

Eugene M. Trisko
Attorney at Law*
P.O. Box 596
Berkeley Springs, WV 25411
(304) 258-1977
(301) 639-5238 (Cell)
emtrisko@earthlink.net

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Air & Radiation Docket and Information Center
U.S. Environmental Protection Agency
Mailcode 6102T
1200 Pennsylvania Avenue, NW
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Attn: Docket ID No. EPA-HQ-OAR-2005-0172
Proposed Revised Ozone National Ambient Air Quality Standards
(NAAQS), and Regulatory Impact Analysis of the Proposed Revisions
to the NAAQS (EPA 452/R-07-008, July 2007)

Ladies & gentlemen:

These comments are submitted on behalf of Unions for Jobs and the Environment (UJAE), a §501(c)(4) organization of twelve national and international labor unions.¹

UJAE's member unions represent more than 3.2 million workers in electric power, transportation, coal mining, construction and other industries. UJAE members' jobs and economic wellbeing will be affected by U.S.

¹ Member unions of UJAE are: Brotherhood of Locomotive Engineers; International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers; International Brotherhood of Electrical Workers; International Brotherhood of Teamsters; Marine Engineers Beneficial Association; Sheet Metal Workers International Association; Transportation • Communications International Union; United Association of Journeymen and Apprentices in the Plumbing and Pipefitting Industry; United Food and Commercial Workers International Union; United Mine Workers of America; United Transportation Union; and Utility Workers of America. For further information about UJAE, *see*, www.ujae.org.

EPA's decisions on the proposed revisions of the NAAQS for Ozone (72 FR 37818, July 11, 2007) and by related state and federal actions needed to implement any such revisions.

Summary of Comments

EPA is proposing to revise the primary 8-hour ozone standard from its current level of 0.08 ppm (effectively 0.084 due to rounding) to a more stringent level within a recommended range of 0.070 to 0.075 ppm, and to require attainment measurements to three decimals.

Based upon uncertainties in the available science, UJAE supports the agency's decision to recommend a revised standard within this range, but we recommend adoption of a revised primary standard at a level not lower than 0.075 ppm. We do not believe that the available science clearly supports setting a primary standard more stringent than 0.075 ppm. In the alternative, based upon the substantial scientific uncertainties identified in the record, UJAE would support a primary standard consistent with the upper end of the Staff Paper's recommendation for a revised standard "somewhat below" a level of 0.080.

UJAE recommends several improvements to EPA's related RIA for the proposed revised ozone standards. These include expanding the control strategy analysis from a single set of strategies related to meeting a standard of 0.070 to include a standard set at 0.075. The very limited emission reduction strategies identified in the RIA as "known" control strategies, principally focused on industrial boiler controls, should be expanded to cover potential reductions of allowable NO_x emissions from electric generating units beyond the "nested cap" approach employed in the RIA.

Specifically, EPA should examine the relative cost-effectiveness of potential reductions of CAIR NO_x allowances versus other stationary, area and mobile source control strategies using air quality metrics such as \$/ppb reduced in areas projected to exceed the revised standard. This recommendation follows from our assessment of the costs of potential "CAIR-Plus" NO_x control strategies estimated in a recent analysis by ICF Incorporated for the Mid-Atlantic Regional Air Management Association (MARAMA).²

² ICF Resources, LLC, Comparison of CAIR and CAIR-Plus Regulatory Proposal Using the Integrated Planning Model (Final Draft Report to MARAMA, May 2007)

Scientific Bases of a Revised Primary Standard

In recommending a revised primary standard within the relatively narrow range of 0.070 to 0.075 ppm, the Administrator has balanced a massive array of uncertain scientific data on the public health effects of ozone, as summarized in EPA's findings:

In considering the available information, the Administrator also judges that a standard level below 0.070 ppm would not be appropriate. In reaching this judgment, the Administrator notes that there is only quite limited evidence from clinical studies at exposure levels below 0.080 ppm O₃. Moreover, the Administrator recognizes that in the body of epidemiological evidence, many studies report positive and statistically significant associations, while others report positive results that are not statistically significant, and a few do not report any positive O₃-related associations. In addition, the Administrator judges that evidence of a causal relationship between adverse health outcomes and O₃ exposures becomes increasingly uncertain at lower levels of exposure. The Administrator also has considered the results of the exposure assessments in reaching his judgment that a standard level below 0.070 ppm would not be appropriate. ...

In considering the results of the health risk assessment, as discussed in section II.B above, the Administrator notes that there are important uncertainties and assumptions inherent in the risk assessment and that this assessment is most appropriately used to simulate trends and patterns that can be expected as well as providing informed but still imprecise estimates of the potential magnitude of risks. The Administrator particularly notes that as lower standard levels are modeled, including a standard set at a level below 0.070 ppm, the risk assessment continues to assume a causal link between O₃ exposures and the occurrence of the health effects examined, such that the assessment continues to indicate reductions in O₃-related risks upon meeting a lower standard level. As discussed above, however, the Administrator recognizes that evidence of a causal relationship between adverse health effects and O₃ exposures becomes increasingly uncertain at lower levels of exposure.

Given all of the information available to him at this time, the Administrator judges that the increasing uncertainty of the existence and magnitude of additional public health protection that standards below 0.070 ppm might provide suggests that such lower standard levels would likely be below what is necessary to protect public health with an adequate margin of safety.

