US EPA ARCHIVE DOCUMENT

Calculation of Required Additional Reductions (Shortfall Calculations):

This includes the following:

A. ***Controls on Electric Generating Units (EGUs) at Georgia Power Plants***

1. *0.13 lbs MMBTU 5-plant average for plants Bowen, Hammond, McDonough, Wansley, and Yates*

2. *0.20 lbs MMBTU 7-plant average for the same 5 plants along with plants Branch and Scherer*

B. ***Open Burning***

1. *A ban on open burning (including both prescribed and slash burning) in 6 additional counties (Bartow, Carroll, Hall, Newton, Spalding and Walton)*

2. *A ban on open burning (including slash burning) in 26 additional counties (Banks, Barrow, Butts, Chattooga, Clarke, Dawson, Floyd, Gordon, Haralson, Heard, Jackson, Jasper, Jones, Lamar, Lumpkin, Madison, Meriwether, Monroe, Morgan, Oconee, Pickens, Pike, Polk, Putnam, Troup and Upson)*

C. ***NOx / VOC RACT and NSR***

1. *Delayed NOx / VOC RACT in 6 additional counties (listed above)*
   The rules have been promulgated, but no credit can be taken at this time, as the RACT determinations are not being expected to take place before November 2000. Nevertheless, reductions are expected to take place by May 2003.

2. *No NOx / VOC RACT and NSR in 26 additional counties (listed above)*
   The rules are revised to remove applicability to these counties.

D. ***Large Combustion Turbines***

1. *A new rule for Large Combustion Turbines in the existing 13-county Non-attainment Area and the 32 additional counties (listed above)*

Note: This version of the "Shortfall Calculations" replaces all previous versions that were submitted as a part of the Atlanta Ozone Non-Attainment Area SIP.

DETERMINATION OF REQUIRED ADDITIONAL REDUCTIONS
"SHORTFALL CALCULATIONS"
(Utilizing corrected 2003 controls).

Method 1

1. Calculate the average (over all modeled days) predicted daily maximum 1-hour ozone concentration at the area of the highest modeled concentration first with the current emissions and then with the future emissions.

   Note: The 1996 Controls modeling was used
   The 1996 peak modeled concentrations were 183.9, 158.7, and 177.5 ppb. The 2003 peak concentrations are 164.3, 154.2, and 132.9 ppb. The average modeled concentrations (i.e., AVGP) for these years are:

   $AVGP_{2003}$ = 150.5 ppb , $AVGP_{1996}$ = 173.4 ppb

2. Calculate the relative reduction factor (RRF) by taking the ratio of the average daily maximum 1-hour ozone concentration obtained with future emissions to that obtained with the current emissions.

   $(RRF) = (AVGP_{2003})/(AVGP_{1996}) = 150.5/173.4 \doteq 0.8679$

3. Calculate the area-wide design value for 1996 (DV_{96}) using the design values that include the year of current emissions. The design value for 1996 was calculated by averaging the design values for 1994-1996, 1995-1997, and 1996-1998. (Averaging three years of design values is performed to reduce the variability in the design value due to meteorology). The respective value for each of those years was 147, 145, and 146 ppb. Thus, the average 1996 design value is:

   DV_{96} = 146 ppb at the Confederate Avenue monitor site

   Note: The Confederate Ave monitor site was used to obtain a value that was close to the peak area site.

4. Multiply the relative reduction factor by the average design value to compute the future design value (DVF).

   $(DVF) = (RRF)*(DV_{96}) = 0.8679 * 146 = 126.72$ ppb

5. Calculate the change in air quality design value (AQ) by subtracting the estimated future design value (step 4) from the base air quality design value (step 3).

   $AQ = DV_{96} - DVF = 146 - 126.72 = 19.28$ ppb

6. Estimate the percent reduction in NOx emissions and VOC emissions that occurred within the 13-county area before and after controls. Biogenics are NOT included in emissions.

