

Draft Report

**Comparison of CAIR and CAIR Plus Proposal using the Integrated Planning Model
(IPM[®])**

Prepared for

Mid-Atlantic Regional Air Management Association (MARAMA)

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A. Overview

MARAMA has awarded a contract to ICF Resources, L.L.C. (ICF), seeking ICF's services to evaluate the impact of EPA's CAIR Policy and the Mid-Atlantic/Northeast Visibility Union (MANE-VU) CAIR Plus proposal on the electric generating sector for the contiguous United States using the Integrated Planning Model (IPM[®]).

IPM is a dynamic linear optimization model that can be used to examine air pollution control policies for various pollutants throughout the contiguous U.S. for the entire electric power system. The dynamic nature of IPM enables the projection of the behavior of the power system over a specified future period. The optimization logic determines the least-cost means of meeting electric generation and capacity requirements while complying with specified constraints including air pollution regulations, transmission bottlenecks, and plant-specific operational constraints. The versatility of IPM allows users to specify which constraints to exercise and populate IPM with their own datasets.

This report summarizes the analysis that ICF has performed in evaluating the impact of the CAIR Plus proposal in the CAIR Plus region on the electricity generating sector by using IPM (hereafter, the analysis is referred to as the MARAMA analysis). As part of this analysis, ICF has also developed a Base Case that implements the EPA's CAIR, CAMR and CAVR policies. The model assumptions and data used in this analysis are presented in Section B. The results are presented in Section C and the analysis limitations are presented in Section D.

Since the modeling is based on analyses developed by U.S. EPA, VISTAS and LADCO, we have summarized only the incremental changes that were proposed by MARAMA as part of this analysis. The documentation for EPA's v2.19 and v3.0 base cases is available at <http://www.epa.gov/airmarkets/progsregs/epa-ipm>. The VISTAS and LADCO study assumptions are summarized in the Appendix.

B. Modeling Assumptions and Changes Made to VISTAS Run

The MARAMA analysis is based on the recent IPM based analysis performed for VISTAS and LADCO except for changes made by MARAMA. These runs are based on the VISTASII_PC_1f run that was developed for VISTAS in 2005. As per direction from MARAMA, the following assumptions for modeling the MARAMA Base Case-CAIR/CAMR/CAVR (MARAMA 5c) and MARAMA CAIR Plus Policy Case (MARAMA 4c) were implemented:

- a) Run year configuration: The run year configuration was updated to support the MARAMA analysis. The revised configuration is summarized in Table 1:

Table 1: Run Years in MARAMA Base Case and MARAMA CAIR Plus Policy Case

Run Year	Calendar Years
2008	2007-2008
2009	2009-2009
2010	2010-2011
2012	2012-2012
2015	2013-2017
2018	2018-2018
2020	2019-2022
2026	2023-2030

b) Natural Gas Prices: As per direction from MARAMA, ICF implemented the EPA Base Case v3.0 natural gas supply curves as part of this analysis. These gas supply curves are documented in the EPA Base Case v3.0 documentation published on its website. The gas supply curves used in the VISTAS analysis were based on the EPA Base Case v2.1.9. The gas supply curves used in the MARAMA analysis result in higher gas prices as compared to the VISTAS analysis.

c) Fuel Oil Prices: The fuel oil price projections from AEO 2006 were implemented in the MARAMA analysis and are higher as compared to the VISTAS analysis. The fuel oil price projections used in the VISTAS analysis were based on AEO 2005. The AEO 2006 assumptions are documented in the EPA Base Case v3.0.

d) SCR and Scrubber Feasibility Limits: Table 2 summarizes the cumulative SCR and scrubber feasibility limits that were implemented (in the MARAMA analysis) in the years 2008, 2009 and 2010. These limits prevent the model from projecting a level of SCR and scrubber builds in the short-term that was higher than the industry's capability to deliver. The feasibility limits in 2008 and 2009 are based on actual planned SCR and scrubber installations. The 2010 limit for scrubbers is based on an internal analysis for installation of SO₂ scrubbers under CAIR. In the VISTAS study, feasibility limits for SCR and scrubbers were not applied in 2008, 2009 and 2010.

Note that in 2008, 2009 and 2010 run years, IPM will only build the most economic SCRs and scrubbers up to those limits.

Table 2: Cumulative SCR and FGD Feasibility Limits in MARAMA Base Case and MARAMA CAIR Plus Policy Case Runs

Year	SCR (GW)	Scrubbers (GW)
2008	98	133
2009	104	153
2010	No Limit	172

e) CAVR (Clean Air Visibility Rule): Consistent with U.S. EPA's implementation of the CAVR rule, MARAMA has implemented the CAVR rule beginning in the run year 2015 within the MARAMA Base Case and MARAMA CAIR Plus Policy Case runs.

CAVR SO₂ Requirements: All CAVR eligible, unscrubbed, non CAIR and non WRAP affected sources larger than 200 MW are required to meet an output emission rate of

0.15 lbs/MMBtu of SO₂ or achieve 95% removal. Based on the results of an internal analysis, only the option to meet the 0.15 lbs/MMBtu of SO₂ was provided in IPM.

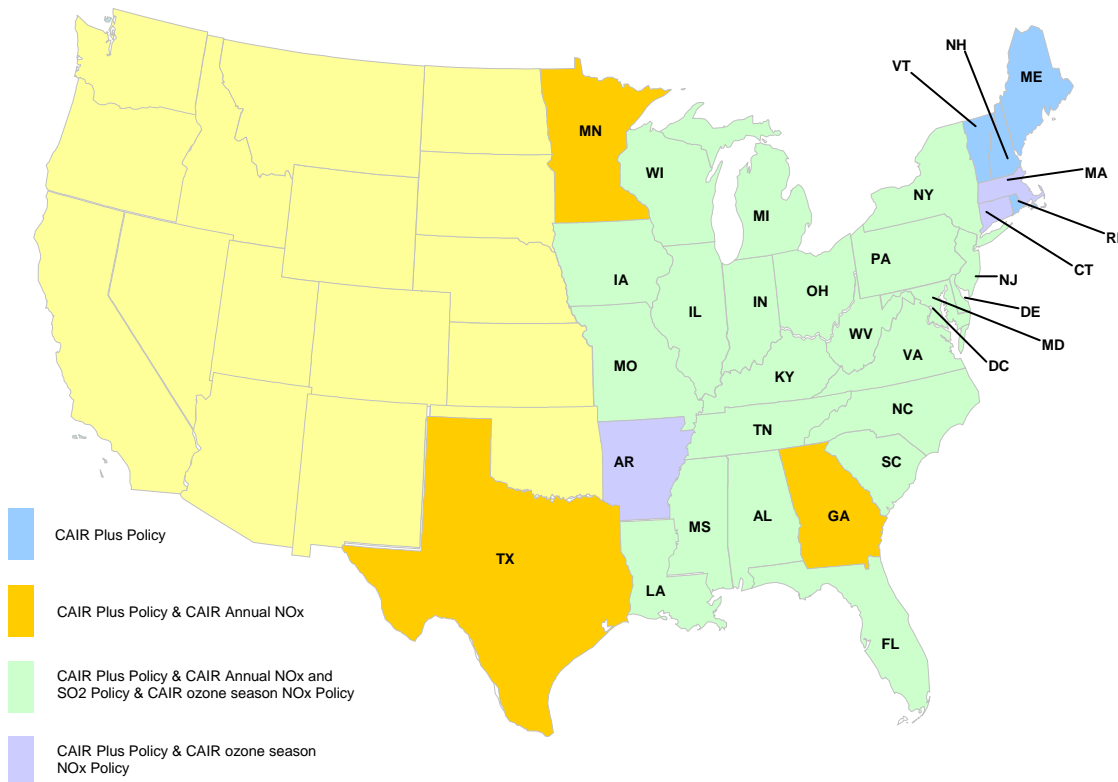
CAVR NO_x Requirements: All CAVR eligible, non CAIR affected sources larger than 200 MW are required to install combustion controls. SCRs are also required if the affected units are cyclone fired. All existing SCRs are required to operate annually.

Note that CAVR eligible sources in the above discussion imply the list of CAVR affected sources that U.S. EPA had modeled in their CAVR analysis using IPM.

f) Title IV SO₂ Bank: The IPM modeling time period in the MARAMA analysis is 2007-2030. In order to capture the dynamics of the SO₂ allowance market pre 2007, MARAMA has implemented a Title IV SO₂ allowance bank of 6.43 million tons, going into the year 2007. This assumption is based on an internal ICF analysis of the current market conditions.

g) Applicable States for Programs: The MARAMA CAIR Plus Policy Case run is based on the MARAMA Base Case run with the MARAMA CAIR Plus proposal implemented as a replacement of the CAIR policy. Figure 1 shows a U.S. map with states affected by CAIR and CAIR Plus policies highlighted.

Figure 1: States affected by CAIR and MARAMA CAIR Plus Policies



h) **NO_x and SO₂ Budgets.** Table 3 summarizes the NO_x budgets implemented in the MARAMA Base Case and MARAMA CAIR Plus Policy runs, and Table 4 summarizes SO₂ allowance retirement ratios implemented in the MARAMA Base Case and MARAMA CAIR Plus Policy Case runs. In IPM, emissions budgets are modeled as a cap that all affected sources together are required to comply with. These sources can buy or sell emission allowances among themselves and bank for future use under favorable economics.

The SO₂ allowance retirement ratio is the number of Title IV SO₂ allowances that need to be surrendered for each ton of SO₂ emissions in the CAIR/CAIR Plus region. In IPM, a CAIR/CAIR Plus policy affected source is required to surrender the applicable number of Title IV SO₂ allowances determined by the SO₂ retirement ratio for every ton of SO₂ emission. A non CAIR/CAIR Plus policy affected source surrenders one Title IV SO₂ allowance for every ton of SO₂ emissions.

Table 3: NO_x Budgets in the CAIR/CAIR Plus Region (Thousand Tons)

Year	NO _x Ozone Season Budget		NO _x Annual Budget	
	MARAMA Base Case	MARAMA CAIR Plus Policy Case	MARAMA Base Case	MARAMA CAIR Plus Policy Case
2009	568	623	1,722*	1,553*
2010	568	623	1,522	1,353
2012	568	415	1,522	902
2015	518	395	1,370	858
2018	485	382	1,268	829

* Includes NO_x Compliance Supplement Pool of 199,997 tons included in 2009.

Table 4: SO₂ Allowance Retirement Ratios in the CAIR/CAIR Plus Region

Year	SO ₂ Allowance Retirement Ratio	
	MARAMA Base Case	MARAMA CAIR Plus Policy Case
2009	1.00	1.00
2010	2.00	2.50
2012	2.00	2.94
2015	2.52	3.32
2018	2.86	4.16

Note: The 2015 budgets and retirement ratios in Tables 3 and 4 are the average of the budgets and retirement ratios over the period 2013-2017.

i) SO₂ and NO_x emission allowances were allowed to be banked in any year and then withdrawn from the bank in a future year under the CAIR program in the base case and the CAIR Plus programs.

C. Results

In this section, ICF has presented the costs, retrofit control installations, emissions, allowance market impacts, delivered fuel prices, generation, power plant retirements and new builds from the MARAMA Base Case and then compared these results with those from the MARAMA CAIR Plus Policy Case

run. The Appendix summarizes the SO₂ and NO_x emission results and production cost components on a state and RPO level. The following paragraphs discuss the results from the two runs.

1. Projected Costs

IPM projects the production cost of the U.S. power sector for each of the modeled run years. The production cost includes the annualized capital costs of new investment decisions (includes control equipments costs and new build costs), fuel costs and the total variable and fixed operation and maintenance (O&M) costs of power plants. The annualized incremental cost¹ of the MARAMA CAIR Plus Policy as compared to MARAMA Base Case is summarized in Table 5. The analysis projects a total cost of \$4.4 billion in 2009 & \$2.6 billion in 2018 respectively. Note that the cost of the policy is highest in 2009 and comes down starting 2010 because in 2009 there are limitations to the number of units that can install SCRs. In order to comply with the NO_x regulations the power sector increases the natural gas based generation resulting in an increase in fuel cost. Note that these costs are for the entire US power sector and the policy could affect states that are within and outside the CAIR Plus region.