In addition, the Administrator judges that a standard level higher than 0.075 ppm would also not be appropriate. This judgment takes into consideration the information discussed above in section II.B, and is based on the strong body of clinical evidence in healthy people at exposure

levels of 0.080 ppm and above, the substantial body of clinical and epidemiological evidence indicating that people with asthma are likely to experience larger and more serious effects than healthy people, the body of epidemiological evidence indicating that associations are observed for a wide range of more serious health effects at levels below 0.080 ppm, and the estimates of exposure and risk remaining upon just meeting a standard set at 0.080 ppm. The much greater certainty of the existence and magnitude of additional public health protection that such levels would forego provides the basis for judging that levels above 0.075 ppm would be higher than what is requisite to protect public health, including the health of at-risk groups, with an adequate margin of safety. For the reasons discussed above, the Administrator proposes to revise the level of the primary O₃ standard to within the range of 0.070 to 0.075 ppm.³

This summary of the available scientific evidence supporting a more stringent standard in the range of 0.070 to 0.075 ppm underscores the numerous critical uncertainties associated with the health studies relied upon by EPA Staff and by the Clean Air Scientific Advisory Committee in reaching their respective recommendations. The Staff Paper ably summarizes these in the context of needed research improvements:

Following completion of the 1996 Ozone Staff Paper (U.S. EPA, 1996), the EPA held a research needs workshop and produced a draft document³³ for review by the CASAC at a public meeting held November 16, 1998. Based on our review of scientific information contained in the 2006 CD, we have concluded that O₃ health research needs and priorities have not changed substantially since the above document was written. Key uncertainties and research needs that continue to be high priority for future reviews of the health-based primary standards are identified below:

(1) An important aspect of risk characterization and decision making for air quality standard levels for the O₃ NAAQS is the characterization of the shape of exposure-response functions for O₃, including the identification of potential population threshold levels. Recent controlled human exposure studies conducted at levels below 0.08 ppm O₃ provide evidence that measurable lung function effects occur in some individuals for 6-8 hr exposures in the range of 0.08 to as low as 0.04 ppm. A major limitation of these data is that they were collected in one laboratory located in an area of the U.S. that typically experiences higher ambient air levels of O₃; therefore, prior attenuation of subject response may have been a factor in the responses observed. Considering the importance

³ 72 FR 37880 (emphasis added.)

of estimating health risks in the range of 0.04 to 0.08 ppm O₃, additional research is needed to evaluate responses in healthy and asthmatic individuals in the range of 0.04 to 0.08 ppm for 6-8 hr exposures while engaged in moderate exertion.

(2) Similarly, for health endpoints reported in epidemiological studies such as hospital admissions, ED visits, and premature mortality, an important aspect of characterizing risk is the shape of concentration-response functions for O₃, including identification of potential population threshold levels. Most of the recent studies and analyses continue to show no evidence for a clear threshold in the relationships between O₃ levels and these health endpoints or have suggested that any such thresholds must be at very low levels approaching policy relevant background levels. Whether or not exposure errors, misclassification of exposure, or potential impacts of other copollutants may be obscuring potential population thresholds is still unknown.

(3) The extent to which the broad mix of photochemical oxidants and more generally other copollutants in the ambient air (e.g., PM, NO₂, SO₂, etc.) may play a role in modifying or contributing to the observed associations between ambient O₃ and various morbidity effects and mortality continues to be an important research question. Ozone has long been known as an indicator of health effects of the entire photochemical oxidant mix in the ambient air and has served as a surrogate for control purposes. A better understanding of sources of the broader pollutant mix, of human exposures, and of how other pollutants may modify or contribute to the health effects of O₃ in the ambient air, and vice versa, is needed to better inform future NAAQS reviews.

(4) As epidemiological research has become a more important factor in assessing the public health impacts of O₃, methodological issues in epidemiological studies have received greater visibility and scrutiny. Investigations of questions on the use of generalized additive models in time-series epidemiological studies have raised model specification issues. There remains a need for further study on the selection of appropriate modeling strategies and appropriate methods to control for time-varying factors, such as temperature, and to better understand the role of copollutants in the ambient air.

(5) Limited controlled human exposure and epidemiology research has provided suggestive evidence of both direct and indirect effects of O₃ on the cardiovascular system, cardiovascular hospital admissions, and cardiovascular mortality. However, additional work will be needed to examine biologically plausible mechanisms of cardiovascular effects and to determine the extent to which O₃ is directly implicated or works together with other pollutants in causing adverse cardiovascular effects in sensitive individuals and in the general population.

(6) Most epidemiological studies of short-term exposure effects have been time-series studies in large populations. Time-series studies remain subject to uncertainty due to use of ambient fixed-site data serving as a surrogate for ambient exposures, to the difficulty of determining the impact of any single pollutant among the mix of pollutants in the ambient air, to

limitations in existing statistical models, or to a combination of all of these factors. Independent variables for air pollution have generally been measurements made at stationary outdoor monitors, but the accuracy with which these measurements actually reflect subjects' exposure is not yet fully understood. Also, additional research is needed to improve the characterization of the degree to which discrepancy between stationary monitor measurements and actual pollutant exposures introduces error into statistical estimates of pollutant effects in time-series studies.

(7) Improved understanding of human exposures to ambient O₃ and to related copollutants is an important research need. Population-based information on human exposure for healthy adults and children and susceptible or at-risk populations including asthmatics to ambient O₃ concentrations, including exposure information in various microenvironments, is needed to better evaluate current and future O₃ exposure models. Such information is needed for sufficient periods to facilitate evaluation of exposure models throughout the O₃ season.

