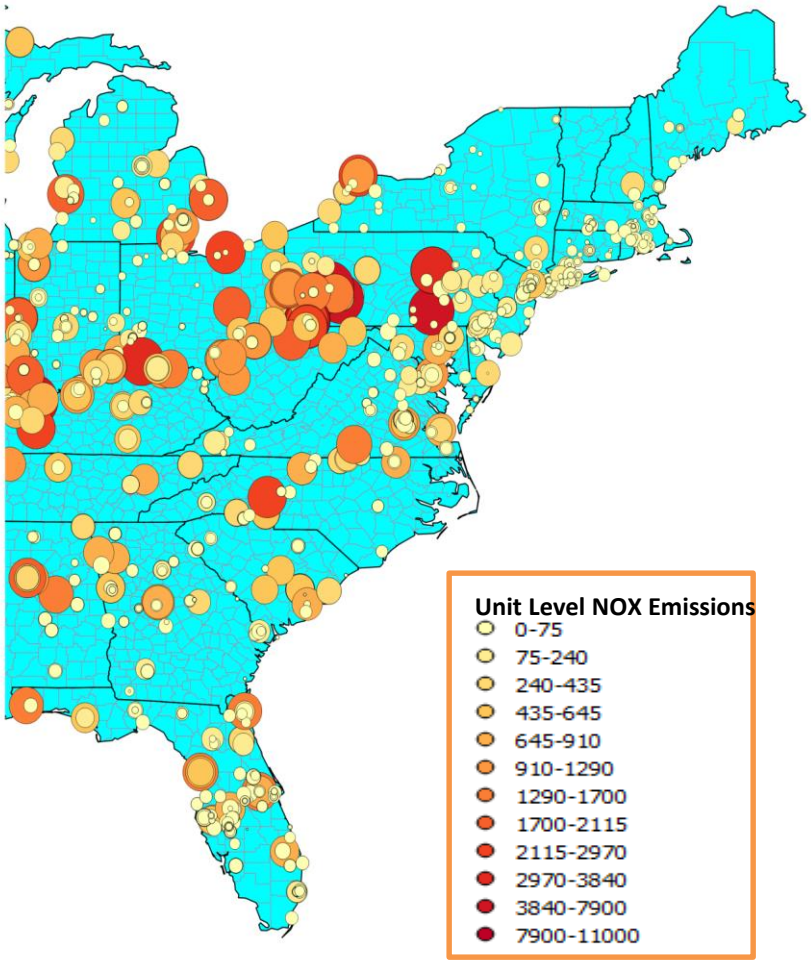
2018 Regional Ozone Season NOx Emissions