Table 5: Cost of the MARAMA CAIR Plus Policy to the US Power Sector (1999 Billion Dollars)

	2008	2009	2010	2012	2015	2018
Variable O&M Cost	0.05	0.02	0.34	0.52	0.42	0.29
Fixed O&M Cost	0.00	-0.02	0.11	0.28	0.18	0.12
Fuel Cost	0.26	4.17	0.18	-0.89	0.05	0.24
Annualized Capital Cost	0.11	0.21	1.55	2.41	2.07	1.91
Total Production Cost	0.41	4.38	2.18	2.32	2.72	2.57

Note: To convert year 1999 dollars to year 2006 dollars, use a conversion factor of 1.1856

The marginal costs² of emission reductions as manifested in the projected allowance prices in the MARAMA Base Case and the MARAMA CAIR Plus policy case are shown in Table 6. The SO₂ and NO_x allowance prices in the CAIR Plus region in the MARAMA CAIR Plus Policy Case run are high starting in 2009 due to the relatively tighter policies applied to the CAIR Plus region as compared to the SO₂ and NO_x policies in the MARAMA Base Case. Tighter policies result in more expensive compliance options being chosen resulting in higher allowance prices. The NO_x allowance prices are high in 2009 and drop in 2010 because the SCR feasibility limits are relaxed starting in 2010. In 2009, due to limitations on SCR installations, a significant increase in natural gas fired generation occurs, driving up the annual NO_x allowance prices. Starting in 2010, SCRs are installed resulting in a reduction in the use of more expensive NO_x reduction options such as natural gas generation, driving down the annual NO_x allowance prices.

The compliance options available to power plants to reduce both annual NO_x emissions and the ozone season NO_x emissions are same. In addition the plants affected by the ozone season NO_x policy and the annual NO_x policy in the MARAMA CAIR Plus Policy Case are identical. Hence, it appears that complying with the annual NO_x policy results in an automatic compliance with the ozone season NO_x policy. This is highlighted by the zero ozone season NO_x allowance price starting 2010.

¹ Annual Incremental Production Cost = Annualized Production Cost of MARAMA CAIR Plus Policy Case – Annualized Production Cost of MARAMA Base Case

² Marginal cost is defined as the cost of reducing one additional ton of emissions.

Table 6: Allowance prices (Marginal Costs) of Emission Reductions in MARAMA Base Case and MARAMA CAIR Plus Policy Case (1999 \$/ton)

CAIR/CAIR Plus Policy	MARAMA Base Case					MARAMA CAIR Plus Policy Case				
	2009	2010	2012	2015	2018	2009	2010	2012	2015	2018
SO₂	692	748	809	943	1,105	870	940	1,017	1186	1,390
NO_x – Ozone	15,270	0	0	0	0	9,153	0	0	0	0
NO_x - Annual	2,489	1,155	1,155	1346	1,577	14,280	4,240	4,586	5346	6,266

Note: To convert year 1999 dollars to year 2006 dollars, use a conversion factor of 1.1856

2. Projected Control Technology Retrofits

Installation of controls is one of the strategies that the power sector opts for complying with the CAIR Plus proposal requirements. This strategy is in addition to other compliance strategies such as changes to plant retirements, plant dispatch and new builds. Under the MARAMA CAIR Plus Policy Case, an additional 19 GW of SO₂ scrubbers and 78 GW of selective catalytic reduction (SCRs) are installed by 2012 (see Table 7). In the MARAMA CAIR Plus Policy Case, the SCR feasibility limits in 2008 and 2009 run years and the SO₂ scrubber limits in 2008 and 2010 run years are achieved.

Table 7: Incremental Pollution Control Installations by Technology in the MARAMA CAIR Plus Policy Case with the MARAMA Base Case (GW)

Technology	2009	2010	2012	2015	2018
Scrubber	9	10	19	18	16
SCR	0	77	78	66	65

3. Emissions

Tables 8 and 9 summarize the SO₂ and NO_x emissions from all units in the MARAMA Base Case and the MARAMA CAIR Plus Policy Case in the 2008, 2009, 2010, 2012, 2015 and 2018 run years. Total projected state-level emissions for SO₂ and NO_x for the MARAMA CAIR Plus Policy Case and the MARAMA Base Case are presented in Tables A1-A3 in the Appendix.

Note, that the CAIR/CAIR Plus policies are not applied to the WRAP region in the MARAMA Base Case and MARAMA CAIR Plus Policy Case runs and hence the SO₂ and NO_x emissions in the two runs in the WRAP region are similar. The CAIR/CAIR Plus SO₂ programs start in 2010 and the NO_x programs start in 2009. Hence, the SO₂ and NO_x emissions are lower starting in 2010 and 2009 respectively.

Table 8: SO₂ Emissions from the U.S. Electric Power Sector (Thousand Tons)

	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
MANE-VU	795.1	652.7	520.2	462.7	410.5	378.1
LADCO	1,949.9	1,786.6	1,590.3	1,593.4	1,490.7	1,436.4
VISTAS	2,887.3	2,674.1	2,100.3	1,982.3	1,690.5	1,403.6
CENRAP	1,395.3	1,391.1	1,397.4	1,384.7	1,158.9	1,137.4
WRAP	508.1	507.5	533.5	533.9	478.1	419.3
National Total	7,535.7	7,012.0	6,141.8	5,957.0	5,228.6	4,774.7
MARAMA CAIR Plus Policy Case						
MANE-VU	721.2	510.5	396.6	377.0	316.3	272.9
difference wrt MARAMA Base Case	-73.9	-142.2	-123.6	-85.7	-94.2	-105.1
LADCO	1,779.6	1,605.8	1,455.5	1,450.1	1,337.4	1,280.5
difference wrt MARAMA Base Case	-170.3	-180.9	-134.8	-143.4	-153.3	-156.0
VISTAS	2,714.3	2,008.8	1,769.7	1,462.8	1,194.1	985.8
difference wrt MARAMA Base Case	-173.0	-665.3	-330.6	-519.5	-496.4	-417.8
CENRAP	1,390.5	1,331.7	1,384.1	1,313.8	1,015.0	961.9
difference wrt MARAMA Base Case	-4.8	-59.5	-13.3	-70.9	-143.9	-175.5
WRAP	504.1	506.1	551.4	552.7	498.1	441.7
difference wrt MARAMA Base Case	-4.0	-1.4	17.9	18.8	20.0	22.4
National Total	7,109.7	5,962.8	5,557.4	5,156.3	4,360.9	3,942.7
difference wrt MARAMA Base Case	-426.0	-1,049.2	-584.4	-800.7	-867.8	-832.0

Table 9: NO_x Emissions from the Electric Power Sector (Thousand Tons)

	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
MANE-VU	386.8	274.0	215.5	211.0	204.1	196.4
LADCO	804.6	484.2	414.5	410.9	391.3	383.6
VISTAS	1,207.8	697.1	617.9	616.7	498.7	452.8
CENRAP	754.8	603.2	603.5	616.3	539.4	538.5
WRAP	601.3	606.6	610.2	613.7	483.5	493.6
National Total	3,755.3	2,665.0	2,461.5	2,468.6	2,117.0	2,064.8
MARAMA CAIR Plus Policy Case						
MANE-VU	376.2	231.0	158.9	162.2	152.7	145.4
difference wrt MARAMA Base Case	-10.6	-43.0	-56.6	-48.8	-51.4	-50.9
LADCO	803.3	422.8	251.1	248.9	244.3	241.5
difference wrt MARAMA Base Case	-1.3	-61.4	-163.4	-162.0	-147.0	-142.0
VISTAS	1,216.4	594.0	349.8	350.3	345.6	349.6
difference wrt MARAMA Base Case	8.6	-103.1	-268.1	-266.4	-153.0	-103.2
CENRAP	755.2	581.0	421.3	431.9	361.4	352.3
difference wrt MARAMA Base Case	0.4	-22.2	-182.1	-184.4	-178.0	-186.1
WRAP	601.5	608.0	611.0	615.1	485.6	495.8
difference wrt MARAMA Base Case	0.2	1.4	0.8	1.5	2.1	2.2
National Total	3,752.6	2,436.8	1,792.2	1,808.5	1,589.7	1,584.7
difference wrt MARAMA Base Case	-2.7	-228.2	-669.4	-660.1	-527.3	-480.1

4. Allowance Market

Tables 10a and 10b summarize the CAIR/CAIR Plus SO₂ and NO_x allowance market as implemented in the CAIR/CAIR Plus region in the MARAMA Base Case and the MARAMA CAIR Plus Policy Case.

SO₂ emission allowances are banked in 2008 and 2009 and withdrawn in subsequent years. Allowances are not banked in later years as the CAIR/CAIR Plus policy starts in 2010 resulting in reduced opportunities for over complying. Annual NO_x emission allowances are banked in 2010 and not in 2009 in the MARAMA CAIR Plus Policy Case because restrictions on SCR installations prevent over compliance of the NO_x cap in 2009.

No ozone season NO_x emission allowances are banked in both the CAIR/CAIR Plus policies because the allowance price is zero starting 2009. A zero allowance price does not provide any incentive for banking of allowances. On a separate note, the allowances banked in the SIP Call budget program are allowed to be banked and used in the ozone season NO_x program starting in 2009.

Table 10a: Summary of SO₂ and NO_x Allowance Market in MARAMA Base Case (Thousand Tons)

Run Year	2008	2009	2010	2012	2015	2018	2020
Years Mapped to Run Year	2007-2008	2009	2010-2011	2012-2012	2013-2017	2018	2019-2022
CAIR - SO₂							
Annual Emissions at Affected Plants (Fossil Units > 25 MW)	7,333	6,807	5,946	5,760	5,031	4,575	4,162
Allowances Banked	5,245	2,473	0	0	0	0	0
Allowances Withdrawn from Bank	0	0	-1,075	-889	-1,073	-1,133	-714
CAIR – Ozone Season NO_x							
Ozone Season Emission Budget	497	568	568	568	518	485	485
Ozone Season Emissions at Affected Plants (Fossil Units > 25 MW in CAIR Region)	493	575	559	558	501	481	465
Allowances Banked	0	0	0	0	0	0	0
Allowances Withdrawn from Bank	0	0	0	0	0	0	0
CAIR – Annual NO_x							
Annual Emission Budget		1,722	1,522	1,522	1,370	1,268	1,268
Annual Emissions at Affected Plants (Fossil Units > 25 MW in CAIR Region)		1,722	1,522	1,522	1,364	1,297	1,268
Allowances Banked		0	0	0	6	0	0
Allowances Withdrawn from Bank		0	0	0	0	-29	0

Table 10b: Summary of SO₂ and NO_x Allowance Market in MARAMA CAIR Plus Policy case (Thousand Tons)

Run Year	2008	2009	2010	2012	2015	2018	2020
Years Mapped to Run Year	2007-2008	2009	2010-2011	2012-2012	2013-2017	2018	2019-2022
CAIR Plus - SO₂							
Annual Emissions at Affected Plants (Fossil Units > 25 MW)	6,907	5,766	5,361	4,960	4,164	3,741	3,212
Allowances Banked	5,671	3,514	0	0	0	0	0
Allowances Withdrawn from Bank	0	0	-1,353	-1,428	-1,107	1,236	-698
CAIR plus – Ozone Season NO_x							
Ozone Season Emission Budget	497	623	623	416	395	382	382
Ozone Season Emissions at Affected Plants (Fossil Units > 25 MW in CAIR Plus Region)	497	623	404	412	398	394	389
Allowances Banked	0	0	0	0	0	0	0
Allowances Withdrawn from Bank	0	0	0	0	0	0	0
CAIR plus – Annual NO_x							
Annual Emission Budget		1,553	1,353	902	858	829	829
Annual Emissions at Affected Plants (Fossil Units > 25 MW in CAIR Plus Region)		1,553	917	927	897	881	867
Allowances Banked		0	436	0	0	0	0
Allowances Withdrawn from Bank		0	0	-24	-38	-52	-38

5. Fuel Prices

Table 11 summarizes the delivered coal and natural gas prices solved by IPM in the MARAMA Base Case and MARAMA CAIR Plus Policy Case runs in the 2008, 2009, 2010, 2012, 2015 and 2018 run years.

The gas prices are higher in the MARAMA CAIR Plus Policy Case, in comparison to the MARAMA Base Case. This is a result of a small increase in gas consumption as shifting from coal to gas is a compliance option leading to higher gas prices. In 2009 and 2010, the gas prices are higher by 0.02 and 0.07 \$/MMBtu respectively. This shift in fuel consumption from coal to gas, results in a drop in coal prices by approximately 0.01 \$/MMBtu.

Table 11: Delivered Fuel Prices in MARAMA Base Case and MARAMA CAIR Plus Policy Case (1999 \$/MMBtu)

Fuel	MARAMA Base Case						MARAMA CAIR Plus Policy Case					
	2008	2009	2010	2012	2015	2018	2008	2009	2010	2012	2015	2018
Coal	1.09	1.07	1.07	1.05	1.03	1.00	1.09	1.06	1.06	1.04	1.02	0.99
Natural Gas	7.39	6.62	4.81	4.75	4.15	4.01	7.39	6.64	4.88	4.75	4.19	4.04

6. Power Plant Retirements

A tighter environmental policy increases a power plant's cost of compliance and hence could make an economic plant uneconomic. Table 12 summarizes the increase in power plant retirements in the MARAMA CAIR Plus Policy Case as compared to the MARAMA Base Case.