The following emission rates are found in the UAM model:

NOx_{1996} = 563.2 tpd	NOx_{2003} = 419.1 tpd
+ 7.42 from open/slash burning	+ 7.75 from open/slash burning
+ 321.53 from electric generating units	+ 213.61 from electric generating units
+ 15.23 from 32 counties	+ 9.06 from 32 counties
+ 0.00 from combustion turbines	+ 4.55 from combustion turbines
= 907.38 tpd	= 654.07 tpd

Note: The emissions from the Georgia Power plants are based on an average of the three episode days. They include the most likely scenario for emissions from individual emission units. However, this should not be construed as individual emission limits for those units.

VOC_{1996} = 508.6 tpd	VOC_{2003} = 376.83 tpd
+ 36.2 from open/slash burning	+ 37.9 from open/slash burning
+ 3.31 from prescribed burning	+3.50 from prescribed burning
+ 31.50 from 32 counties	+ 13.99 from 32 counties
= 579.61 tpd	= 432.22 tpd

$$\%NOx_{Rd} = [(907.38 - 654.07)/907.38]*100 = 27.92\%$$

$$\%VOC_{Rd} = [(579.61 - 432.22)/579.61]*100 = 25.43\%$$

7. Divide the percent reduction in NOx emissions by the change in the air quality design value and divide the percent reduction in VOC emissions by the change in air quality design value.

$$NOx_{norm} = \%NOx_{Rd} / AQ = 27.92\% / 19.28 \text{ ppb} = 1.45 \text{ \%/ppb}$$
$$VOC_{norm} = \%VOC_{Rd} / AQ = 25.43\% / 19.28 \text{ ppb} = 1.32 \text{ \%/ppb}$$

8. Estimate the amount of additional ozone reduction needed by taking the difference between the future design value and 124 ppb, the maximum ozone design value consistent with meeting the NAAQS.

$$RN = 126.72 - 124 = 2.72 \text{ ppb}$$

9. Calculate additional necessary emission reductions by taking the product of each of the "normalized" emissions reduction factors and the amount of ozone reduction needed.

$$NOx_{needed} = RN * NOx_{norm} = 2.72 \text{ ppb} * 1.45 \%/\text{ppb} = 3.94 \%$$

$$VOC_{needed} = RN * VOC_{norm} = 2.72 \text{ ppb} * 1.32 \%/\text{ppb} = 3.59\%$$

Percent amount of reductions needed from 1996 base: **NOx = 3.94%**
VOC = 3.59%

Amount of reductions needed in tons per day: **NOx = 907.38 tpd * 3.94% = 35.75 tpd**
VOC = 579.61 tpd * 3.59% = 20.81 tpd

Required NOx Reductions	**35.75**

Industrial Open Burning Ban	-0.24
Commercial Open Burning Ban	-0.19
Residential Open Burning Ban	-3.66
Slash Burning Ban	-3.66
Additional EGU Controls	-44.06
Relieve NSR in 26 Counties	+1.73
Relieve RACT in 26 Counties	+10.98
Delay RACT in 6 Counties	+0.81
New Combustion Turbine Rule	-3.1

Extra NOx Reductions Beyond Those Required	**5.64**

Required VOC Reductions	**20.81**

Industrial Open Burning Ban	-0.91
Commercial Open Burning Ban	-0.96
Residential Open Burning Ban	-18.48
Slash Burning Ban	-17.55
Prescribed Burning Ban	-3.5
Relieve NSR in 26 Counties	+0.2
Delay RACT in 6 Counties	+3.69
Relieve RACT in 26 Counties	+10.66