(8) Information is needed to improve inputs to current and future population-based O₃ exposure and health risk assessment models. Collection of time-activity data over longer time periods is needed to reduce uncertainty in the modeled exposure distributions that form an important part of the basis for decisions regarding air quality standard for O₃ and other air pollutants. Research addressing energy expenditure and associated breathing rates in various population groups, particularly healthy and asthmatic children, in various locations, across the spectrum of physical activity, including sleep to vigorous physical exertion is needed.

(9) An important consideration in the O₃ NAAQS review is the characterization of policy relevant background levels. There still remain significant uncertainties in the characterization of 8-hr daily maximum O₃ background concentrations. Further research to improve the evaluation of the GEOS-CHEM model which has been used to characterize estimates of policy relevant background levels would help reduce uncertainties in estimating health risks relevant for standard setting (i.e., those risks associated with exposure to O₃ in excess of policy relevant background levels) and would aid in the development of associated control programs.⁴

These shortcomings in the health and epidemiological evidence associated with short- and long-term exposure to ozone support our concerns about the inadequate bases for setting a revised standard below a level of 0.075 ppm, the upper end of the Administrator's recommended range. Indeed, other authorities argue that there is an inadequate scientific basis for

⁴ U.S. EPA, Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper at 6-87-6-90, EPA-452/R-07-003, January 2007 (emphasis added, footnotes omitted.)

changing the current standard.⁵ These considerations would support a less aggressive tightening of the standard, such as Staff's upper end recommendation for a standard "somewhat below" 0.080.

EPA's Regulatory Impact Analysis

UJAE has reviewed EPA's July 2007 Regulatory Impact Analysis (RIA) for the revised ozone standards to assess the potential impacts of standards within the Administrator's recommended range on the electric utility, mining, transportation, and other industries employing UJAE members.

EPA's RIA analyzes a limited array of "known" control options for meeting ozone standards ranging from 0.065 ppm to 0.079 ppm. The cost analysis is divided between engineering cost estimates for "known" controls applied mainly to industrial boilers and mobile sources, and much larger "extrapolated" costs based on additional estimated NO_x reductions needed to achieve alternative standards. In brief:

- Identified "known" EGU controls are limited to relatively minor reduction of CAIR NO_x caps in the Northeast and Midwest, with no net reduction in overall CAIR region emissions. Some targeted "command-and-control" EGU NO_x reductions are applied elsewhere in the CAIR region, at units not projected to install SCR or SNCR by 2020.
- Most identified "known" controls are applied to industrial and commercial boilers.
- The modeled costs associated with "known" controls are \$3.9 billion for all source categories, including \$0.2 billion for EGU controls. The "extrapolated costs" needed to meet alternative ozone standards are potentially much larger – between \$1.6 and \$4.9 billion annually for a 0.075 ppm standard, and \$6 to \$18 billion annually for a standard of 0.070 ppm:

⁵ See, e.g., Statement of Roger O. McClellan before the Senate Subcommittee on Clean Air and Nuclear Safety, Senate Environment and Public Works Committee Hearing on EPA's Proposed Revision to the National Ambient Air Quality Standards for Ozone (July 11, 2007); The Annapolis Center for Science-Based Public Policy, *The Science and Health Effects of Ground-Level Ozone* (2007).

	<i>Level of Standard in 2020</i>			
	0.065 ppm	0.070 ppm	0.075 ppm	0.079 ppm
Modeled Costs (\$B)	\$3.9	\$3.9	\$3.9	\$3.9
Extrapolated Costs (\$B)	\$13 to \$42	\$5.9 to \$18	\$1.6 to \$4.9	(\$0.95) to (\$0.57)*
Total Costs (\$B)	\$17 to \$46	\$10 to \$22	\$5.5 to \$8.8	\$3 to \$3.3

* The use of the 0.070 ppm control strategy as a starting point for extrapolating the 0.079 standard resulted in over attainment in some areas. For over attaining areas, cost savings were applied. For the 0.079 ppm standard the cost savings from over attaining areas was greater than the costs for areas still needing extrapolated tons (see Table 5.4).

Source: EPA RIA (July 2007).