Table 12: Incremental Power Plant retirements in MARAMA CAIR Plus Policy Case with the MARAMA Base Case (MW)

Plant Type	2008	2009	2010	2012	2015	2018
Coal Steam	75	2,071	2,491	2,491	2,491	2,491
Oil/Gas Steam	2,428	2,428	2,279	2,279	2,184	2,184
Combined Cycle	-73	-73	208	208	86	86

7. Power Plant Generation

Power plant dispatch is one of the compliance strategies for meeting a tighter environmental policy. In the MARAMA CAIR Plus Policy Case as compared to the MARAMA Base Case, the generation mix changes towards lower emission intensive fuel and plant types. Table 13 summarizes the generation mix in the MARAMA CAIR Plus Policy Case and the MARAMA Base Case. Note that there is an increase in natural gas fired generation and a reduction in coal generation in all years except 2012. This occurs because 2012 is the first year when the SCR and scrubber feasibility limits are no longer applicable resulting in increased control installation and an increase in coal generation. In years after 2012, the SO₂ and NO_x policies in the MARAMA CAIR Plus Policy case continue to become tighter resulting in an increase in gas based generation.

Table 13: Generation by Fuel Type in the U.S. Electric Power Sector (GWh)

	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
Coal	2,207,575	2,182,342	2,505,629	2,555,760	2,753,775	2,961,213
Natural Gas	766,729	881,165	633,335	723,687	718,592	755,794
Other	1,239,171	1,227,029	1,230,909	1,239,070	1,260,405	1,261,865
National Total	4,213,475	4,290,536	4,369,873	4,518,517	4,732,772	4,978,872
MARAMA CAIR Plus Policy Case						
Coal	2,199,361	2,068,364	2,498,861	2,573,146	2,747,597	2,923,877
difference wrt MARAMA Base Case	-8,214	-113,978	-6,768	17,386	-6,178	-37,336
Natural Gas	774,308	998,192	639,444	706,069	723,301	791,719
difference wrt MARAMA Base Case	7,579	117,027	6,109	-17,618	4,709	35,925
Other	1,237,805	1,223,006	1,230,447	1,238,659	1,259,833	1,260,982
difference wrt MARAMA Base Case	-1,366	-4,023	-462	-411	-572	-883
National Total	4,211,474	4,289,562	4,368,752	4,517,874	4,730,731	4,976,578
difference wrt MARAMA Base Case	-2,001	-974	-1,121	-643	-2,041	-2,294

8. Power Plant New Builds

Table 14 summarizes the new power plant builds in the MARAMA Base Case and the MARAMA CAIR Plus Policy Case. Note, that in the MARAMA CAIR Plus policy case, new build penetration is higher than in the MARAMA Base Case. A reason for this increase is the need to compensate for increased power plant retirements as presented in Table 12.

Table 14: New Power Plant Builds by Plant Type in the United States (MW)

	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
Coal Steam	0	0	38,112	44,309	48,903	75,101
IGCC	0	0	0	0	23,222	27,653
Combined Cycle	6,449	6,449	6,473	8,498	20,298	24,242
Combustion Turbine	4,543	4,543	4,543	4,543	4,787	16,330
Other	6,368	6,368	6,727	7,396	8,861	9,977
National Total	17,360	17,360	55,855	64,746	106,071	153,303
MARAMA CAIR Plus Policy Case						
Coal Steam	0	0	36,296	46,636	52,318	73,040
difference wrt MARAMA Base Case	0	0	-1,816	2,327	3,415	-2,061
IGCC	0	0	3,794	3,794	25,031	31,985
difference wrt MARAMA Base Case	0	0	3,794	3,794	1,809	4,332
Combined Cycle	6,163	6,163	6,163	7,980	20,862	33,288
difference wrt MARAMA Base Case	-286	-286	-310	-518	564	9,046
Combustion Turbine	4,798	4,798	4,798	4,798	4,798	10,564
difference wrt MARAMA Base Case	255	255	255	255	11	-5,766
Other	6,471	6,471	6,820	7,748	8,936	10,009
difference wrt MARAMA Base Case	103	103	93	352	75	32
National Total	17,432	17,432	57,871	70,956	111,945	158,886
difference wrt MARAMA Base Case	72	72	2,016	6,210	5,874	5,583

D. Limitations of Analysis

MARAMA modeling using IPM is based on various economic and engineering input assumptions that are inherently uncertain, such as assumptions for future fuel prices, electricity demand growth and the cost and performance of control technologies. As configured, IPM does not take into account demand response (i.e., consumer reaction to changes in electricity prices).

Appendix

1. Summary of Changes to EPA Base Case v2.1.9 by Vistas

The EPA Base Case v.2.1.9 was developed by ICF under the direction of the U.S. Environmental Protection Agency (EPA). It serves as the starting point for the analysis presented in this report. Subsequent to its release the VISTAS Regional Planning Organization initiated a two-phase study using IPM. Starting with the EPA 2.1.9 as a base, VISTAS, along with study participants from CENRAP and LADCO RPOs, made several changes to the underlying datasets and modeling assumptions. The starting point for the MARAMA analyses discussed in this report was work from the VISTAS study as modeled in the run VISTASII_PC_1f.

VISTAS and its workgroup initiated a review of NEEDS and recommended a large number of changes to the data. This occurred in two phases. In addition to unit level changes, VISTAS and its workgroup made a number of global changes that are reflected in this case. These are briefly described below:

- Demand forecast were changed to reflect unadjusted EIA AEO 2005 national electricity and peak demand values.
- AEO 2005 data was used for all assumptions regarding new builds of conventional technologies. The cost and performance assumptions for these units were as per the AEO 2005 documentation, while assumptions for renewable capacity were the same as those used in the EPA Base Case 2004 v.2.1.9.
- For nuclear units, the cost of continued operation was updated to approximately \$27 per kilowatt-year based on AEO 2005.
- Fuel oil price projections from AEO 2005 were used.
- Hardwired Duke Power and Progress Energy control technology investment strategies for complying with the North Carolina Clean Smoke Stacks rule.
- The renewable portfolio standards (RPS) is modeled based on the most recent RGGI documentation using a single RPS region for Massachusetts (MA), Rhode Island (RI), New York (NY), New Jersey (NJ), Maryland (MD) and Connecticut (CT). The RPS requirements within these states can be met by renewable generation from New England, New York and PJM. EPA Base Case 2004 v.2.1.9 methodology and EIA AEO 2004 projected renewable builds were used for the rest of the regions.

2. Emission and Cost Results

Tables A1- A3 present SO₂ and NO_x emissions from the MARAMA Base Case and MARAMA CAIR Plus Policy Case runs by state in 2008, 2009, 2012, 2015 and 2018 run years.

Tables A4- A7 present variable O&M costs, fixed O&M costs, annualized capital costs and fuel costs from the MARAMA Base Case and MARAMA CAIR Plus Policy Case runs by state in 2008, 2009, 2012, 2015 and 2018 run years.

Table A1: State Level Annual SO₂ Emissions in MARAMA Base Case and MARAMA CAIR Plus Policy Case (Thousand Tons)

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	3.92	3.97	9.94	12.18	14.32	3.02	3.07	4.33	4.94	5.10	-0.90	-0.90	-5.61	-7.25	-9.21
	Delaware	33.74	32.55	17.58	15.39	14.91	33.74	27.51	28.25	8.08	3.33	0.00	-5.04	10.67	-7.32	-11.58
	District of Columbia	0.00	0.00	0.19	0.29	0.61	0.00	0.00	0.42	0.49	0.69	0.00	0.00	0.23	0.20	0.09
	Maine	38.03	38.18	8.27	8.99	9.72	35.20	20.37	5.25	5.16	4.93	-2.83	-17.82	-3.03	-3.83	-4.79
	Maryland	131.26	70.35	52.95	31.45	35.12	100.07	40.91	33.11	31.48	32.87	-31.19	-29.44	-19.84	0.03	-2.26
	Massachusetts	78.18	36.10	29.40	29.54	33.16	76.47	31.16	16.23	11.48	9.07	-1.71	-4.95	-13.17	-18.06	-24.09
	New Hampshire	7.66	7.66	11.89	13.38	14.89	7.66	5.17	3.42	3.17	3.29	0.00	-2.49	-8.47	-10.21	-11.60
	New Jersey	26.56	25.85	28.02	26.43	23.26	26.23	25.08	26.67	23.92	16.90	-0.34	-0.77	-1.35	-2.51	-6.36
	New York	124.38	121.50	102.77	90.69	85.43	110.64	76.99	76.67	72.34	66.85	-13.75	-44.51	-26.10	-18.36	-18.58
	Pennsylvania	351.36	316.46	199.54	179.20	142.94	328.14	280.17	182.16	154.50	129.13	-23.22	-36.29	-17.38	-24.71	-13.82
Rhode Island	0.00	0.00	1.29	1.77	2.23	0.00	0.00	0.27	0.40	0.44	0.00	0.00	-1.02	-1.37	-1.79	
Vermont	0.06	0.06	0.87	1.17	1.46	0.06	0.06	0.23	0.31	0.33	0.00	0.00	-0.64	-0.86	-1.13	
MANE-VU Total		795.15	652.67	462.72	410.49	378.05	721.23	510.47	377.01	316.26	272.93	-73.92	-142.20	-85.71	-94.23	-105.13
LADCO	Illinois	304.37	305.38	260.79	242.84	245.07	299.79	246.23	240.88	222.02	238.01	-4.58	-59.15	-19.91	-20.82	-7.06
	Indiana	496.08	484.54	463.56	414.50	375.99	477.52	409.76	409.93	377.41	332.19	-18.56	-74.78	-53.63	-37.09	-43.80
	Michigan	406.43	405.55	398.23	397.48	399.39	406.19	389.53	397.34	390.95	376.76	-0.24	-16.02	-0.89	-6.53	-22.62
	Ohio	581.77	442.29	317.26	282.55	263.97	434.83	413.57	251.28	198.98	190.57	-146.94	-28.72	-65.97	-83.57	-73.41
	Wisconsin	161.24	148.89	153.59	153.31	152.02	161.30	146.70	150.63	148.06	142.94	0.06	-2.19	-2.96	-5.25	-9.08
LADCO Total		1,949.89	1,786.65	1,593.42	1,490.68	1,436.44	1,779.63	1,605.80	1,450.06	1,337.42	1,280.47	-170.26	-180.85	-143.36	-153.26	-155.97
VISTAS	Alabama	357.18	332.19	286.68	254.34	217.75	336.44	236.72	220.26	196.68	158.39	-20.73	-95.47	-66.42	-57.65	-59.36
	Florida	213.04	210.85	194.77	194.04	172.02	212.81	190.65	157.70	156.69	115.40	-0.22	-20.20	-37.06	-37.35	-56.61
	Georgia	559.78	559.99	312.67	214.81	183.26	594.91	363.22	92.69	94.55	74.76	35.13	-196.77	-219.98	-120.26	-108.50
	Kentucky	390.62	370.85	275.00	274.04	240.08	364.54	325.44	274.69	220.25	203.97	-26.08	-45.42	-0.31	-53.78	-36.11
	Mississippi	82.21	70.23	85.71	27.87	23.17	81.48	62.58	25.67	23.13	24.61	-0.73	-7.65	-60.04	-4.74	1.44
	North Carolina	270.86	166.57	130.37	110.68	101.40	264.63	146.17	121.58	92.25	73.37	-6.24	-20.40	-8.79	-18.43	-28.03
	South Carolina	174.49	170.47	119.40	115.90	114.69	157.90	137.81	119.44	92.93	63.90	-16.59	-32.66	0.04	-22.97	-50.79
	Tennessee	243.44	233.32	235.73	231.69	141.08	236.48	163.77	199.94	136.09	109.62	-6.96	-69.54	-35.80	-95.60	-31.45
	Virginia	202.14	184.86	146.53	117.09	80.26	185.99	152.68	126.49	71.28	46.69	-16.15	-32.17	-20.03	-45.81	-33.57
	West Virginia	393.55	374.73	195.41	150.00	129.88	279.13	229.74	124.29	110.23	115.07	-114.42	-144.99	-71.13	-39.77	-14.82
VISTAS Total		2,887.30	2,674.06	1,982.27	1,690.46	1,403.57	2,714.31	2,008.78	1,462.76	1,194.09	985.77	-172.99	-665.27	-519.51	-496.37	-417.80
CENRAP	Arkansas	82.63	82.63	83.21	40.83	42.16	82.63	81.80	83.29	37.82	40.29	0.00	-0.82	0.08	-3.01	-1.87
	Iowa	145.10	139.25	147.98	143.59	144.93	146.70	130.52	139.98	138.56	137.28	1.60	-8.73	-8.00	-5.03	-7.65