Extra VOC Reductions Beyond Those Required	**6.04**

Additional NOx Reductions (tons per day) Calculations

County	2003 Emissions[1] with 10/28/99 SIP Controls	Additional Controls										Total of Additional Controls	2003 Emissions with 10/28/99 SIP and Additional Controls
		Electric Generating Units[2]	Open Burning Ban					Relieve NSR	Delay RACT	Relieve RACT	Combustion Turbines Rule (new)		
			Industrial Burning	Commercial Burning	Residential Burning	Slash Burning	Prescribed Burning						
Cherokee	11.66											0.00	11.66
Clayton	19.66											0.00	19.66
Cobb	68.18	-3.4800									2.6400	-0.84	69.02
Coweta	32.42	-2.3600										-2.36	34.78
DeKalb	61.14											0.00	61.1
Douglas	10.04											0.00	10.04
Fayette	7.40											0.00	7.40
Forsyth	6.75											0.00	6.7
Fulton	116.81											0.00	116.8
Gwinnett	50.02											0.00	50.0
Henry	23.14											0.00	23.1
Paulding	4.67											0.00	4.6
Rockdale	7.41											0.00	7.4
NAA TOTALS	**419.30**	**-5.84**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.64**	**-3.20**	**422.50**
Bartow	69.87	30.5400	0.0118	0.0123	0.2299	0.0091	0.0000		-0.1900		0.3600	30.97	38.96
Carroll	11.28		0.0166	0.0156	0.2937	0.0037	0.0000					0.33	10.96
Hall	16.05		0.0190	0.0209	0.3924	0.0253	0.0000		-0.6200			-0.16	16.2
Newton	8.60		0.0055	0.0091	0.1719	0.1812	0.0000					0.37	8.2
Spalding	6.40		0.0101	0.0119	0.2238	0.0417	0.0000					0.29	6.1
Walton	6.22		0.0047	0.0084	0.1586	0.3860	0.0000					0.56	5.6
SIX COUNTY TOTALS	**118.41**	**30.54**	**0.07**	**0.08**	**1.47**	**0.65**	**0.00**	**0.00**	**-0.81**	**0.00**	**0.36**	**32.35**	**86.0**
Banks	0.75		0.0297	0.0022	0.0424	0.0742						0.15	0.6
Barrow	5.37		0.0396	0.0065	0.1222	0.0598						0.23	5.1
Butts	3.21		0.0020	0.0034	0.0630	0.1523						0.22	2.9
Chattooga	0.45		0.0059	0.0048	0.0914	0.0037		-0.4200		-1.4100		-1.72	2.1
Dawson	1.66		0.0002	0.0021	0.0388	0.1251						0.17	1.5
Floyd	10.26	-6.0000	0.0168	0.0178	0.3341	0.0670		-0.3000		-1.8800		-7.74	18.0
Gordon	6.44		0.0196	0.0077	0.1442	0.1106						0.28	6.1
Habersham	1.08											0.00	1.0
Haralson	2.89		0.0047	0.0048	0.0903	0.0127						0.11	2.7
Heard	13.41		0.0010	0.0019	0.0354	0.1650					0.1000	0.30	13.1
Jackson	6.50		0.0063	0.0065	0.1234	0.0434						0.18	6.3
Jasper	1.59		0.0012	0.0019	0.0348	0.0489				-0.2400		-0.15	1.7
Jones	0.75		0.0003	0.0046	0.0853	0.1323				-0.3700		-0.15	0.8
Lamar	1.33		0.0025	0.0029	0.0535	0.0580						0.12	1.2
Lumpkin	0.73		0.0012	0.0033	0.0599	0.0218						0.09	0.6
Meriwether	3.20		0.0038	0.0048	0.0921	0.4787				-0.2300		0.35	2.8
Monroe	3.27	12.2700	0.0020	0.0038	0.0704	0.0163						12.36	-9.0
Morgan	2.09		0.0022	0.0028	0.0529	0.3027				-0.3500		0.01	2.0
Oconee	0.66		0.0010	0.0039	0.0724	0.2175						0.29	0.3
Pickens	2.86		0.0013	0.0031	0.0594	0.2846						0.35	2.5