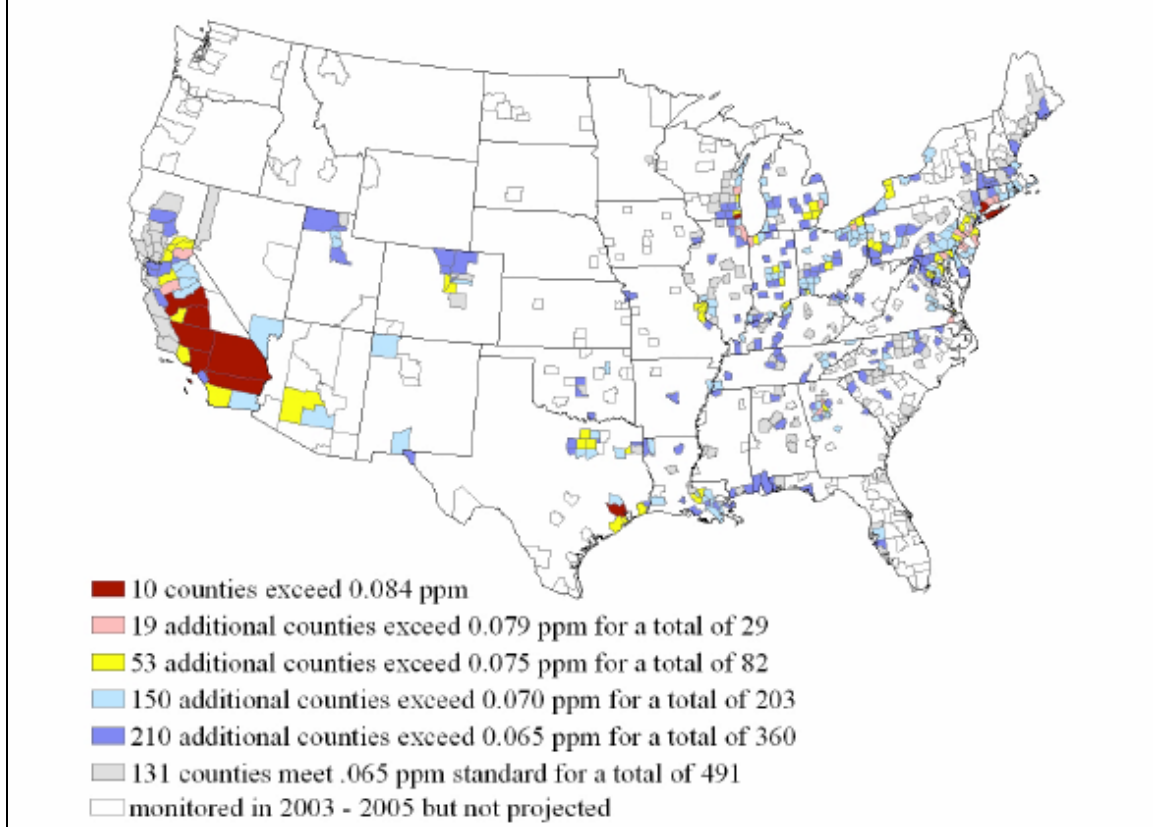
With a revised standard set at a level of 0.070 to 0.075, the substantial “extrapolated” costs associated with attaining alternative standards potentially imply CAIR-Plus NOx controls for EGUs, beyond the “known” controls discussed in the RIA. With (assumed) major new industrial boiler reductions in place, and limited opportunities for mobile source reductions within a ~2020 compliance timeframe, EGU reductions beyond those identified as “known” controls need to be more carefully analyzed in the Final RIA.

Geographic Scope of Nonattainment

EPA estimates the potential NOx and VOC reductions needed to attain a 0.070 standard for different urban areas. The agency evaluates the costs of “known controls” and recognizes that the standards cannot be attained in all areas with additional “known” controls.

EPA’s map of potential nonattaining counties in 2020 is shown below, for alternative levels of the standard, based on existing monitor data:

Fig. 3.4 Baseline Annual Ozone Air Quality in 2020



Source: EPA RIA (July 2007).

This map illustrates the large extent of additional eastern nonattainment in moving from the current standard to a standard of 0.075 or 0.070 ppm. Ten counties (in CA, NY and CT) are projected to exceed the existing standard of 0.084 ppm. An additional 72 counties would exceed a 0.075 standard, after implementation of CAIR/CAMR/CAVR and all other state and federal measures. With a new standard at 0.070 ppm, another 150 counties would be pushed into nonattainment, for a total of 203 counties in nonattainment. (These data are based on existing monitors, so the actual extent of nonattainment would be much larger.)

RIA Compliance Options

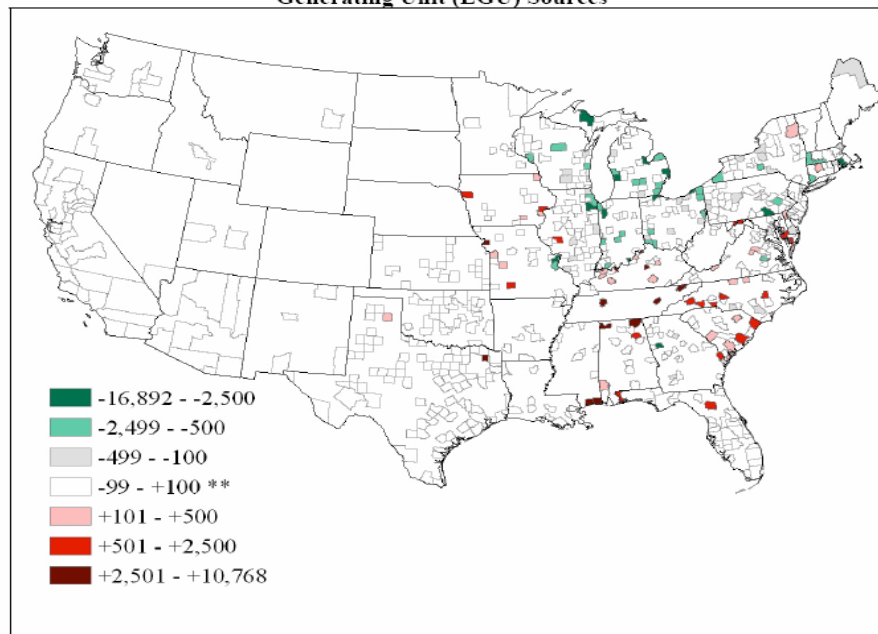
EPA modeled only one hypothetical compliance strategy, for a 0.070 standard, and then estimated the additional emission reductions needed to meet this and other alternative standards. EPA focused almost entirely on industrial point source, mobile and area source controls, and assumed few

additional EGU controls would be required. The largest category of projected NOx reductions (79%) is at industrial point sources, followed by on-road mobile sources (16%). Net EGU reductions account for only 1% of projected NOx reductions.