		MARAMA Base Case (MARAMA 5c)					MARAMA CAIR Plus Policy Case (MARAMA 4c)					MARAMA 4c - MARAMA 5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Kansas	80.16	80.52	81.49	59.32	59.32	78.46	78.82	81.49	59.33	59.33	-1.70	-1.70	0.00	0.01	0.01
	Louisiana	111.31	111.31	75.41	77.24	79.60	111.31	90.60	75.57	77.33	76.61	0.00	-20.71	0.15	0.09	-2.99
	Minnesota	96.56	87.83	86.82	85.30	84.26	95.74	83.38	83.05	69.59	65.99	-0.82	-4.45	-3.76	-15.70	-18.27
	Missouri	266.99	277.00	280.20	279.69	280.02	264.07	256.76	273.47	266.18	224.44	-2.93	-20.24	-6.74	-13.50	-55.58
	Nebraska	73.63	73.63	73.63	37.18	37.18	73.63	73.63	73.63	37.18	37.18	0.00	0.00	0.00	0.00	0.00
	Oklahoma	113.68	113.68	117.28	48.06	50.17	113.68	113.68	119.50	48.13	52.10	0.00	0.00	2.22	0.07	1.93
	Texas	425.27	425.27	438.68	387.65	359.75	424.27	422.47	383.82	280.86	268.66	-1.00	-2.80	-54.87	-106.79	-91.09
CENRAP Total		1,395.34	1,391.12	1,384.70	1,158.86	1,137.39	1,390.49	1,331.67	1,313.78	1,015.00	961.89	-4.85	-59.45	-70.91	-143.86	-175.50
WRAP	Arizona	60.54	60.55	63.27	63.27	56.86	60.54	60.55	63.67	64.15	57.77	0.00	0.00	0.39	0.87	0.91
	California	6.79	6.79	7.55	7.55	7.46	6.79	6.67	7.65	7.65	7.52	0.00	-0.12	0.10	0.10	0.07
	Colorado	87.22	86.55	87.21	52.84	53.46	86.55	86.56	87.21	52.84	53.75	-0.67	0.01	0.00	0.00	0.30
	Idaho	0.05	0.05	1.16	1.16	1.03	0.05	0.05	1.31	1.31	1.13	0.00	0.00	0.15	0.15	0.10
	Montana	19.88	19.88	20.52	20.52	20.46	16.72	16.72	20.61	20.61	20.53	-3.16	-3.16	0.09	0.09	0.06
	Nevada	31.24	31.30	31.95	28.21	29.01	31.24	31.30	32.07	28.42	29.23	0.00	0.00	0.11	0.22	0.22
	New Mexico	52.92	52.92	53.64	53.64	54.44	52.92	52.92	53.74	53.83	54.62	0.00	0.00	0.10	0.20	0.19
	North Dakota	92.63	92.65	93.39	85.04	85.05	96.70	100.00	109.45	101.11	101.91	4.07	7.35	16.06	16.07	16.86
	Oregon	10.18	10.18	16.36	16.36	15.64	10.18	10.18	17.19	17.19	16.18	0.00	0.00	0.83	0.83	0.54
	South Dakota	12.09	12.09	12.09	4.15	4.19	12.09	12.09	12.09	4.18	4.20	0.00	0.00	0.00	0.03	0.01
	Utah	53.16	53.16	53.16	53.16	33.55	53.16	53.16	53.16	53.16	33.55	0.00	0.00	0.00	0.00	0.00
	Washington	11.25	11.25	20.92	20.85	19.47	11.25	11.25	22.42	21.19	22.57	0.00	0.00	1.50	0.34	3.10
	Wyoming	70.13	70.10	72.69	71.37	38.67	65.88	64.64	72.16	72.45	38.72	-4.25	-5.46	-0.53	1.08	0.05
WRAP Total		508.08	507.48	533.92	478.12	419.27	504.06	506.09	552.71	498.09	441.67	-4.01	-1.39	18.79	19.97	22.40
National		7,535.74	7,011.98	5,957.02	5,228.62	4,774.72	7,109.72	5,962.81	5,156.32	4,360.86	3,942.72	-426.02	1,049.17	-800.70	-867.75	-832.00

Table A2: State Level Annual NO_x Emissions in MARAMA Base Case and MARAMA CAIR Plus Policy Case (Thousand Tons)

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	3.45	3.60	5.07	5.19	5.70	3.47	3.75	3.67	3.81	3.89	0.02	0.15	-1.41	-1.38	-1.81
	Delaware	12.51	10.74	11.40	10.91	10.82	12.52	9.63	9.68	4.84	3.88	0.01	-1.11	-1.72	-6.07	-6.94
	District of Columbia	0.11	0.13	0.21	0.30	0.47	0.11	0.13	0.33	0.39	0.50	0.00	0.00	0.12	0.10	0.04
	Maine	7.81	7.90	2.66	2.64	2.79	7.47	3.83	1.87	1.89	1.87	-0.35	-4.07	-0.79	-0.75	-0.91
	Maryland	54.99	17.95	16.08	16.75	19.05	54.68	14.86	17.39	17.57	18.76	-0.30	-3.09	1.31	0.82	-0.29
	Massachusetts	30.40	24.25	24.58	22.06	22.55	21.05	14.12	11.97	9.87	9.52	-9.35	-10.13	-12.61	-12.19	-13.03
	New Hampshire	3.96	4.07	5.32	5.29	5.65	3.96	2.92	2.47	2.56	2.62	0.00	-1.15	-2.86	-2.72	-3.04
	New Jersey	16.89	10.86	11.00	12.70	12.47	16.90	11.30	10.65	12.07	10.89	0.01	0.44	-0.35	-0.63	-1.58
	New York	48.33	48.69	46.09	41.49	38.66	47.78	42.20	31.36	30.58	28.87	-0.56	-6.48	-14.73	-10.91	-9.80
	Pennsylvania	207.95	145.07	87.64	85.80	77.06	207.82	127.48	72.39	68.63	64.10	-0.12	-17.59	-15.25	-17.17	-12.96
Rhode Island	0.26	0.56	0.53	0.57	0.67	0.26	0.60	0.23	0.27	0.28	0.01	0.05	-0.31	-0.30	-0.39	
Vermont	0.13	0.17	0.39	0.40	0.47	0.16	0.17	0.20	0.21	0.23	0.03	0.00	-0.19	-0.18	-0.24	
MANE-VU Total		386.78	273.97	210.98	204.09	196.36	376.18	231.00	162.21	152.70	145.41	-10.60	-42.97	-48.77	-51.39	-50.94
LADCO	Illinois	131.61	87.63	73.57	70.99	72.83	130.94	62.30	56.56	54.11	53.28	-0.67	-25.33	-17.00	-16.88	-19.55
	Indiana	219.39	143.93	107.85	96.96	85.02	221.74	136.99	54.76	53.12	51.23	2.35	-6.94	-53.09	-43.84	-33.79
	Michigan	120.89	87.52	86.62	88.13	93.41	119.99	82.46	39.61	40.24	41.41	-0.90	-5.07	-47.02	-47.89	-52.00
	Ohio	272.56	117.12	98.09	89.81	86.65	271.01	99.06	66.81	65.12	63.43	-1.55	-18.06	-31.28	-24.68	-23.23
	Wisconsin	60.14	47.94	44.77	45.39	45.66	59.63	41.96	31.15	31.70	32.17	-0.51	-5.98	-13.63	-13.69	-13.48
LADCO Total		804.59	484.15	410.91	391.28	383.56	803.32	422.78	248.89	244.30	241.52	-1.27	-61.37	-162.02	-146.98	-142.05
VISTAS	Alabama	131.82	82.69	64.24	47.15	47.46	134.34	49.99	31.71	31.14	32.77	2.51	-32.70	-32.53	-16.01	-14.69
	Florida	164.71	115.56	78.29	70.96	66.61	164.87	105.83	49.60	49.18	48.59	0.17	-9.73	-28.68	-21.78	-18.03
	Georgia	239.40	96.51	91.57	59.66	51.41	239.40	74.45	37.83	38.70	42.02	0.00	-22.07	-53.74	-20.96	-9.39
	Kentucky	171.39	96.49	88.07	70.17	58.75	176.07	95.68	38.52	37.71	37.31	4.69	-0.81	-49.55	-32.47	-21.44
	Mississippi	38.08	31.45	31.51	8.19	9.05	38.10	29.13	7.66	8.54	9.65	0.02	-2.32	-23.85	0.36	0.60
	North Carolina	62.68	55.77	56.84	56.86	56.59	62.70	52.15	52.68	51.00	49.03	0.02	-3.63	-4.16	-5.86	-7.57
	South Carolina	50.92	35.77	39.21	38.97	40.67	52.83	38.36	26.69	26.60	28.76	1.91	2.58	-12.52	-12.38	-11.91
	Tennessee	104.18	48.16	39.36	39.14	29.16	104.92	28.14	20.29	20.23	20.28	0.74	-20.02	-19.07	-18.91	-8.89
	Virginia	65.98	61.26	55.74	48.48	39.68	65.14	55.80	35.24	33.26	31.77	-0.84	-5.46	-20.49	-15.22	-7.91
	West Virginia	178.66	73.46	71.84	59.07	53.44	178.03	64.51	50.07	49.25	49.45	-0.63	-8.94	-21.77	-9.82	-3.98
VISTAS Total		1,207.82	697.13	616.66	498.65	452.83	1,216.41	594.03	350.30	345.61	349.63	8.58	-103.09	-266.36	-153.05	-103.20
CENRAP	Arkansas	45.27	32.09	32.95	34.03	35.42	45.27	32.47	16.44	12.18	13.71	0.01	0.39	-16.52	-21.85	-21.71
	Iowa	74.72	46.53	50.84	47.84	48.69	75.87	41.27	20.41	20.36	19.70	1.15	-5.26	-30.42	-27.48	-28.99

		MARAMA Base Case (MARAMA 5c)					MARAMA CAIR Plus Policy Case (MARAMA 4c)					MARAMA 4c - MARAMA 5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Kansas	82.69	82.77	82.84	53.35	53.55	82.69	83.03	82.87	53.38	53.53	0.00	0.27	0.03	0.03	-0.02
	Louisiana	50.69	31.85	33.50	32.36	34.76	50.79	31.69	14.69	15.71	17.97	0.10	-0.16	-18.81	-16.65	-16.79
	Minnesota	74.90	41.15	40.77	40.40	40.52	74.85	35.92	18.58	17.40	16.69	-0.05	-5.23	-22.19	-23.01	-23.83
	Missouri	121.35	72.29	75.04	67.71	67.91	121.95	70.89	49.65	48.52	45.56	0.59	-1.40	-25.40	-19.19	-22.35
	Nebraska	50.75	50.77	50.77	38.47	38.57	50.82	50.86	50.85	38.56	38.58	0.08	0.09	0.08	0.09	0.01
	Oklahoma	74.20	77.32	77.53	53.43	53.57	74.20	81.19	77.81	56.45	55.98	0.00	3.88	0.28	3.02	2.41
	Texas	180.26	168.45	172.08	171.83	165.47	178.80	153.67	100.62	98.86	90.62	-1.46	-14.78	-71.46	-72.97	-74.85
CENRAP Total		754.82	603.20	616.33	539.42	538.46	755.23	580.99	431.92	361.42	352.34	0.42	-22.21	-184.41	-178.01	-186.13
WRAP	Arizona	79.45	79.51	82.42	67.94	71.91	79.39	79.54	82.85	68.41	72.73	-0.06	0.03	0.44	0.47	0.82
	California	30.37	33.35	26.79	28.48	31.62	30.80	33.92	26.42	28.20	30.96	0.43	0.58	-0.37	-0.29	-0.66
	Colorado	68.06	68.83	68.91	60.47	61.47	68.05	68.89	68.87	60.43	61.48	-0.01	0.06	-0.04	-0.04	0.00
	Idaho	0.71	0.71	0.80	0.80	0.80	0.71	0.71	0.89	0.88	0.88	0.00	0.00	0.08	0.08	0.08
	Montana	38.43	38.43	38.79	38.79	38.81	38.43	38.44	38.85	38.85	38.87	0.00	0.01	0.05	0.05	0.06
	Nevada	46.56	46.66	47.09	30.70	31.60	46.56	46.91	47.19	30.81	31.84	0.00	0.25	0.09	0.11	0.24
	New Mexico	73.46	73.65	74.30	72.30	73.17	73.46	73.69	74.44	72.53	73.46	-0.01	0.04	0.13	0.24	0.28
	North Dakota	71.53	71.71	71.69	39.86	39.93	70.92	71.76	71.76	39.94	39.94	-0.61	0.05	0.07	0.09	0.02
	Oregon	10.89	10.94	14.32	14.32	14.32	11.30	11.30	14.79	14.79	14.79	0.41	0.37	0.47	0.47	0.47
	South Dakota	14.54	14.54	14.55	1.75	1.83	14.57	14.58	14.58	1.80	1.82	0.03	0.04	0.03	0.05	-0.01
	Utah	60.79	60.79	60.79	53.39	53.36	60.79	60.79	60.79	53.39	53.36	0.00	0.00	0.00	0.00	0.00
	Washington	25.34	26.32	32.05	21.64	21.64	25.34	26.32	32.55	22.53	22.53	0.00	0.00	0.50	0.90	0.90
	Wyoming	81.17	81.17	81.18	53.07	53.16	81.18	81.18	81.18	53.07	53.19	0.01	0.01	0.01	0.00	0.03
WRAP Total		601.30	606.58	613.68	483.51	493.62	601.50	608.02	615.14	485.64	495.84	0.20	1.43	1.47	2.13	2.23
National		3,755.31	2,665.04	2,468.55	2,116.96	2,064.83	3,752.64	2,436.82	1,808.46	1,589.66	1,584.74	-2.67	-228.21	-660.09	-527.30	-480.09