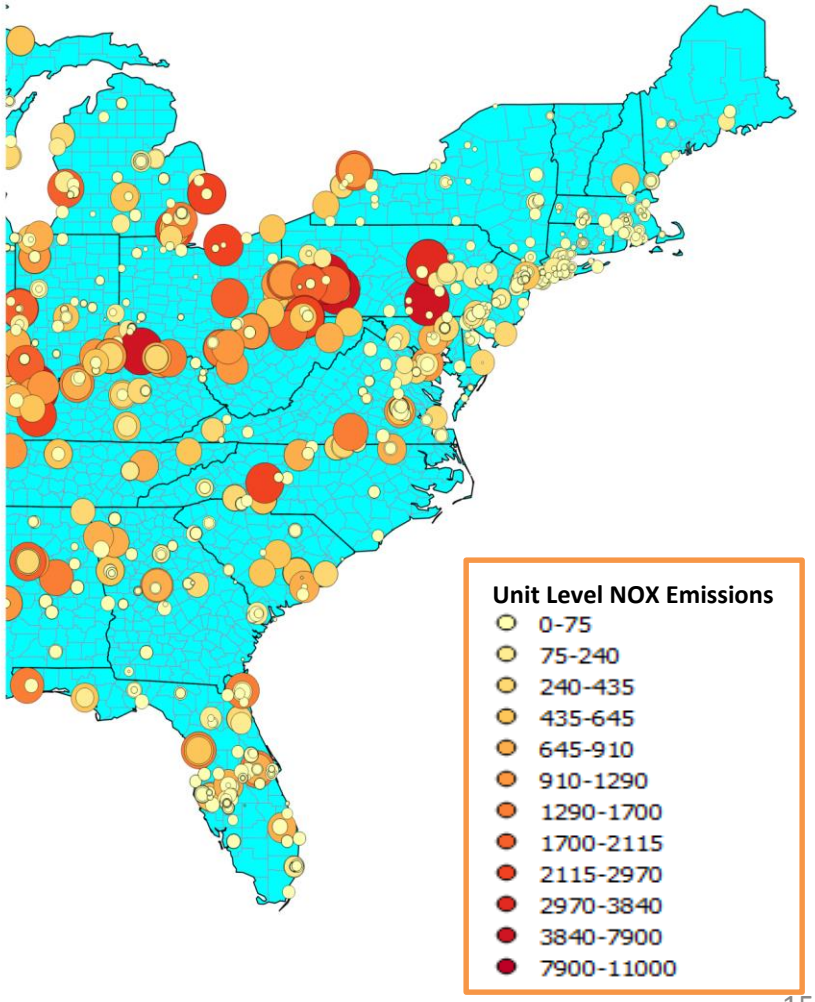


Region #1 Average Afternoon NOx on OS Peak Days by Fuel/Unit Type



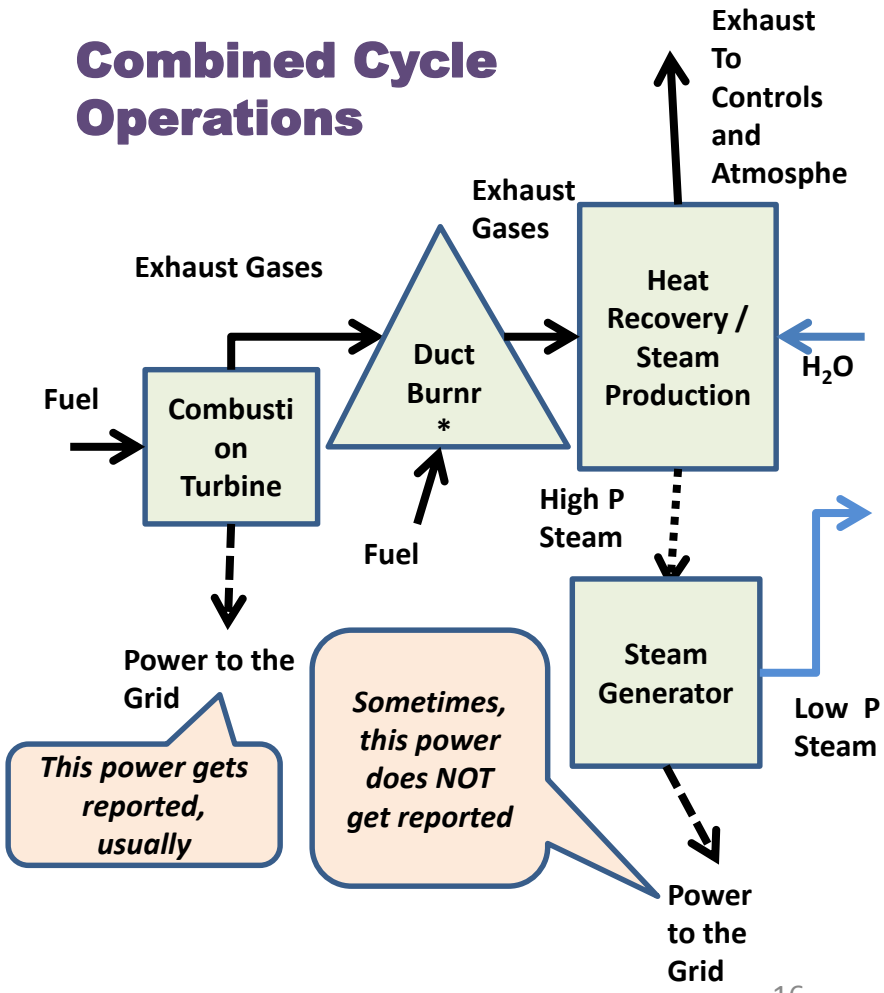
Mapping of Results



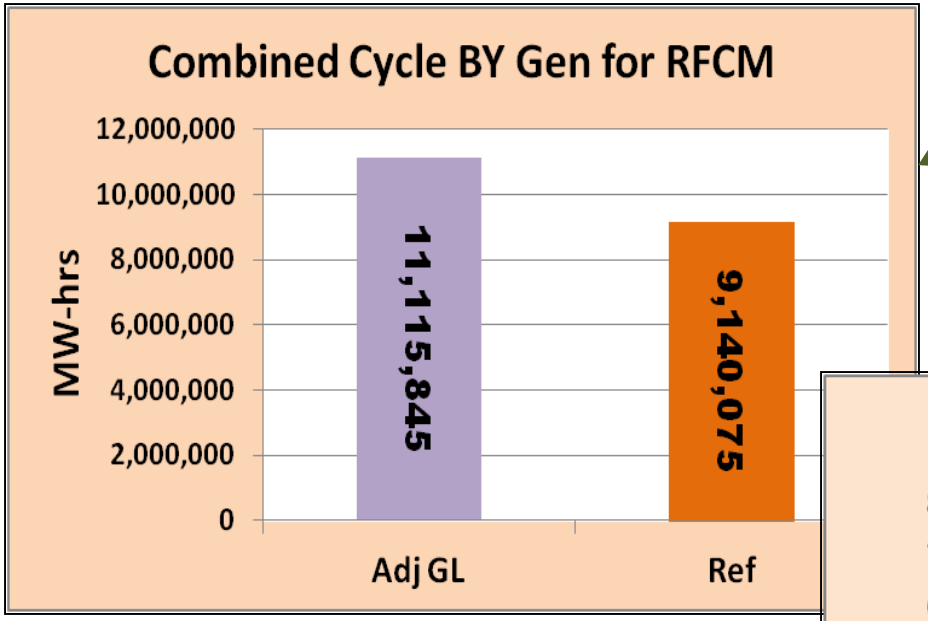


Impacts of CAMD Reporting Inconsistencies

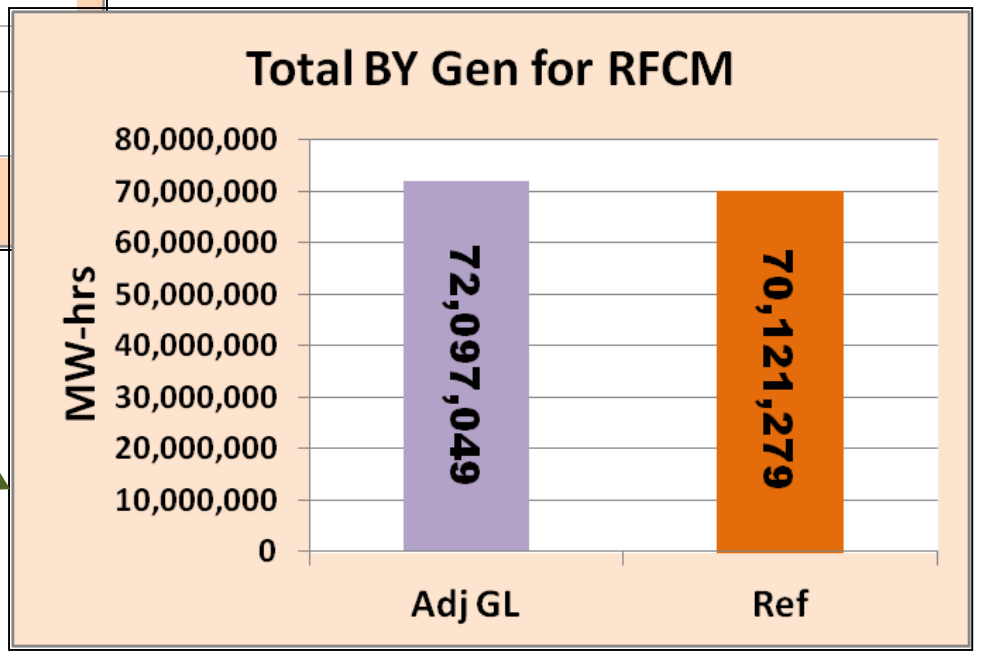
- Two states examined impacts of combined cycles under-reporting gross load
- Questions:
  - How does it affect NOx, particularly summertime NOx, emission estimates?
  - How does it affect CO2 emission estimates?
- ERTAC tool allows user to selectively adjust BY hourly CAMD file using the nonCAMD hourly file