For the 0.070 standard, EPA assumed that CAIR EGU NOx caps would be lowered in the Midwest MRPO and Northeast OTC regions for the ozone season. EPA estimated the reduction of ozone season NOx emissions in these two regions by calculating the potential reductions achieved by retrofitting SCR or SNCR controls on all coal units not projected to install controls under CAIR/CAMR/CAVR. EPA left the total CAIR region NOx cap unchanged, allowing for trading of surplus allowances to defray the costs of controls. The agency lowered the regional ozone season caps in MRPO and OTC by an amount equal to 75% of the reduction that could be achieved by retrofitting uncontrolled units with SCR or SNCR.

Overall, EPA estimates that lowering the CAIR ozone season caps in the MRPO and OTC regions, while leaving the CAIR cap unchanged, would reduce a total of 55,000 tons of NOx in the two regions.

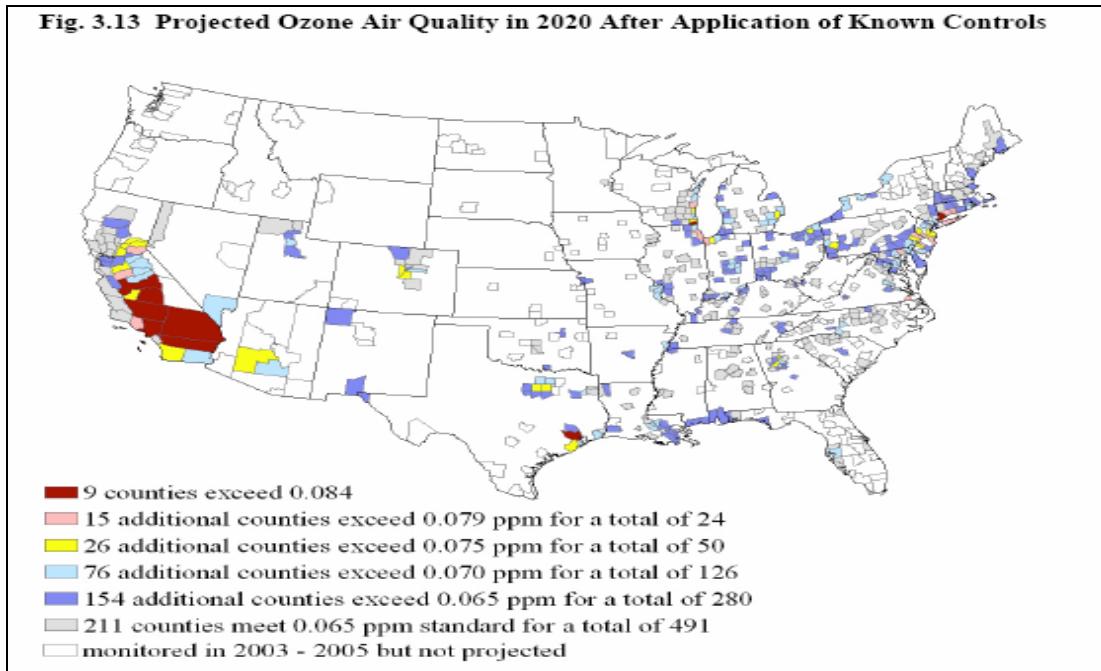
Figure 3a.2 Tons of Nitrogen Oxide (NOx) Emissions Reduced from Electrical Generating Unit (EGU) Sources*



*Reductions are negative and increases are positive
 **The -99 - +100 range is not shown because these are small county-level NOx reductions or increases that likely had little to no impact on ozone estimates. Most counties in this range had NOx differences of under 1 ton.

Source: EPA RIA (July 2007).

Outside of the MRPO and OTC regions, the RIA uses a “command and control” EGU strategy, targeting uncontrolled coal plants for retrofits of SCR or SNCR. The amount of NO_x reduced from EGU units within and outside of MRPO and OTC is summarized by the above map (increases reflect the purchase of allowances from units receiving controls in the MRPO and OTC regions):



Source: EPA RIA (July 2007).

Based on EPA’s modeling for the application of “known” controls after implementation of CAIR/CAMR/CAVR, a total of 50 counties would not meet a 0.075 standard, while 126 counties would not meet a 0.070 standard. An additional 154 counties, mainly in the Mid-Atlantic and along the Ohio River Valley, have ozone values between 0.065 and 0.070.

Residual Nonattainment Reduction Needs

EPA employs an “impact ratio” analysis to measure the extent of local ozone reductions per thousand tons of NO_x and VOC emission reductions, using 90% reduction assumptions applied across the board in five illustrative geographic areas. This approach focuses on local source impacts and ignores transported ozone.

Results for the five illustrative areas are summarized below. Relatively high impact benefits from local controls occur in Atlanta, California and Dallas, while the Northeast and Lake Michigan regions show low impacts:

Table 4.1: Summary of site-specific impact ratios over the five analysis zones of Approach A.

	Minimum Impact Ratio	Maximum Impact Ratio	Average Impact Ratio	Controlling County Impact Ratio
Atlanta	0.051	0.187	0.123	0.187
Central CA	0.077	0.106	0.095	0.106
Dallas	0.118	0.138	0.130	0.135
Lake Michigan Area	-0.022 ¹	0.052	0.010	0.032
Northeast Corridor	0.002	0.035	0.022	0.035

Source: EPA RIA (July 2007).

The average impact ratio for the Lake Michigan area is 0.010, meaning that a local reduction of 1000 tons of ozone precursors reduces ozone by 0.1 ppb. (The negative value for Lake Michigan represents a NO_x disbenefit, a known phenomenon in Chicago.) The “controlling county” is the county with the highest ozone.