Table A3: State Level Ozone Season NO_x Emissions in MARAMA Base Case and MARAMA CAIR Plus Policy Case (Thousand Tons)

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	1.55	1.62	2.20	2.26	2.47	1.56	1.68	1.61	1.66	1.70	0.01	0.06	-0.60	-0.59	-0.77
	Delaware	4.63	4.21	4.98	4.51	4.49	4.64	3.60	3.91	1.96	1.64	0.01	-0.62	-1.07	-2.55	-2.85
	District of Columbia	0.05	0.08	0.09	0.12	0.20	0.05	0.08	0.14	0.17	0.21	0.00	0.00	0.05	0.04	0.02
	Maine	3.60	3.50	1.14	1.13	1.16	3.49	1.49	0.80	0.80	0.81	-0.11	-2.02	-0.34	-0.32	-0.34
	Maryland	12.99	7.56	7.39	7.42	8.53	12.69	6.38	7.85	7.73	8.30	-0.30	-1.18	0.46	0.32	-0.22
	Massachusetts	10.68	9.46	10.62	9.08	9.37	6.62	5.71	5.11	4.23	3.89	-4.06	-3.75	-5.51	-4.85	-5.49
	New Hampshire	1.75	1.82	2.32	2.31	2.46	1.75	1.03	1.07	1.08	1.10	0.00	-0.79	-1.25	-1.23	-1.36
	New Jersey	4.67	4.87	4.89	5.70	5.61	4.67	5.18	4.86	5.34	5.10	0.01	0.31	-0.03	-0.36	-0.51
	New York	19.58	19.25	21.05	18.57	17.38	19.32	17.85	14.50	13.72	12.59	-0.26	-1.40	-6.55	-4.85	-4.80
	Pennsylvania	62.73	56.17	37.74	36.94	33.46	62.61	45.34	30.97	29.58	28.31	-0.12	-10.83	-6.77	-7.36	-5.15
	Rhode Island	0.16	0.27	0.23	0.24	0.29	0.16	0.28	0.10	0.11	0.12	0.00	0.00	-0.13	-0.13	-0.17
Vermont	0.06	0.10	0.17	0.17	0.20	0.09	0.09	0.09	0.09	0.10	0.03	-0.01	-0.08	-0.08	-0.10	
MANE-VU Total		122.45	108.92	92.81	88.45	85.62	117.66	88.71	71.00	66.47	63.87	-4.79	-20.21	-21.81	-21.98	-21.74
LADCO	Illinois	30.31	28.34	32.45	31.95	31.69	29.03	26.56	24.95	24.01	23.19	-1.28	-1.79	-7.49	-7.94	-8.50
	Indiana	61.30	60.20	46.53	41.46	36.44	63.62	54.54	23.65	23.11	22.38	2.32	-5.65	-22.88	-18.35	-14.06
	Michigan	37.03	36.85	36.74	37.17	39.19	35.98	33.23	16.74	17.15	17.72	-1.05	-3.62	-20.00	-20.02	-21.48
	Ohio	48.86	42.49	41.56	38.06	36.88	48.17	37.83	28.63	27.99	27.69	-0.69	-4.66	-12.93	-10.07	-9.19
	Wisconsin	26.45	18.48	19.11	19.68	19.74	26.31	18.11	13.33	13.57	13.92	-0.14	-0.38	-5.77	-6.10	-5.82
LADCO Total		203.96	186.36	176.38	168.31	163.94	203.11	170.26	107.31	105.82	104.89	-0.85	-16.10	-69.07	-62.48	-59.05
VISTAS	Alabama	33.72	30.50	28.91	20.94	21.00	20.41	14.23	7.34	5.34	6.12	-13.31	-16.27	-21.58	-15.60	-14.87
	Florida	76.17	53.03	36.72	32.55	30.72	33.60	17.52	8.96	8.81	8.45	-42.57	-35.52	-27.76	-23.74	-22.27
	Georgia	106.58	43.78	41.36	26.77	23.56	36.80	37.03	36.88	23.81	23.90	-69.78	-6.75	-4.48	-2.96	0.33
	Kentucky	41.98	39.49	38.10	30.09	25.80	23.42	13.94	7.27	7.20	8.21	-18.56	-25.55	-30.83	-22.89	-17.59
	Mississippi	17.32	11.95	14.26	3.97	4.33	32.89	15.17	8.16	7.61	7.58	15.57	3.22	-6.10	3.64	3.25
	North Carolina	21.61	14.55	21.94	24.05	25.45	31.60	28.23	21.64	20.84	19.65	9.99	13.68	-0.29	-3.22	-5.80
	South Carolina	15.98	15.85	17.32	16.86	17.32	22.52	22.55	22.55	17.11	17.13	6.54	6.70	5.23	0.25	-0.19
	Tennessee	15.91	15.81	17.30	17.06	12.44	35.00	41.30	37.02	28.65	27.61	19.09	25.49	19.72	11.59	15.17
	Virginia	25.81	24.55	24.34	20.26	17.50	88.68	72.76	50.76	49.49	46.60	62.88	48.21	26.42	29.23	29.10
	West Virginia	30.03	26.88	30.57	25.42	22.52	324.92	262.74	200.58	168.86	165.25	294.89	235.86	170.01	143.44	142.72
VISTAS Total		385.11	276.40	270.81	218.00	200.64	36.24	20.20	14.31	14.23	14.74	-348.87	-256.20	-256.50	-203.77	-185.90
CENRAP	Arkansas	20.41	14.25	14.65	15.20	15.84	76.34	44.81	24.18	22.93	23.07	55.93	30.56	9.53	7.72	7.23
	Iowa	32.57	18.17	22.00	20.62	21.01	106.58	30.11	17.11	17.50	18.89	74.01	11.94	-4.90	-3.12	-2.12

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Kansas	36.80	36.80	36.86	23.79	23.86	46.66	34.84	16.88	16.57	16.51	9.86	-1.97	-19.98	-7.22	-7.35
	Louisiana	23.32	14.61	15.64	15.00	15.97	17.34	11.75	3.70	4.11	4.60	-5.98	-2.85	-11.94	-10.89	-11.37
	Minnesota	33.21	18.53	17.78	17.65	17.76	21.73	18.92	20.97	22.17	21.14	-11.48	0.38	3.20	4.52	3.38
	Missouri	31.11	30.04	33.01	29.72	29.50	17.89	15.23	11.66	11.49	12.71	-13.22	-14.81	-21.35	-18.23	-16.79
	Nebraska	22.49	22.51	22.51	17.07	17.11	16.64	9.33	8.95	8.89	8.92	-5.85	-13.18	-13.56	-8.18	-8.19
	Oklahoma	34.99	37.97	36.74	25.78	25.41	25.14	21.03	15.09	14.10	14.17	-9.85	-16.93	-21.65	-11.68	-11.25
	Texas	89.95	84.23	86.85	86.97	85.90	29.96	25.46	22.08	21.28	21.44	-59.99	-58.77	-64.77	-65.69	-64.46
CENRAP Total		324.85	277.12	286.04	251.79	252.36	394.52	231.70	154.93	153.25	156.18	69.67	-45.42	-131.11	-98.54	-96.18
WRAP	Arizona	35.13	35.14	36.28	30.09	31.68	35.07	35.16	36.43	30.15	32.00	-0.06	0.03	0.15	0.06	0.32
	California	12.75	13.83	11.59	12.51	13.81	13.00	14.28	11.37	12.45	13.48	0.25	0.45	-0.22	-0.06	-0.33
	Colorado	29.98	30.12	30.17	26.60	27.03	29.98	30.24	30.16	26.62	27.03	0.00	0.12	-0.01	0.01	0.00
	Idaho	0.31	0.31	0.34	0.34	0.34	0.31	0.31	0.38	0.38	0.38	0.00	0.00	0.04	0.03	0.03
	Montana	17.00	17.00	17.15	17.15	17.16	17.00	17.01	17.18	17.18	17.19	0.00	0.01	0.02	0.02	0.02
	Nevada	20.90	20.93	20.94	13.65	14.06	20.90	20.99	20.97	13.70	14.18	0.00	0.06	0.02	0.05	0.11
	New Mexico	32.65	32.84	33.02	32.13	32.49	32.64	32.85	33.09	32.23	32.64	-0.01	0.01	0.07	0.10	0.15
	North Dakota	31.60	31.74	31.73	17.63	17.66	31.18	31.77	31.77	17.68	17.68	-0.41	0.02	0.04	0.06	0.02
	Oregon	4.76	4.81	6.25	6.25	6.25	4.97	4.97	6.45	6.45	6.45	0.20	0.16	0.20	0.20	0.20
	South Dakota	6.44	6.44	6.44	0.77	0.81	6.45	6.46	6.45	0.80	0.81	0.01	0.02	0.01	0.03	0.00
	Utah	26.91	26.91	26.91	23.64	23.60	26.91	26.91	26.91	23.64	23.60	0.00	0.00	0.00	0.00	0.00
	Washington	11.19	11.61	14.06	9.45	9.45	11.19	11.61	14.27	9.83	9.83	0.00	0.00	0.21	0.38	0.38
	Wyoming	35.93	35.93	35.93	23.49	23.53	35.93	35.93	35.93	23.49	23.54	0.00	0.00	0.00	0.00	0.01
WRAP Total		265.54	267.60	270.82	213.71	217.87	265.54	268.48	271.36	214.59	218.81	-0.01	0.88	0.54	0.88	0.94
National		1,301.91	1,116.41	1,096.86	940.26	920.43	1,305.74	1,021.88	805.17	708.99	709.01	3.84	-94.53	-291.69	-231.26	-211.42

Table A4: State Level Fixed O&M Costs in MARAMA Base Case and MARAMA CAIR Plus Policy Case (1999 Million Dollars)