RFCM BY Generation, Ref vs AdjGL

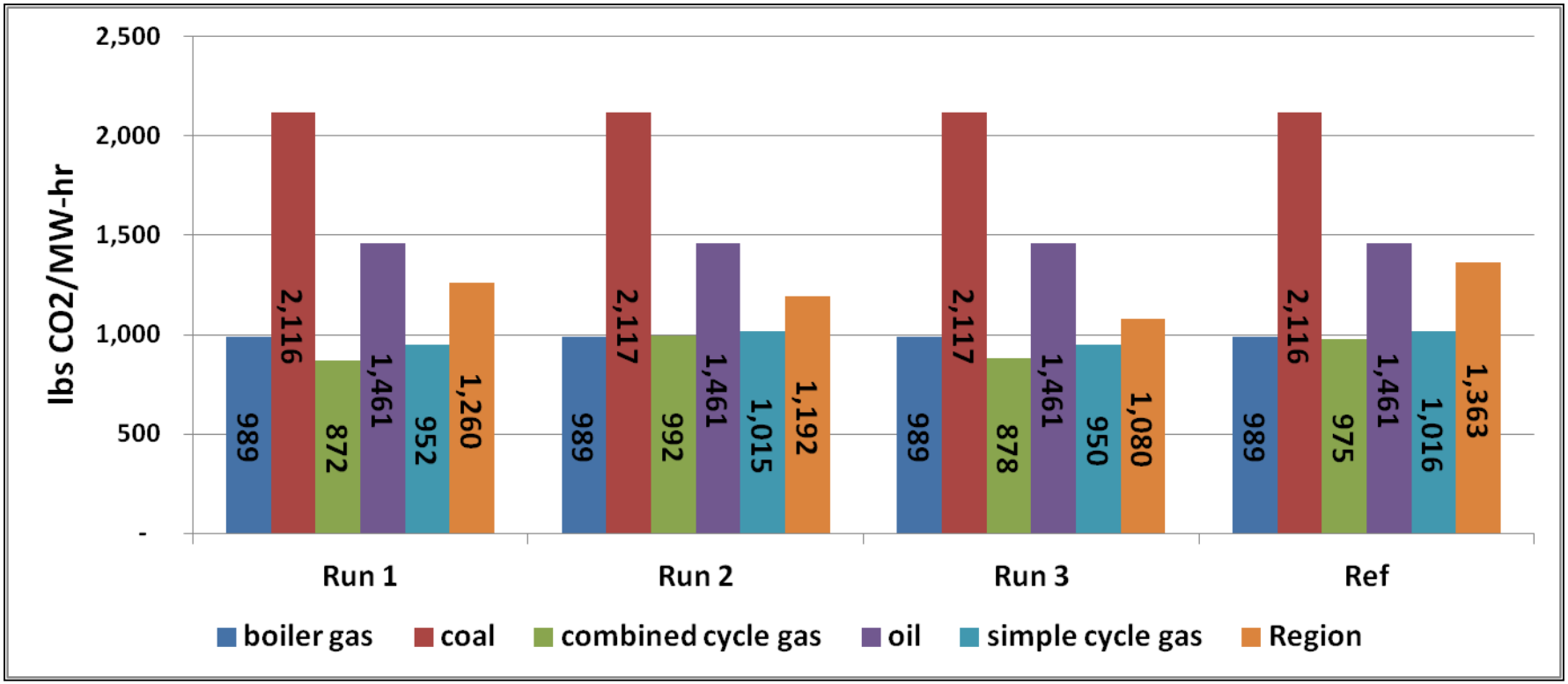


About a 22% increase in CC generation for the region



About a 3% increase in overall generation for the region

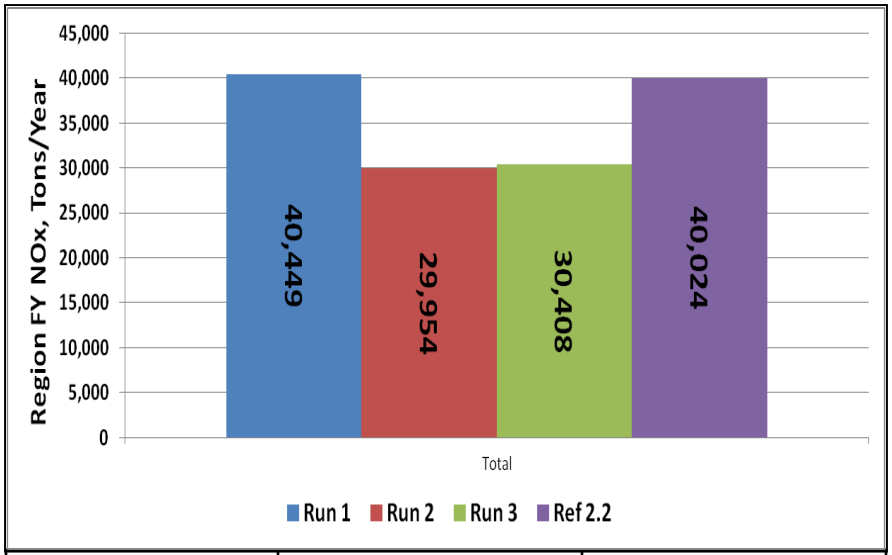
Regional Data-lbs CO_2/MW-hr



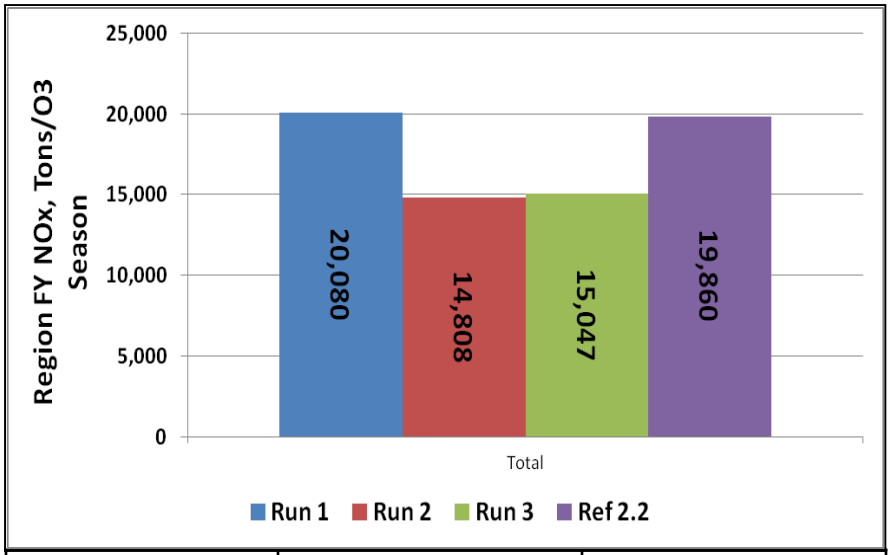
	Boiler Gas	Coal	CC	Oil	SC	Region
Run 1	989 lbs/MW-hr	2,116 lbs/MW-hr	872 lbs/MW-hr	1,461 lbs/MW-hr	952 lbs/MW-hr	1,260 lbs/MW-hr
Run 2	989 lbs/MW-hr	2,116 lbs/MW-hr	992 lbs/MW-hr	1,461 lbs/MW-hr	1,015 lbs/MW-hr	1,192 lbs/MW-hr
Run 3	989 lbs/MW-hr	2,116 lbs/MW-hr	878 lbs/MW-hr	1,461 lbs/MW-hr	950 lbs/MW-hr	1,080 lbs/MW-hr
Ref2.2	989 lbs/MW-hr	2,116 lbs/MW-hr	975 lbs/MW-hr	1,461 lbs/MW-hr	1,016 lbs/MW-hr	1,363 lbs/MW-hr

Region FY Data-NOx

The Growth Rates have a much larger impact on NOx emissions than the GL adjustments.



Δ (1-Ref2.2)=	**425 tons (1.1% increase)**	**GL adjustment**
Δ (2-Ref2.2)=	**-10,070 tons (25.2% decrease)**	**Higher NG GRs**
Δ (3-Ref2.2)=	**-9,616 tons (24.0% decrease)**	**GL adjustments & higher GRs**