The RIA also uses an alternative impact methodology that imposes controls within 200 km of nonattainment counties, thereby incorporating limited ozone transport effects. From these two impact analyses, EPA developed a uniform estimate of the impact of reducing NO_x in areas projected to violate the proposed standards after the implementation of “known controls” (50,000 tons = -5 ppb). These estimates enabled EPA to extrapolate the total tons of NO_x needed to attain the standard. The results for the 0.070 and 0.075 ppm alternative standards are summarized in the tables below:

Table 4.7. Estimated Annual Incremental Tons Needed for an 0.070 ppm air quality target in 2020 (20 areas)

Control Region	Controlling County	Post-scenario design value (ppb)	Incremental Extrapolated NOx Tons
Lake Michigan region	Kenosha WI	85.0	124,000
Ozone Transport Region	Fairfield CT	87.1	123,000
Eastern TX areas (Houston/Dallas)	Harris TX	90.5	116,000
VA areas (Norfolk/Richmond)	Suffolk City VA	80.8	99,000
Detroit, MI	Macomb MI	78.4	75,000
Phoenix, AZ	Maricopa AZ	77.6	67,000
Denver, CO	Jefferson CO	76.9	60,000
OH areas (Cleveland/Columbus/Cincinnati)	Geauga OH	76.5	56,000
Atlanta, GA	Fulton GA	76.0	51,000
St Louis, MO-IL	St Louis City MO	75.7	48,000
Indiana areas (Indianapolis)	Shelby IN	74.5	36,000
LA areas (Baton Rouge)	E Baton Rouge LA	74.4	35,000
KY areas (Louisville)	Clark IN	74.0	31,000
Sacramento / San Joaquin Valley	Kern CA**	96.3	20,000
TN areas (Memphis)	Crittenden AR	72.9	20,000
NC areas (Charlotte)	Mecklenburg NC	72.3	14,000
Salt Lake City, UT	Salt Lake UT	72.2	13,000
Las Vegas, NV	Clark NV	72.0	11,000
FL areas (Tampa)	Hillsborough FL	71.4	5,000
Los Angeles South Coast Air Basin, CA	Los Angeles CA**	105.0	0*

Table 4.8. Estimated Annual Incremental Tons Needed for an 0.075 ppm air quality target in 2020 (11 areas)

Control Region	Controlling County	Post-scenario design value (ppb)	Incremental Extrapolated NOx Tons
Lake Michigan region	Kenosha WI	85.0	74,000
Ozone Transport Region	Fairfield CT	87.1	73,000
Eastern TX areas (Houston/Dallas)	Harris TX	90.5	66,000
VA areas (Norfolk)	Suffolk City VA	80.8	49,000
Detroit, MI	Macomb MI	78.4	25,000
Phoenix, AZ	Maricopa AZ	77.6	17,000
Denver, CO	Jefferson CO	76.9	10,000
OH areas (Cleveland)	Geauga OH	76.5	6,000
Atlanta, GA	Fulton GA	76.0	1,000
Sacramento / San Joaquin Valley	Kern CA**	96.3	0*
Los Angeles South Coast Air Basin, CA	Los Angeles CA**	105.0	0*

*/** CA is assumed to meet later deadlines.

Source: EPA RIA (July 2007).

The amount of NO_x reductions needed to attain the alternative standards in the Northeast and Lake Michigan regions increase by roughly two-thirds in moving from a 0.075 standard to a 0.070 standard. The number of urban areas required to reduce emissions beyond “known” controls nearly doubles, from 10 to 21.

Nationally, the RIA estimates that an additional 321,000 tons of annual NO_x reductions are needed to meet a 0.075 ppm standard by 2020. Meeting a 0.070 standard requires an estimated 1.0 million tons of NO_x reductions beyond those modeled as “known” controls. In sum, a 0.005 ppm difference in the standard doubles the number of counties in nonattainment after full implementation of CAIR/CAMR/CAVR plus “known” controls, and triples the amount of NO_x reductions estimated to achieve full attainment.

Cost Estimates for Full Attainment

EPA estimated the costs of applying “known” controls based on engineering cost estimates for various control technologies, and then calculated the additional costs associated with reducing emissions to achieve full attainment based on its extrapolated emission reduction estimates.

The table below summarizes EPA’s estimates of the costs of “known” controls available to help meet a 0.070 ppm standard. Most of the costs are concentrated in the non-EGU industrial point source sector. Of the estimated \$3.9 billion annual cost, \$200 million is incurred by the EGU sector, while industrial point sources incur costs of \$2.3 billion:

Table 5.1 Comparison of Modeled Annual Control Costs Nationwide, by sector, for a 0.070 ppm control scenario (\$1999)⁶

Source Category	0.070 ppm Control Strategy		Average Cost per Ton (\$1999)
	Total Cost (\$B 1999)		
	East	West	
A. Electric Generating Units (EGU) Sector <i>Controls for NOx Cap-and-Trade Program and Local Measures in Projected Nonattainment Areas</i>	\$0.20	\$0	\$2,000
Total	\$0.20	\$0	
B. Onroad	\$0.51	\$0.11	\$2,300
C. Nonroad	\$0.09	\$0.02	\$4,400
Total	\$0.60	\$0.13	
D. Non-EGU Sector <i>Point Sources (Ex: Pulp & Paper, Iron & Steel, Cement, Chemical Manu.)</i>	\$2.30	\$0.34	\$3,600
E. Area Sector <i>Area Sources (Ex: Res. Woodstoves, Agriculture)</i>	\$0.31	\$0.01	\$2,000
Total	\$2.6	\$0.35	
Total Annualized Costs (using a 7% interest rate)	\$3.90		
Total Annualized Costs (using a 3% interest rate)	\$3.60		

Source: EPA RIA (July 2007).