RPO	State	MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
		2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	433.4	434.0	456.9	468.9	506.4	433.8	434.4	464.5	478.3	513.6	0.4	0.4	7.6	9.5	7.2
	Delaware	59.0	59.0	66.5	69.5	71.2	55.4	55.4	58.8	62.5	65.6	-3.6	-3.6	-7.8	-7.0	-5.6
	District of Columbia	14.2	14.2	15.4	20.8	22.8	14.2	14.2	16.8	20.7	22.0	0.0	0.0	1.5	-0.1	-0.8
	Maine	61.4	61.4	56.0	60.7	64.1	61.4	61.5	59.8	65.2	67.8	0.0	0.1	3.8	4.6	3.7
	Maryland	460.1	473.5	503.2	587.4	614.9	464.9	477.8	527.3	587.0	605.6	4.8	4.2	24.1	-0.4	-9.3
	Massachusetts	441.8	442.9	427.5	448.1	464.9	436.9	438.1	434.4	460.3	472.8	-4.8	-4.8	6.9	12.2	8.0
	New Hampshire	209.4	209.4	225.6	234.1	240.4	209.5	209.5	227.8	237.8	242.5	0.1	0.1	2.2	3.7	2.1
	New Jersey	857.5	857.5	897.2	920.3	960.1	853.0	853.0	891.3	919.1	969.6	-4.5	-4.5	-5.9	-1.1	9.4
	New York	1,429.0	1,429.1	1,502.6	1,563.9	1,604.6	1,427.9	1,437.5	1,514.3	1,553.0	1,607.9	-1.1	8.4	11.7	-10.8	3.3
	Pennsylvania	1,968.3	1,972.1	2,027.4	2,105.5	2,197.8	1,963.2	1,960.2	2,014.5	2,101.9	2,198.2	-5.1	-11.8	-12.9	-3.6	0.4
	Rhode Island	22.3	22.3	20.5	23.1	25.0	23.6	23.6	22.1	25.1	26.5	1.3	1.3	1.6	2.0	1.5
Vermont	120.2	120.2	123.3	125.2	126.4	120.2	120.2	124.3	126.5	127.4	0.0	0.0	1.0	1.3	1.0	
MANE-VU Total		6,076.6	6,095.6	6,322.1	6,627.3	6,898.6	6,064.0	6,085.4	6,356.1	6,637.5	6,919.4	-12.5	-10.2	34.0	10.2	20.8
LADCO	Illinois	2,021.9	2,022.7	2,058.7	2,168.9	2,392.5	2,028.4	2,031.9	2,060.8	2,178.6	2,395.0	6.6	9.2	2.1	9.7	2.5
	Indiana	625.1	634.2	672.6	716.8	727.9	622.0	628.5	679.6	734.8	765.8	-3.1	-5.7	7.1	18.0	38.0
	Michigan	1,094.2	1,094.3	1,094.8	1,132.5	1,235.6	1,085.8	1,085.9	1,101.1	1,141.4	1,201.9	-8.4	-8.4	6.2	8.8	-33.7
	Ohio	1,031.0	1,060.9	1,129.4	1,170.0	1,205.7	1,047.8	1,044.7	1,126.6	1,195.7	1,250.5	16.8	-16.3	-2.8	25.8	44.7
	Wisconsin	515.7	515.9	529.6	552.9	589.6	507.1	507.7	531.1	552.5	578.9	-8.6	-8.2	1.5	-0.5	-10.7
LADCO Total		5,287.8	5,328.0	5,485.1	5,741.1	6,151.3	5,291.1	5,298.6	5,499.2	5,803.0	6,192.1	3.3	-29.4	14.0	61.9	40.8
VISTAS	Alabama	987.4	989.5	1,030.4	1,123.4	1,181.0	987.0	993.8	1,064.0	1,126.7	1,191.2	-0.3	4.2	33.5	3.3	10.1
	Florida	1,355.1	1,356.0	1,503.1	1,678.6	1,741.9	1,355.2	1,356.1	1,519.8	1,696.8	1,733.0	0.1	0.1	16.8	18.2	-8.9
	Georgia	835.8	857.9	901.2	1,089.0	1,208.6	836.1	878.2	990.1	1,107.4	1,230.0	0.2	20.3	89.0	18.4	21.4
	Kentucky	495.5	496.2	533.6	556.5	569.1	494.3	493.6	541.9	582.1	591.9	-1.2	-2.5	8.3	25.6	22.8
	Mississippi	308.0	311.2	312.6	389.2	411.2	305.4	308.7	333.2	384.7	406.7	-2.6	-2.6	20.6	-4.5	-4.5
	North Carolina	970.1	986.3	1,087.1	1,189.0	1,251.9	970.3	987.5	1,095.4	1,188.8	1,249.2	0.2	1.1	8.3	-0.2	-2.7
	South Carolina	936.7	936.8	994.9	1,088.0	1,148.4	936.5	936.5	1,002.6	1,094.1	1,163.6	-0.3	-0.3	7.6	6.1	15.1
	Tennessee	663.6	664.6	735.2	754.3	782.6	663.4	664.4	747.0	785.4	794.3	-0.3	-0.3	11.9	31.1	11.8
	Virginia	627.0	627.0	720.5	790.7	831.8	620.3	614.8	718.0	790.4	826.5	-6.7	-12.3	-2.5	-0.3	-5.3
	West Virginia	517.6	529.5	576.1	605.8	613.3	535.7	540.8	583.9	609.5	621.9	18.1	11.3	7.9	3.7	8.7
VISTAS Total		7,697.0	7,755.1	8,394.7	9,264.5	9,739.8	7,704.3	7,774.3	8,595.9	9,365.9	9,808.3	7.3	19.2	201.3	101.4	68.5
CENRAP	Arkansas	383.8	383.8	420.6	465.1	484.0	383.8	383.8	422.7	458.5	485.8	0.0	0.0	2.1	-6.6	1.8
	Iowa	274.5	282.0	285.1	297.5	303.2	275.7	277.7	282.9	286.7	291.8	1.2	-4.3	-2.2	-10.8	-11.3

RPO	State	MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
		2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Kansas	340.0	340.9	356.8	394.4	413.8	337.5	338.4	354.2	391.9	394.3	-2.5	-2.5	-2.5	-2.5	-19.5
	Louisiana	437.9	437.9	467.7	524.9	583.9	438.1	443.0	471.6	527.7	584.9	0.3	5.2	3.9	2.8	1.0
	Minnesota	443.2	441.2	447.3	447.3	453.0	444.6	439.3	446.4	450.2	454.6	1.4	-1.9	-0.9	3.0	1.6
	Missouri	444.1	447.2	456.6	506.6	538.7	445.3	443.8	455.6	494.6	535.5	1.3	-3.4	-1.0	-12.0	-3.2
	Nebraska	303.8	309.8	313.9	325.3	326.0	304.4	310.4	314.5	325.5	325.9	0.6	0.6	0.6	0.2	-0.1
	Oklahoma	301.4	301.4	350.9	385.7	418.3	301.4	301.4	351.6	385.6	413.3	0.0	0.0	0.7	-0.2	-4.9
	Texas	1,986.4	2,016.3	2,331.5	2,426.5	2,629.0	1,983.9	2,017.4	2,342.3	2,450.6	2,626.6	-2.5	1.1	10.8	24.1	-2.5
	CENRAP Total	4,915.0	4,960.5	5,430.3	5,773.3	6,149.9	4,914.7	4,955.2	5,441.8	5,771.3	6,112.7	-0.3	-5.4	11.4	-2.0	-37.1
WRAP	Arizona	711.5	716.5	756.0	756.0	900.5	693.3	698.3	744.0	749.9	894.9	-18.3	-18.3	-11.9	-6.0	-5.7
	California	1,516.5	1,519.3	1,547.1	1,699.9	1,762.0	1,537.7	1,540.5	1,566.7	1,714.1	1,776.2	21.1	21.1	19.6	14.2	14.2
	Colorado	197.1	201.1	204.4	224.9	230.6	196.0	199.9	203.2	223.6	232.1	-1.2	-1.2	-1.2	-1.3	1.5
	Idaho	49.1	49.1	53.0	53.0	53.0	49.1	49.1	54.0	54.0	54.0	0.0	0.0	1.0	1.0	1.0
	Montana	136.5	142.9	147.2	147.2	150.6	136.5	143.0	147.8	147.8	151.3	0.0	0.0	0.6	0.6	0.6
	Nevada	184.7	185.5	197.3	207.4	218.6	184.7	185.5	198.9	210.4	221.7	0.0	0.0	1.6	3.0	3.1
	New Mexico	171.5	171.5	186.3	194.6	206.1	171.5	171.5	186.9	190.1	208.4	0.0	0.0	0.5	-4.5	2.3
	North Dakota	142.1	142.1	147.2	163.5	163.9	140.5	140.5	145.6	152.6	161.9	-1.6	-1.6	-1.6	-10.8	-2.0
	Oregon	253.4	253.4	296.2	296.2	296.2	255.2	255.2	301.7	301.7	301.7	1.8	1.8	5.5	5.5	5.5
	South Dakota	44.2	44.2	44.2	47.9	48.3	44.4	44.4	44.4	48.2	48.3	0.2	0.2	0.2	0.3	0.0
	Utah	162.4	162.4	162.4	164.3	179.6	162.4	162.4	162.4	164.3	179.7	0.0	0.0	0.0	0.0	0.0
	Washington	597.7	598.8	675.8	701.9	701.9	597.7	598.8	684.5	712.3	712.3	0.0	0.0	8.7	10.4	10.4
	Wyoming	228.7	228.7	236.4	236.4	248.1	228.8	228.8	236.4	236.4	248.5	0.0	0.0	0.0	0.0	0.4
	WRAP Total	4,395.6	4,415.6	4,653.5	4,893.0	5,159.6	4,397.9	4,417.8	4,676.5	4,905.4	5,191.0	2.3	2.3	23.1	12.4	31.4
	National	28,372.0	28,554.7	30,285.7	32,299.2	34,099.0	28,372.0	28,531.3	30,569.5	32,483.0	34,223.4	0.0	-23.4	283.8	183.8	124.4

Note: To convert year 1999 dollars to year 2006 dollars, use a conversion factor of 1.1856

Table A5: State Level Variable O&M Costs in MARAMA Base Case and MARAMA CAIR Plus Policy Case (1999 Million Dollars)

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	45.2	48.4	67.2	71.7	78.7	45.4	51.3	56.3	62.0	64.3	0.1	2.9	-11.0	-9.6	-14.4
	Delaware	15.9	19.6	24.0	22.7	23.4	15.9	17.9	18.6	11.1	10.9	0.0	-1.7	-5.4	-11.7	-12.4
	District of Columbia	0.0	0.0	1.5	4.6	7.1	0.0	0.0	3.3	5.5	7.1	0.0	0.0	1.8	0.9	0.0
	Maine	29.6	29.8	23.9	24.1	25.8	28.8	22.8	19.4	21.4	22.1	-0.8	-7.1	-4.5	-2.7	-3.7
	Maryland	103.1	127.4	152.6	196.0	229.3	105.4	127.5	178.7	207.6	228.6	2.3	0.1	26.1	11.6	-0.7
	Massachusetts	115.6	99.4	136.3	133.9	146.0	116.4	98.8	112.8	116.0	119.7	0.8	-0.6	-23.5	-17.9	-26.3
	New Hampshire	29.2	30.7	49.1	51.7	57.0	29.3	29.6	38.6	43.8	45.5	0.0	-1.1	-10.5	-7.8	-11.5
	New Jersey	91.3	96.5	99.8	96.3	99.9	91.4	101.8	98.5	97.7	105.4	0.0	5.3	-1.3	1.4	5.5
	New York	165.1	168.1	284.0	303.9	310.5	167.1	174.1	307.1	315.6	326.8	2.1	6.0	23.1	11.7	16.3
	Pennsylvania	426.6	468.8	535.1	530.3	539.4	432.1	469.5	531.8	530.0	529.7	5.6	0.7	-3.3	-0.2	-9.7
	Rhode Island	1.9	4.7	6.5	7.6	9.2	1.9	5.2	3.9	5.5	6.0	0.0	0.5	-2.6	-2.1	-3.2
Vermont	6.0	6.0	9.9	10.3	11.2	6.0	6.0	8.2	9.1	9.3	0.0	0.0	-1.7	-1.2	-2.0	
MANE-VU Total		1,029.5	1,099.5	1,390.0	1,453.1	1,537.4	1,039.7	1,104.5	1,377.1	1,425.3	1,475.4	10.2	5.0	-12.8	-27.7	-62.0
LADCO	Illinois	289.8	308.3	367.0	378.1	461.7	292.8	312.4	377.8	392.2	482.0	3.0	4.1	10.8	14.2	20.3
	Indiana	309.2	354.4	390.3	426.6	432.3	310.5	342.3	426.6	452.2	467.8	1.4	-12.1	36.3	25.6	35.5
	Michigan	189.2	210.6	210.4	245.5	336.1	190.7	219.0	252.7	285.2	318.9	1.5	8.4	42.4	39.7	-17.3
	Ohio	408.1	521.6	567.4	590.7	590.8	428.6	503.0	568.0	600.9	610.1	20.5	-18.6	0.6	10.1	19.3
	Wisconsin	127.2	129.6	145.7	164.2	185.8	128.9	136.9	166.1	184.3	206.7	1.7	7.3	20.4	20.1	20.9
LADCO Total		1,323.5	1,524.5	1,680.9	1,805.1	2,006.7	1,351.5	1,513.6	1,791.3	1,914.8	2,085.5	28.0	-10.9	110.4	109.7	78.8
VISTAS	Alabama	219.5	256.5	299.3	347.0	377.4	213.2	252.0	336.2	355.2	401.0	-6.3	-4.5	36.8	8.2	23.6
	Florida	325.0	348.3	512.8	582.6	656.2	325.2	346.3	524.7	598.2	626.8	0.2	-2.0	11.8	15.5	-29.4
	Georgia	204.6	252.8	321.3	411.7	465.1	204.6	278.4	446.0	485.7	554.9	0.0	25.6	124.7	74.0	89.8
	Kentucky	267.7	305.5	346.3	362.9	373.9	262.1	280.0	360.1	381.6	386.3	-5.6	-25.5	13.8	18.6	12.5
	Mississippi	56.3	61.4	65.7	104.2	120.8	56.6	72.0	91.0	107.6	126.3	0.3	10.5	25.3	3.4	5.5
	North Carolina	283.8	244.6	292.7	315.9	360.7	281.3	241.2	303.0	323.1	359.0	-2.5	-3.4	10.3	7.2	-1.7
	South Carolina	170.8	190.6	242.8	259.9	296.8	166.1	184.6	250.0	269.3	312.8	-4.7	-5.9	7.1	9.5	16.0
	Tennessee	159.9	186.3	195.2	194.1	212.9	155.4	162.7	203.7	213.5	217.9	-4.5	-23.6	8.5	19.4	5.0
	Virginia	121.9	133.0	188.6	211.6	253.4	122.1	130.1	201.7	224.6	255.6	0.2	-2.9	13.1	13.0	2.3
	West Virginia	285.2	324.8	391.7	412.9	419.4	314.6	355.8	407.0	418.6	426.9	29.4	31.1	15.4	5.7	7.5
VISTAS Total		2,094.8	2,303.8	2,856.6	3,202.9	3,536.6	2,101.3	2,303.2	3,123.3	3,377.4	3,667.6	6.6	-0.7	266.7	174.6	131.0
CENRAP	Arkansas	65.6	71.0	81.2	128.4	148.4	65.7	80.4	88.5	137.7	162.4	0.2	9.4	7.3	9.3	14.0
	Iowa	85.2	92.8	96.9	101.5	108.2	86.3	95.8	113.7	115.5	120.9	1.1	3.0	16.8	14.0	12.7
	Kansas	104.9	105.1	105.3	118.2	128.9	104.9	105.7	105.4	118.2	119.9	0.0	0.6	0.1	0.0	-9.0