Additional NOx Reductions (tons per day) Calculations

County	2003 Emissions[1] with 10/28/99 SIP Controls	Additional Controls										Total of Additional Controls	2003 Emissions with 10/28/99 SIP and Additional Controls
		Electric Generating Units[2]	Open Burning Ban					Relieve NSR	Delay RACT	Relieve RACT	Combustion Turbines Rule (new)		
			Industrial Burning	Commercial Burning	Residential Burning	Slash & Burning	Prescribed Burning						
Pike	0.73		0.0002	0.0022	0.0421	0.0652						0.11	0.63
Polk	4.34		0.0056	0.0074	0.1390	0.0000						0.15	4.19
Troup	3.56		0.0184	0.0123	0.2283	0.5727						0.83	2.73
White	0.05											0.00	0.05
REMAINDER TOTALS	**77.19**	**6.27**	**0.17**	**0.11**	**2.08**	**3.01**	**0.00**	**-0.72**	**0.00**	**-4.48**	**0.10**	**6.53**	**70.66**
UAM-IV TOTALS	**614.91**	**30.97**	**0.23**	**0.19**	**3.55**	**3.66**	**0.00**	**-0.72**	**-0.81**	**-4.48**	**3.10**	**35.69**	**579.22**
Chattooga	2.45												2.45
Clarke	1.13		0.0048	0.0015	0.0197	0.0000		-0.0100		-0.4300		-0.41	1.54
Floyd	11.55											0.00	11.55
Madison	0.00		0.0000	0.0000	0.0272	0.0000		-0.9300		-5.0800		-5.98	5.98
Monroe	77.79											0.00	77.79
Pickens	0.05											0.00	0.05
Putnam	84.16	13.0900	0.0015	0.0000	0.0176	0.0000						13.11	71.05
Upson	0.36		0.0015	0.0000	0.0469	0.0000		-0.0700		-0.9900		-1.01	1.37
NON-UAM-IV TOTALS	**177.48**	**13.09**	**0.01**	**0.00**	**0.11**	**0.00**	**0.00**	**-1.01**	**0.00**	**-6.50**	**0.00**	**5.70**	**171.78**
47-COUNTY TOTAL	**792.39**	**44.06**	**0.24**	**0.19**	**3.66**	**3.66**	**0.00**	**-1.73**	**-0.81**	**-10.98**	**3.10**	**41.39**	**751.00**

Note 1 *The 2003 Emissions are based on an average of the three episode days.*

Note 2 *The emissions from the electric generating units (EGUs) at Georgia Power are based on an average of the three episode days. It includes the most likely scenario for emissions from individual emission units. However, this should not be construed as individual emission limits for those units.*

Additional VOC Reductions (tons per day) Calculations

County	2003 Emissions[1] with 10/28/99 SIP Controls	Additional Controls: Electric Generating Units[2]	Open Burning Ban: Industrial Burning	Open Burning Ban: Commercial Burning	Open Burning Ban: Residential Burning	Open Burning Ban: Slash Burning	Open Burning Ban: Prescribed Burning	Relieve NSR	Delay RACT	Relieve RACT	Combustion Turbines Rule (new)	Total of Additional Controls	2003 Emissions with 10/28/99 SIP & Additional Controls
Cherokee	12.50											0.00	12.50
Clayton	22.45											0.00	22.45
Cobb	61.71											0.00	61.71
Coweta	8.98											0.00	8.98
DeKalb	74.33											0.00	74.33
Douglas	10.01											0.00	10.01
Fayette	7.48											0.00	7.48
Forsyth	7.56											0.00	7.56
Fulton	100.65											0.00	100.65
Gwinnett	48.24											0.00	48.24
Henry	10.17											0.00	10.17
Paulding	4.73											0.00	4.73
Rockdale	8.47											0.00	8.47
NAA TOTALS	**377.29**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**377.29**
Bartow	17.59		0.0592	0.0619	1.1603	0.0435	1.7382					3.06	14.53
Carroll	16.42		0.0843	0.0790	1.4822	0.0174	1.6599		-1.5000			1.82	14.60
Hall	18.68		0.0961	0.1056	1.9804	0.1216	0.0000		-0.6800			1.62	17.06
Newton	10.13		0.0283	0.0463	0.8676	0.8691	0.0000		-0.5100			1.30	8.83
Spalding	8.92		0.0509	0.0602	1.1302	0.1999	0.0956		-1.0000			0.54	8.38
Walton	8.85		0.0238	0.0428	0.8008	1.8511	0.0000					2.72	6.13
SIX COUNTY TOTALS	**80.59**	**0.00**	**0.34**	**0.40**	**7.42**	**3.10**	**3.49**	**0.00**	**-3.69**	**0.00**	**0.00**	**11.07**	**69.51**
Banks	1.00		0.0153	0.0115	0.2139	0.3562						0.60	0.41
Barrow	7.19		0.0200	0.0329	0.6168	0.2868						0.96	6.23
Butts	3.98		0.0100	0.0170	0.3180	0.7300						1.07	2.90
Chattooga	0.47		0.0295	0.0246	0.4615	0.0174						0.53	-0.03
Dawson	2.49		0.0010	0.0104	0.1957	0.5997						0.81	1.67
Floyd	14.05		0.0846	0.0899	1.6862	0.3215		-0.1200		-3.3500		-1.29	15.34
Gordon	10.17		0.0986	0.0389	0.7279	0.5301				-0.6800		0.72	9.46
Habersham	1.28											0.00	1.28
Haralson	6.05		0.0238	0.0244	0.4558	0.0608						0.56	5.49
Heard	3.13		0.0049	0.0095	0.1791	0.7909						0.98	2.15
Jackson	5.81		0.0318	0.0332	0.6227	0.2086				-0.8900		0.01	5.80
Jasper	4.05		0.0064	0.0093	0.1754	0.2347				-1.2200		-0.79	4.85
Jones	1.29		0.0017	0.0230	0.4304	0.6345						1.09	0.20
Lamar	1.93		0.0126	0.0145	0.2705	0.2781						0.58	1.35
Lumpkin	1.14		0.0062	0.0162	0.3024	0.1043						0.43	0.71
Meriwether	3.43		0.0192	0.0248	0.4651	2.2953				-1.1800		1.62	1.81
Monroe	2.35		0.0103	0.0190	0.3551	0.0782						0.46	1.89
[illegible]	1.83		0.0110	0.0143	0.2673	1.4513				-1.4200		0.32	1.51
[illegible]	[illegible]		0.0052	0.0195	0.3656	1.0429						1.43	-0.66
[illegible]	[illegible]		[illegible]	0.0160	0.2995	1.3644						1.69	3.46