In addition to these “known” costs, EPA estimated the costs associated with achieving full attainment of alternative standards outside of California (which will be subject to attainment dates beyond 2020). The agency’s estimates include alternative cost calculation methodologies, including region-specific increasing marginal costs and lower- and upper-fixed cost estimates.

Cost findings for meeting the 0.075 and 0.070 standards are shown in the following two tables. These estimates reflect the extrapolated emission reduction requirements needed to attain the standard, and must be added to the above costs of “known controls.”

Table 5.5 Extrapolated Costs of Meeting the 0.075 ppm Standard				
Extrapolated Costs for 075 Standard	MC Curve Estimate (\$M 1999)	Lower Fixed Cost/Ton Estimate (\$M 1999)	Upper Fixed Cost/Ton Estimate* (\$M 1999)	Cost/Ton Estimate of Last Control Applied on MC Curve Estimate (\$ 1999)
<u>Extrapolated Costs</u>				
CA – Los Angeles ^b	\$0	\$0	\$0	
CA – Kern County ^b	\$0	\$0	\$0	
Houston / Dallas	\$1,254	\$400	\$1,008	\$20,085
Ozone Transport Region	\$1,307	\$443	\$1,114	\$19,187
Lake Michigan region	\$1,310	\$449	\$1,130	\$19,362
Richmond / Norfolk	\$790	\$297	\$748	\$16,982
Detroit	\$396	\$152	\$382	\$16,392
Phoenix	\$282	\$72	\$260	\$17,851
Denver	\$160	\$42	\$153	\$16,787
Cleveland/Columbus/Cincinnati	\$92	\$36	\$92	\$15,537
Atlanta	\$15	\$6	\$15	\$15,303
<i>Total Cost</i>	\$5,606	\$1,896		
<u>Extrapolated Cost Savings</u>				
Baton Rouge, LA	(\$225)	(\$91)	^c	
Indianapolis, IN	(\$209)	(\$85)	^c	
Louisville, KY-IN	(\$284)	(\$115)	^c	
St. Louis, MO-IL	(\$30)	(\$12)	^c	
<i>Total Cost Savings</i>	(\$748)	(\$303)		
Total Extrapolated Cost	\$4,858	\$1,593		
<i>Average cost per ton</i>	\$23,000	\$7,600		

Source: EPA RIA (July 2007).

Table 5.6 Extrapolated Costs of Meeting the 0.070 ppm Standard*				
Extrapolated Costs for 0.070 Standard	MC Curve Estimate (\$M 1999)	Lower Fixed Cost/Ton Estimate (\$M 1999)	Upper Fixed Cost/Ton Estimate (\$M 1999)	Cost/Ton Estimate of Last Control Applied on MC Curve Estimate (\$ 1999)
CA – Los Angeles ^b	\$0	\$0	\$0	
CA – Kern County ^b	\$829	\$181	\$305	\$43,541
Houston / Dallas	\$2,299	\$703	\$1,771	\$21,735
Ozone Transport Region	\$2,310	\$746	\$1,878	\$20,937
Lake Michigan region	\$2,334	\$752	\$1,893	\$21,612
Richmond / Norfolk	\$1,683	\$600	\$1,511	\$18,732
Detroit	\$1,272	\$455	\$1,145	\$18,642
Phoenix	\$1,364	\$282	\$1,023	\$25,451
Denver	\$1,190	\$253	\$916	\$24,387
Cleveland/Columbus/Cincinnati	\$926	\$339	\$855	\$17,787
Atlanta	\$825	\$309	\$779	\$17,103
St. Louis	\$785	\$291	\$733	\$17,427
Indianapolis	\$579	\$218	\$550	\$16,887
Baton Rouge	\$555	\$212	\$534	\$16,422
Louisville	\$491	\$188	\$473	\$16,383
Memphis	\$313	\$121	\$305	\$15,987
Charlotte	\$217	\$85	\$214	\$15,771
Salt Lake City	\$211	\$55	\$198	\$17,243
Las Vegas	\$177	\$46	\$168	\$16,939
Tampa	\$77	\$30	\$76	\$15,447
Total Extrapolated Cost	\$18,441	\$5,867	\$15,328	
<i>Average cost per ton</i>	<i>\$18,400</i>	<i>\$5,900</i>	<i>\$15,300</i>	

Source: EPA RIA (July 2007).

Need for Multi-Source Cost-Effectiveness Analysis of Incremental Air Quality Benefits

UJAE recommends improvements to EPA’s RIA for the proposed revised ozone standards. These include expanding the control strategy analysis from a single set of strategies related to meeting a standard of 0.070 to include a standard set at 0.075. The very limited emission reduction strategies identified in the RIA as “known” control strategies, principally focused on industrial boiler controls, should be expanded to cover potential reductions of allowable NOx emissions from electric generating units beyond the “nested cap” approach employed in the RIA.

Specifically, EPA should examine the relative cost-effectiveness of potential reductions of CAIR NOx allowances relative to other stationary, area and mobile source control strategies using air quality metrics such as \$/ppb reduced in areas projected to exceed the revised standard.