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Louisiana	80.9	81.5	107.9	137.6	174.1	82.0	95.7	123.9	149.1	182.6	1.0	14.2	15.9	11.5	8.5
	Minnesota	111.9	107.0	105.8	105.7	106.2	111.8	106.4	120.0	124.2	123.3	-0.2	-0.7	14.2	18.5	17.1
	Missouri	145.5	172.5	177.0	193.3	218.4	143.9	157.2	182.8	187.6	230.0	-1.6	-15.3	5.8	-5.7	11.6
	Nebraska	47.6	47.7	47.7	73.1	73.1	47.6	47.7	47.7	72.9	72.9	0.0	0.0	0.0	-0.2	-0.2
	Oklahoma	111.0	117.9	151.4	173.1	194.1	111.1	127.4	152.5	178.9	199.9	0.1	9.5	1.1	5.8	5.8
	Texas	601.4	623.1	878.0	936.9	1,026.7	603.2	628.1	951.2	1,023.6	1,082.1	1.7	5.0	73.2	86.7	55.4
CENRAP Total		1,354.1	1,418.5	1,751.2	1,967.8	2,178.2	1,356.5	1,444.4	1,885.7	2,107.8	2,294.1	2.4	25.8	134.5	140.0	115.9
WRAP	Arizona	198.4	199.3	245.2	246.0	303.3	198.3	199.6	252.1	256.1	316.6	-0.1	0.3	6.9	10.1	13.3
	California	504.4	528.0	521.1	601.1	647.5	505.2	528.7	513.1	590.3	632.5	0.8	0.6	-7.9	-10.8	-15.0
	Colorado	93.3	98.5	99.4	112.1	121.6	93.3	99.1	99.1	111.9	124.0	0.0	0.7	-0.3	-0.2	2.4
	Idaho	2.5	2.5	9.6	9.6	9.6	2.5	2.5	10.8	10.8	10.8	0.0	0.0	1.2	1.2	1.2
	Montana	48.7	48.7	54.0	54.0	54.2	48.7	48.7	54.7	54.7	55.0	0.0	0.0	0.7	0.7	0.8
	Nevada	91.7	94.4	108.3	113.0	126.9	91.7	94.9	110.2	116.5	130.7	0.0	0.5	1.9	3.5	3.7
	New Mexico	86.2	86.7	101.3	104.6	118.5	86.2	86.8	99.7	104.0	121.5	0.0	0.1	-1.5	-0.6	3.0
	North Dakota	71.8	72.2	72.1	81.9	82.0	69.9	71.2	71.2	77.1	81.0	-1.9	-0.9	-0.9	-4.8	-0.9
	Oregon	24.1	24.1	74.8	74.8	74.8	24.9	24.9	81.6	81.6	81.6	0.9	0.8	6.8	6.8	6.8
	South Dakota	5.4	5.4	5.5	9.6	9.9	5.4	5.5	5.5	9.7	9.9	0.0	0.0	0.0	0.1	0.0
	Utah	88.3	88.3	88.3	88.3	91.8	88.3	88.3	88.3	88.3	91.8	0.0	0.0	0.0	0.0	0.0
	Washington	51.1	53.9	147.9	146.9	146.9	51.1	53.9	159.8	159.8	159.8	0.0	0.0	11.9	12.9	12.9
	Wyoming	116.8	116.8	117.4	117.4	123.9	116.8	116.8	117.4	117.4	124.4	0.0	0.0	0.0	0.0	0.5
WRAP Total		1,382.7	1,418.8	1,644.8	1,759.3	1,910.9	1,382.3	1,420.8	1,663.5	1,778.3	1,939.7	-0.4	2.0	18.7	19.0	28.8
National		7,184.5	7,765.3	9,323.4	10,188.1	11,169.8	7,231.3	7,786.5	9,841.0	10,603.7	11,462.3	46.8	21.3	517.6	415.6	292.5

Note: To convert year 1999 dollars to year 2006 dollars, use a conversion factor of 1.1856

Table A6: State Level Annualized Capital Costs in MARAMA Base Case and MARAMA CAIR Plus Policy Case (1999 Million Dollars)

		MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	98.6	98.6	268.9	344.7	413.1	100.2	100.2	294.3	379.8	427.2	1.6	1.6	25.4	35.1	14.1
	Delaware	10.6	10.6	28.7	40.6	49.3	10.6	10.6	18.0	34.3	51.5	0.0	0.0	-10.8	-6.3	2.2
	District of Columbia	1.8	1.8	10.2	42.2	56.3	1.8	1.8	20.5	43.5	52.5	0.0	0.0	10.3	1.3	-3.8
	Maine	34.2	34.2	100.4	129.7	156.1	34.5	35.0	109.9	142.9	161.2	0.4	0.8	9.5	13.3	5.1
	Maryland	91.4	133.1	266.5	709.1	900.7	102.2	142.2	414.6	729.5	857.5	10.8	9.1	148.1	20.4	-43.2
	Massachusetts	208.0	208.0	527.6	669.7	798.2	213.9	213.9	578.3	738.6	827.6	6.0	6.0	50.7	68.9	29.4
	New Hampshire	75.0	75.0	195.6	249.2	297.7	75.7	75.7	213.2	274.3	307.9	0.7	0.7	17.6	25.1	10.2
	New Jersey	23.6	23.6	71.7	147.7	203.1	23.6	23.6	70.6	174.9	285.4	0.0	0.0	-1.1	27.2	82.3
	New York	172.4	172.4	1,097.2	1,427.5	1,495.0	183.0	204.8	1,245.0	1,438.2	1,596.5	10.7	32.4	147.8	10.6	101.5
	Pennsylvania	86.0	90.6	281.8	386.0	451.3	91.1	91.1	290.8	449.5	562.0	5.0	0.5	9.1	63.5	110.7
	Rhode Island	18.9	18.9	55.7	72.0	86.8	19.2	19.2	61.0	79.5	89.7	0.2	0.2	5.4	7.5	2.9
Vermont	12.0	12.0	35.3	45.6	55.0	12.1	12.1	38.7	50.3	56.8	0.1	0.1	3.4	4.7	1.8	
MANE-VU Total		832.4	878.6	2,939.5	4,264.0	4,962.7	867.9	930.1	3,355.0	4,535.2	5,275.8	35.5	51.4	415.5	271.2	313.1
LADCO	Illinois	44.1	44.2	133.6	267.9	810.0	60.0	80.3	170.2	353.6	869.9	15.9	36.1	36.6	85.7	59.9
	Indiana	26.6	44.4	110.4	311.2	349.2	29.6	50.3	220.2	494.4	636.6	3.0	5.8	109.9	183.2	287.3
	Michigan	5.3	5.3	5.3	216.8	745.3	6.8	6.8	154.3	381.8	593.8	1.4	1.4	148.9	165.0	-151.5
	Ohio	96.6	180.2	524.5	748.0	761.7	138.5	165.0	482.7	843.3	985.4	41.9	-15.2	-41.8	95.4	223.7
	Wisconsin	14.9	14.9	50.3	160.0	255.6	0.4	3.9	118.6	236.2	386.0	-14.6	-11.0	68.3	76.2	130.4
LADCO Total		187.6	289.0	824.1	1,703.8	2,921.8	235.2	306.2	1,146.0	2,309.3	3,471.7	47.6	17.2	321.9	605.5	549.9
VISTAS	Alabama	20.8	20.8	86.7	521.0	814.9	17.0	47.7	279.1	545.5	879.5	-3.8	27.0	192.4	24.5	64.6
	Florida	13.0	26.7	940.0	1,721.1	2,118.5	13.0	26.9	1,052.3	1,853.2	2,047.4	0.0	0.2	112.3	132.1	-71.1
	Georgia	1.4	1.4	112.4	864.6	1,344.1	2.6	56.5	510.9	933.4	1,450.2	1.2	55.1	398.5	68.8	106.1
	Kentucky	8.2	9.8	86.6	190.5	230.4	4.9	4.9	168.7	325.8	384.6	-3.4	-4.9	82.0	135.4	154.2
	Mississippi	0.5	0.5	13.0	236.4	365.2	0.7	0.7	108.6	230.5	363.9	0.2	0.2	95.6	-5.9	-1.3
	North Carolina	234.1	275.2	619.1	862.1	1,114.8	235.4	276.3	678.3	878.6	1,119.1	1.3	1.1	59.3	16.5	4.3
	South Carolina	23.3	23.4	317.6	531.9	750.0	21.3	21.3	385.2	576.5	811.5	-2.1	-2.2	67.6	44.6	61.5
	Tennessee	18.0	18.0	31.6	31.6	107.1	15.7	15.7	79.6	125.8	146.5	-2.3	-2.3	48.0	94.2	39.4
	Virginia	9.6	9.6	303.7	536.3	766.0	10.6	10.6	374.2	591.8	805.3	0.9	0.9	70.5	55.5	39.3
West Virginia	2.7	2.7	139.6	281.4	313.6	51.3	61.6	201.5	353.7	429.9	48.7	58.9	62.0	72.3	116.2	
VISTAS Total		331.8	388.2	2,650.2	5,776.7	7,924.7	372.5	522.2	3,838.4	6,414.8	8,438.0	40.7	134.0	1,188.2	638.1	513.2
CENRAP	Arkansas	0.1	0.1	41.9	191.2	314.2	0.1	0.1	69.6	225.3	349.6	0.0	0.0	27.8	34.1	35.3
	Iowa	0.0	0.7	0.7	10.4	17.3	2.4	4.7	45.4	45.9	53.5	2.4	4.1	44.7	35.5	36.1
	Kansas	0.0	0.0	0.0	22.2	71.6	0.0	0.0	0.0	22.3	37.5	0.0	0.0	0.0	0.0	-34.0

		MARAMA Base Case (MARAMA 5c)					MARAMA CAIR Plus Policy Case (MARAMA 4c)					MARAMA 4c - MARAMA 5c				
RPO	State	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Louisiana	0.1	0.1	100.7	290.3	508.6	0.1	12.3	146.9	326.7	532.4	0.0	12.2	46.1	36.4	23.8
	Minnesota	45.1	84.0	84.1	84.1	86.9	47.9	88.7	119.2	132.0	132.0	2.8	4.6	35.2	47.9	45.1
	Missouri	2.8	14.6	18.3	91.7	259.4	4.7	8.6	53.0	117.7	306.2	2.0	-6.0	34.7	26.0	46.8
	Nebraska	0.0	0.0	0.0	34.4	35.7	1.2	1.2	1.2	35.3	35.7	1.2	1.2	1.2	0.8	0.0
	Oklahoma	0.5	0.5	237.8	345.0	524.0	0.5	0.5	242.7	353.7	516.1	0.0	0.0	4.9	8.8	-7.9
	Texas	221.8	221.8	2,255.6	2,615.9	3,424.1	235.7	251.8	2,401.4	2,828.5	3,624.9	13.9	30.0	145.8	212.6	200.8
CENRAP Total		270.3	321.8	2,739.1	3,685.2	5,241.9	292.6	367.8	3,079.4	4,087.3	5,587.7	22.3	46.0	340.3	402.1	345.9
WRAP	Arizona	2.8	2.8	263.3	263.3	587.1	2.8	2.8	308.6	350.2	676.6	0.0	0.0	45.3	86.9	89.5
	California	784.0	784.0	974.2	1,499.4	1,684.2	751.6	751.6	929.3	1,414.0	1,598.8	-32.4	-32.4	-44.9	-85.4	-85.4
	Colorado	0.0	0.0	0.0	42.3	82.8	0.0	0.0	0.0	42.2	102.3	0.0	0.0	0.0	-0.2	19.4
	Idaho	9.0	9.0	62.6	62.6	62.6	9.0	9.0	69.7	69.7	69.7	0.0	0.0	7.2	7.2	7.2
	Montana	5.2	5.2	36.5	36.5	37.7	5.3	5.3	40.8	40.8	42.4	0.1	0.1	4.2	4.2	4.7
	Nevada	0.7	0.7	65.6	70.3	149.8	0.7	0.7	76.8	92.0	171.5	0.0	0.0	11.3	21.6	21.7
	New Mexico	0.6	0.6	68.0	75.3	153.2	0.6	0.6	77.9	88.9	172.4	0.0	0.0	9.9	13.6	19.2
	North Dakota	23.2	23.2	23.2	48.0	48.8	19.3	19.3	19.3	36.2	44.2	-3.8	-3.8	-3.8	-11.8	-4.6
	Oregon	50.2	50.2	350.7	350.7	350.7	50.2	50.2	390.8	390.8	390.8	0.0	0.0	40.1	40.1	40.1
	South Dakota	0.0	0.0	0.0	13.3	14.7	0.5	0.5	0.5	13.9	14.9	0.5	0.5	0.5	0.6	0.3
	Utah	0.0	0.0	0.0	0.0	15.4	0.0	0.0	0.0	0.0	15.7	0.0	0.0	0.0	0.0	0.3
	Washington	95.2	95.2	665.8	665.8	665.8	95.2	95.2	742.0	742.0	742.0	0.0	0.0	76.2	76.2	76.2
	Wyoming	0.0	0.0	0.0	0.0	31.8	0.1	0.1	0.1	0.1	34.9	0.1	0.1	0.1	0.1	3.1
WRAP Total		970.9	970.9	2,509.9	3,127.6	3,884.6	935.3	935.3	2,655.8	3,280.8	4,076.3	-35.6	-35.6	146.0	153.2	191.7
National		2,593.0	2,848.6	11,662.8	18,557.4	24,935.7	2,703.5	3,061.6	14,074.6	20,627.4	26,849.4	110.5	213.1	2,411.8	2,070.0	1,913.7