Additional VOC Reductions (tons per day) Calculations

County	2003 Emissions[1] with 10/28/99 SIP Controls	Additional Controls: Electric Generating Units[2]	Open Burning Ban: Industrial Burning	Open Burning Ban: Commercial Burning	Open Burning Ban: Residential Burning	Open Burning Ban: Slash Burning	Open Burning Ban: Prescribed Burning	Relieve NSR	Delay RACT	Relieve RACT	Combustion Turbines Rule (new)	Total of Additional Controls	2003 Emissions with 10/28/99 SIP & Additional Controls
Pike	1.33		0.0013	0.0113	0.2122	0.3129						0.54	0.79
Polk	6.32		0.0286	0.0375	0.7018	0.0000						0.77	5.55
Troup	5.85		0.0934	0.0615	1.1524	2.7464				-0.3700		3.68	2.16
White	0.09											0.00	0.09
REMAINDER TOTALS	**91.09**	**0.00**	**0.52**	**0.56**	**10.48**	**14.44**	**0.00**	**-0.12**	**0.00**	**-9.11**	**0.00**	**16,77**	**74.32**
UAM-IV TOTALS	**548.97**	**0.00**	**0.86**	**0.95**	**17.90**	**17.55**	**3.49**	**-0.12**	**-3.69**	**-9.11**	**0.00**	**27.84**	**521.13**
Chattooga	0.00											0.00	
Clarke	0.60		0.0260	0.0069	0.1043	0.0000				-0.3100		-0.17	0.77
Floyd	0.50											0.00	
Madison	0.00		0.0000	0.0000	0.1429	0.0000						0.14	-0.14
Monroe	1.07											0.00	
Pickens	0.00											0.00	
Putnam	0.51		0.0087	0.0000	0.0930	0.0000				-0.2600		-0.16	0.67
Upson	0.00		0.0087	0.0000	0.2476	0.0000		-0.0800		-0.9800		-0.80	0.80
NON-UAM IV TOTALS	**2.68**	**0.00**	**0.04**	**0.01**	**0.59**	**0.00**	**0.00**	**-0.08**	**0.00**	**-1.55**	**0.00**	**-0.99**	**3.67**
47 COUNTY TOTALS	**551.65**	**0.00**	**0.91**	**0.96**	**18.48**	**17.55**	**3.49**	**-0.20**	**-3.69**	**-10.66**	**0.00**	**26.85**	**524.81**

The 2003 Emissions are based on an average of the three episode days.

The emissions from the electric generating units (EGUs) at Georgia Power are based on an average of the three episode days. It includes the most likely scenario for emissions from individual emission units. However, this should not be construed as individual emission limits for those units.