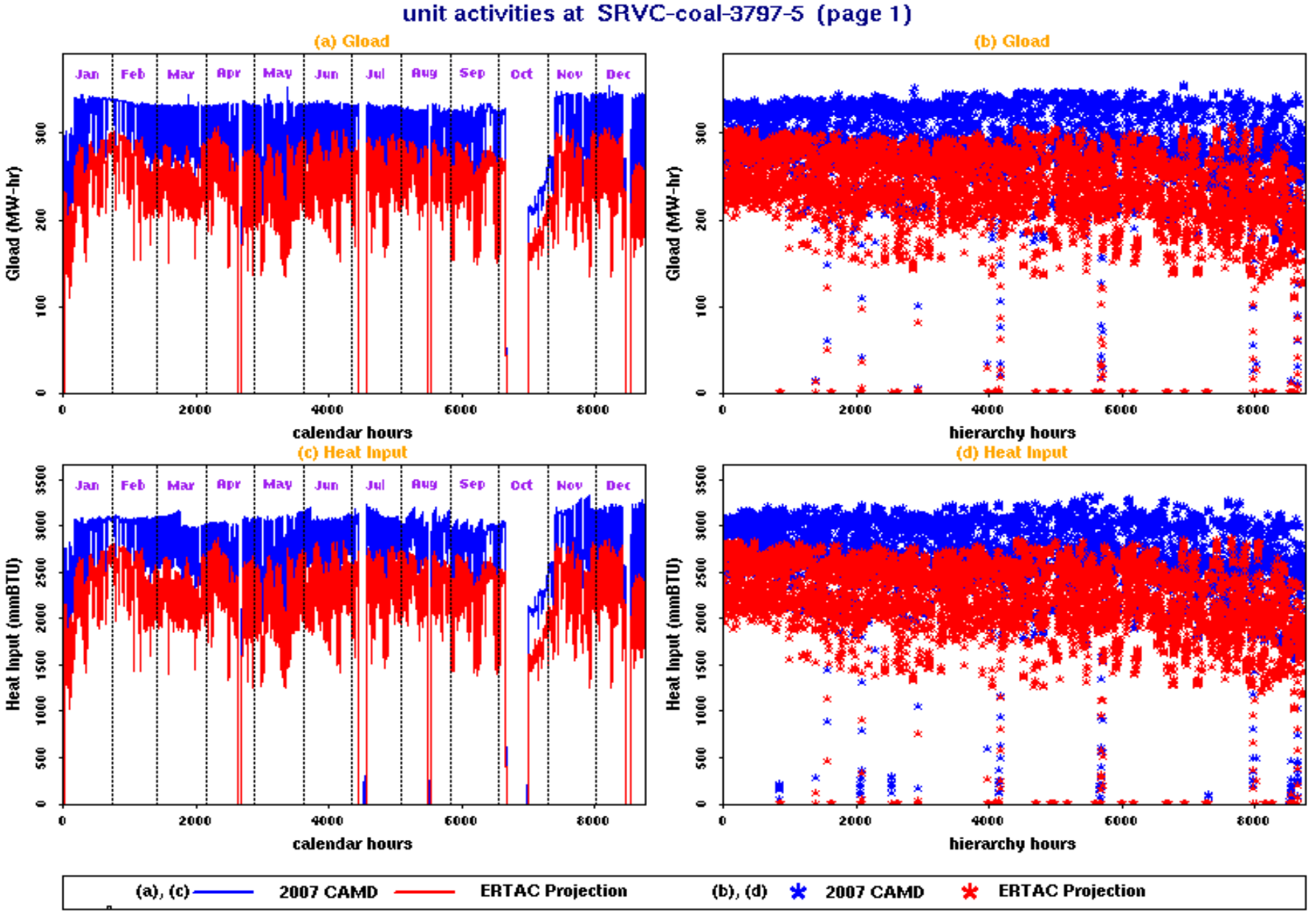


Δ (1-Ref2.2)=	**220 tons (1.1% increase)**	**GL adjustment**
Δ (2-Ref2.2)=	**-5,052 tons (25.4% decrease)**	**Higher NG GRs**
Δ (3-Ref2.2)=	**-4,813 tons (24.2% decrease)**	**GL adjustments & higher GRs**