Note: To convert year 1999 dollars to year 2006 dollars, use a conversion factor of 1.1856

Table A7: State Level Fuel Costs in MARAMA Base Case and MARAMA CAIR Plus Policy Case (1999 Million Dollars)

RPO	State	MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
		2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
MANE-VU	Connecticut	769.1	777.2	312.6	286.5	289.9	769.6	931.5	342.8	278.4	287.6	0.5	154.3	30.2	-8.1	-2.3
	Delaware	133.8	137.4	126.9	118.1	122.3	135.2	131.7	114.7	63.0	61.0	1.4	-5.7	-12.3	-55.1	-61.3
	District of Columbia	0.8	4.3	4.6	14.6	21.1	1.0	4.3	9.4	16.6	20.6	0.1	0.0	4.9	2.0	-0.5
	Maine	595.2	567.1	219.5	203.3	199.8	579.6	442.1	212.5	204.8	202.9	-15.6	-124.9	-7.0	1.6	3.0
	Maryland	550.0	556.1	573.4	691.8	775.7	545.8	546.6	635.4	718.9	761.1	-4.2	-9.5	62.0	27.2	-14.6
	Massachusetts	2,558.5	2,293.0	1,509.5	1,099.0	1,087.8	2,541.8	2,300.9	1,467.2	1,101.0	1,150.9	-16.7	7.9	-42.3	2.0	63.2
	New Hampshire	162.0	248.7	197.2	197.4	208.6	163.8	238.2	168.1	178.8	185.7	1.8	-10.5	-29.1	-18.6	-22.8
	New Jersey	791.8	830.0	687.2	575.2	620.0	793.5	1,096.5	676.6	606.2	675.1	1.7	266.5	-10.6	31.0	55.1
	New York	3,020.5	2,969.7	1,811.6	1,615.3	1,706.5	3,060.4	3,078.9	1,742.0	1,641.8	1,761.1	40.0	109.2	-69.6	26.4	54.6
	Pennsylvania	2,677.2	2,818.8	2,505.5	2,287.3	2,242.5	2,768.7	3,293.2	2,455.1	2,343.2	2,278.4	91.4	474.4	-50.5	55.9	35.8
	Rhode Island	118.9	269.3	33.4	35.7	36.1	120.0	296.1	32.9	33.7	34.5	1.1	26.8	-0.4	-2.0	-1.6
Vermont	22.4	23.2	34.0	35.3	37.4	22.5	22.8	31.0	34.3	34.6	0.1	-0.4	-3.0	-1.0	-2.8	
MANE-VU Total		11,400.1	11,494.9	8,015.5	7,159.7	7,347.8	11,501.8	12,382.8	7,887.7	7,220.9	7,453.4	101.7	888.0	-127.8	61.2	105.7
LADCO	Illinois	1,792.0	1,756.9	1,823.0	1,780.4	1,830.6	1,793.8	1,686.0	1,803.9	1,752.3	1,807.3	1.8	-70.9	-19.0	-28.1	-23.3
	Indiana	1,658.3	1,760.7	1,608.5	1,539.3	1,439.0	1,715.1	1,925.8	1,583.4	1,520.1	1,505.1	56.8	165.1	-25.1	-19.2	66.1
	Michigan	1,503.5	1,569.8	1,445.3	1,458.2	1,572.0	1,510.0	1,876.9	1,491.6	1,454.0	1,460.7	6.5	307.0	46.3	-4.3	-111.3
	Ohio	2,208.1	2,337.1	2,162.4	2,113.0	2,039.7	2,151.1	2,475.1	2,065.0	2,065.4	2,024.6	-57.0	138.0	-97.4	-47.6	-15.1
	Wisconsin	752.4	758.6	757.6	717.0	710.6	804.4	803.3	726.5	706.9	699.6	52.0	44.7	-31.1	-10.1	-11.0
LADCO Total		7,914.2	8,183.2	7,796.8	7,607.9	7,592.0	7,974.4	8,767.1	7,670.4	7,498.7	7,497.3	60.2	583.9	-126.4	-109.3	-94.7
VISTAS	Alabama	2,349.6	2,518.6	2,296.5	1,977.4	1,973.2	2,354.2	2,925.6	2,236.4	1,983.2	2,029.9	4.6	407.0	-60.1	5.8	56.7
	Florida	6,215.0	6,005.6	4,443.9	4,101.2	4,241.5	6,214.9	6,395.5	4,264.0	4,166.4	4,411.3	-0.2	389.9	-179.9	65.2	169.7
	Georgia	3,108.1	3,229.5	2,525.8	2,439.2	2,530.8	3,069.4	3,022.0	2,526.0	2,501.1	2,622.1	-38.7	-207.5	0.2	61.9	91.3
	Kentucky	1,064.1	1,051.9	980.2	1,009.0	1,009.2	1,082.2	1,014.3	968.7	1,016.0	1,017.8	18.1	-37.6	-11.5	7.0	8.7
	Mississippi	869.0	959.5	737.6	720.1	735.9	885.8	1,529.5	746.3	756.8	766.1	16.7	570.0	8.7	36.6	30.3
	North Carolina	1,433.0	1,286.9	1,365.8	1,431.7	1,521.8	1,411.5	1,351.5	1,373.0	1,446.8	1,504.9	-21.5	64.6	7.2	15.2	-16.9
	South Carolina	1,250.0	1,383.2	1,283.6	1,248.9	1,331.1	1,240.2	1,607.5	1,284.8	1,276.6	1,404.0	-9.9	224.4	1.2	27.7	72.9
	Tennessee	824.3	831.8	850.9	816.0	797.8	809.4	713.2	833.1	822.3	800.6	-14.9	-118.6	-17.8	6.3	2.8
	Virginia	1,150.9	1,536.1	1,201.4	1,136.5	1,168.7	1,157.6	1,580.0	1,148.6	1,117.0	1,168.2	6.6	43.8	-52.8	-19.5	-0.4
West Virginia	1,072.9	1,047.9	1,000.4	1,015.0	1,004.6	1,035.4	986.7	962.3	1,021.1	1,022.3	-37.6	-61.2	-38.1	6.2	17.7	
VISTAS Total		19,337.1	19,851.1	16,686.1	15,895.0	16,314.6	19,260.5	21,125.7	16,343.2	16,107.3	16,747.3	-76.7	1,274.7	-342.9	212.3	432.7
CENRAP	Arkansas	1,004.4	1,168.2	1,055.4	928.8	910.6	1,009.7	1,571.2	969.4	904.9	889.7	5.3	403.0	-86.0	-23.9	-20.9
	Iowa	616.4	660.1	631.8	613.1	662.6	633.5	721.2	623.5	629.6	652.8	17.1	61.1	-8.3	16.5	-9.8

RPO	State	MARAMA Base Case (MARAMA_5c)					MARAMA CAIR Plus Policy Case (MARAMA_4c)					MARAMA_4c - MARAMA_5c				
		2008	2009	2012	2015	2018	2008	2009	2012	2015	2018	2008	2009	2012	2015	2018
	Kansas	450.8	444.6	429.2	420.6	462.5	452.0	476.3	439.3	420.4	429.0	1.2	31.8	10.1	-0.2	-33.5
	Louisiana	1,186.7	1,157.1	993.9	873.4	882.7	1,239.7	1,589.9	985.4	837.2	878.1	53.0	432.8	-8.4	-36.2	-4.6
	Minnesota	510.6	506.9	468.6	453.6	445.9	510.9	481.1	454.0	449.9	439.6	0.3	-25.8	-14.6	-3.6	-6.3
	Missouri	928.3	987.7	1,002.7	976.8	987.6	926.2	968.8	979.2	930.9	898.9	-2.1	-18.9	-23.5	-46.0	-88.7
	Nebraska	261.3	262.4	253.3	245.8	237.9	261.3	263.1	253.3	247.3	238.6	0.0	0.7	0.0	1.5	0.7
	Oklahoma	2,075.0	2,133.6	1,483.7	1,314.4	1,190.5	2,081.5	2,459.8	1,494.1	1,424.6	1,371.4	6.5	326.2	10.4	110.1	180.9
	Texas	11,121.2	10,873.2	6,764.2	6,269.0	6,376.2	11,132.1	10,941.1	6,751.3	6,294.5	6,356.9	11.0	67.9	-12.9	25.4	-19.3
	CENRAP Total	18,154.6	18,193.7	13,082.8	12,095.6	12,156.5	18,246.8	19,472.5	12,949.5	12,139.2	12,155.0	92.2	1,278.8	-133.2	43.6	-1.5
WRAP	Arizona	3,550.5	3,253.5	2,509.5	2,290.6	2,351.6	3,542.8	3,267.3	2,500.7	2,198.2	2,333.1	-7.6	13.8	-8.9	-92.4	-18.5
	California	6,747.7	6,763.8	4,322.4	4,924.4	5,631.8	6,772.7	6,788.1	4,155.1	4,813.1	5,410.4	25.0	24.3	-167.3	-111.3	-221.4
	Colorado	509.3	672.9	577.7	582.5	628.0	508.2	688.5	569.4	578.8	610.1	-1.2	15.6	-8.3	-3.7	-17.8
	Idaho	117.8	104.9	19.4	18.8	18.2	117.9	105.0	21.8	20.9	20.3	0.1	0.0	2.4	2.1	2.0
	Montana	105.5	104.2	114.2	111.1	107.8	107.5	107.1	115.0	112.2	109.2	2.0	2.9	0.8	1.1	1.3
	Nevada	1,194.4	1,094.7	846.6	774.7	779.1	1,194.5	1,120.3	849.2	777.1	788.4	0.0	25.6	2.6	2.3	9.3
	New Mexico	404.0	413.5	393.5	390.7	446.9	402.8	418.7	399.7	399.7	458.1	-1.2	5.2	6.3	9.0	11.2
	North Dakota	229.8	229.3	223.4	238.5	232.5	231.6	234.7	223.0	238.7	232.3	1.8	5.5	-0.5	0.2	-0.3
	Oregon	886.1	796.4	657.6	587.4	566.1	943.1	841.5	670.1	602.2	579.7	57.0	45.1	12.5	14.8	13.6
	South Dakota	36.3	35.9	35.8	33.9	38.2	36.3	36.7	35.5	34.0	33.4	0.0	0.8	-0.3	0.1	-4.7
	Utah	230.1	223.8	217.8	211.5	206.7	230.1	223.7	221.5	210.1	206.4	0.0	-0.1	3.7	-1.3	-0.3
	Washington	591.6	713.8	606.6	532.5	514.7	591.3	713.4	597.1	558.1	537.7	-0.4	-0.4	-9.6	25.6	23.0
	Wyoming	299.9	296.4	295.8	288.1	285.0	302.8	300.1	298.0	286.5	284.9	2.9	3.7	2.2	-1.6	-0.1
	WRAP Total	14,903.0	14,702.9	10,820.4	10,984.8	11,806.6	14,981.4	14,845.0	10,656.1	10,829.8	11,604.0	78.4	142.1	-164.3	-155.0	-202.7
	National	71,709.1	72,425.7	56,401.6	53,743.0	55,217.5	71,964.8	76,593.2	55,507.0	53,795.8	55,457.0	255.7	4,167.5	-894.6	52.8	239.5

Note: To convert year 1999 dollars to year 2006 dollars, use a conversion factor of 1.1856