Post Processors

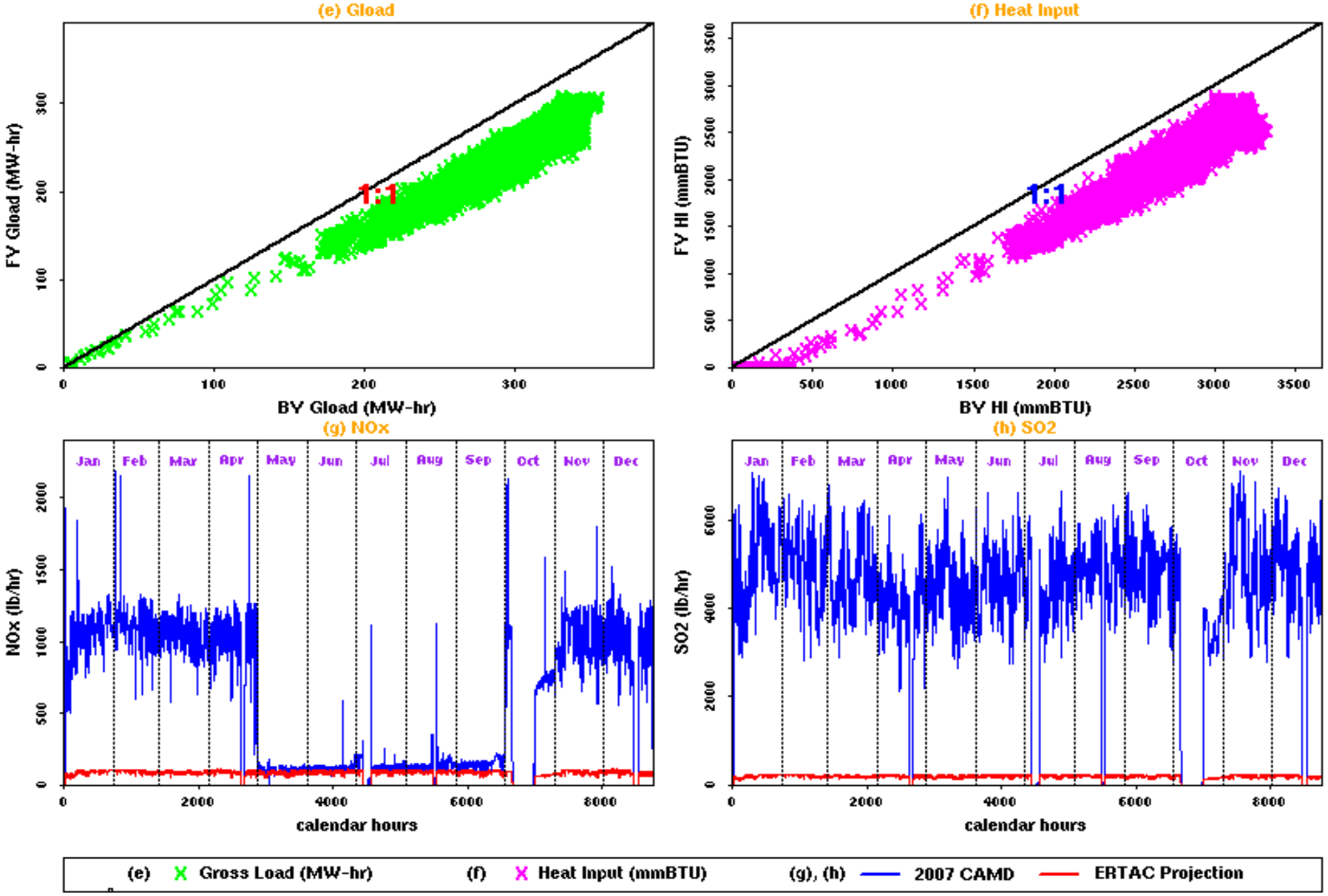
- Criteria Pollutant Post Processor – summarizes NOx, SO_2, activity at unit level
- CO_2 Post Processor – summarizes CO_2 and activity at unit level
- Graphical
  - provides nice unit level summary of information
  - Needs a lot of memory and time to run
- ERTAC_to_SMOKE – provides all necessary additional information (other pollutants, stack parameters, etc) to allow the ERTAC data to be fed into SMOKE for air quality modeling assessments

Graphical Post Processor



Graphical Post Processor

unit activities at SRVC-coal-3797-5 (page 2)



New Applications-Under Development or Being Considered

- Building Block #2: developing a post processor to reduce coal utilization and increase combined cycle utilization in each region such that each CC unit operates at least at 65% or 70% utilization
- Update the BY 2012 UAF with latest info
  - Run 2020, 2025 and 2030 FY projections
  - Analyze the result of improving all coal fired units' heat rates by 6% (building block #1)
  - Analyze the result of updating the hourly gross load data for any combined cycle that under reports power generation
- SIP quality modeling effort-led by OTC for BY 2018






Any Questions?