This recommendation follows from our assessment of the costs of potential “CAIR-Plus” NO_x control strategies estimated in a recent analysis by ICF Incorporated for the Mid-Atlantic Regional Air Management Association (MARAMA).⁶ The MARAMA study, discussed *infra*, shows extremely high costs (\$/ton) for further reduction of CAIR NO_x allowances using the OTC proposed Model Rules as the basis for an additional NO_x reduction strategy. Further, we understand from OTC Executive Director Chris Recchia’s remarks at the March 2, 2007, OTC Special Meeting that modeling of the OTC Model Rules for CAIR-Plus controls indicates an average ozone reduction of approximately 1 ppb in the CAIR region. The extremely high costs of CAIR-Plus EGU controls - and the long distances separating most EGUs from urban ozone nonattainment areas - call for a more refined \$/ppb analysis of control options for stationary, mobile and area sources in the Final RIA.

MARAMA OTC CAIR-Plus Analysis

MARAMA requested ICF to model the OTC CAIR-Plus strategy, which reduces the number of SO₂ and NO_x allowances throughout the CAIR region by 40% by 2015, while requiring comparable emission reductions throughout CENRAP. ICF’s May 2007 analysis includes costs for both SO₂ and NO_x controls, but the capital expenditures it forecasts are mainly for additional retrofits of SCRs. (SO₂ reductions are achieved largely by fuel-switching and other non-technological means.) The OTC CAIR-Plus scenario for a 40% reduction of EGU NO_x emissions is a rough proxy for a new EPA SIP Call or similar regional transport rule to reduce EGU NO_x emissions below CAIR levels.

SCR Retrofits

ICF projects the retrofit of 65GW of additional SCR capacity throughout the CAIR region to achieve a 40% reduction of emissions below CAIR levels. The Phase II CAIR NO_x allocation to states is based on an emission rate of 0.125 lbs NO_x/MMBTU. A 40% reduction of this rate is equivalent to 0.075 lbs NO_x/MMBTU. Spread across a utility system, such an emission rate would necessitate retrofitting SCRs on most of the smallest and oldest units, threatening their continued economic viability.

⁶ ICF Resources, LLC, Comparison of CAIR and CAIR-Plus Regulatory Proposal Using the Integrated Planning Model (Final Draft Report to MARAMA, May 2007)

The table below shows the incremental retrofits of FGDs and SCRs in the CAIR-Plus scenario compared to the CAIR reference case. Most of the FGD retrofits (for SO₂ control) are installed outside the CAIR region, while virtually all of the SCR retrofits are installed within the CAIR states.

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

Technology	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
Scrubber	24.9	31.4	59.7	65.6	87.5	98.7
SCR	9.0	15.0	38.5	42.1	58.6	66.3
MARAMA CAIR Plus Policy Case						
Scrubber	30.5	38.9	69.5	85.1	106.4	115.3
difference wrt MARAMA Base Case	5.6	7.5	9.8	19.5	18.9	16.6
SCR	9.0	15.0	115.2	120.0	124.5	131.2
difference wrt MARAMA Base Case	0.0	0.0	76.8	77.8	65.9	64.9

Source: ICF/MARAMA (May 2007).

The CAIR-Plus policy case doubles the amount of SCR capacity projected to be installed in response to CAIR, from 66.3 GW in 2018 to 131.2 GW. These SCR retrofits are in addition to the ~85 GW of SCR capacity installed in response to the 1998 SIP Call. In practice, every eastern coal unit larger than ~100 MW would be retrofitted to meet OTC’s CAIR-Plus strategy.

MARAMA’s proposed 40% reduction of EGU NO_x emissions, approximately 0.5 million tons annually, would entail estimated capital costs of ~\$2.5 billion annually by 2018, with total capital and O&M costs of ~\$3.5 billion annually. These CAIR-Plus costs are an order of magnitude above the “known” EGU controls analyzed in EPA’s RIA. If confronted with SCR retrofit mandates, many (or most) smaller and older eastern coal units likely would be retired.

Table 9: Annual NO_x Emissions from the U.S. Electric Power Sector (All Units including Fossil and Non-fossil units) (Thousand Tons)

	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
MANE-VU	386.0	271.9	213.2	208.7	202.3	198.8
LADCO	803.9	483.4	413.0	409.0	389.5	382.1
VISTAS	1,207.6	699.9	622.0	621.1	502.0	452.9
CENRAP	754.5	604.1	603.0	616.0	539.4	538.3
WRAP	601.1	606.3	610.1	613.5	483.4	493.5
CAIR Plus Policy States	2,944.5	1,847.6	1,642.5	1,643.8	1,488.0	1,426.5
National Total	3,753.1	2,665.6	2,461.3	2,468.5	2,116.6	2,065.6
MARAMA CAIR Plus Policy Case						
MANE-VU	375.9	228.0	158.8	162.1	152.7	145.6
difference wrt MARAMA Base Case	-10.1	-43.9	-54.4	-46.7	-49.6	-53.2
LADCO	804.2	425.9	251.2	249.2	244.7	241.8
difference wrt MARAMA Base Case	0.4	-67.5	-161.8	-159.8	-144.8	-140.3
VISTAS	1,215.7	597.6	350.8	351.2	346.2	350.3
difference wrt MARAMA Base Case	8.0	-102.3	-271.2	-269.9	-155.8	-102.6
CENRAP	754.5	577.5	420.9	431.6	361.6	351.7
difference wrt MARAMA Base Case	0.1	-26.6	-182.1	-184.4	-177.8	-186.6
WRAP	600.5	606.5	610.0	615.2	485.5	495.7
difference wrt MARAMA Base Case	-0.6	0.2	-0.1	1.7	2.1	2.2
CAIR Plus Policy States	2,942.9	1,614.1	972.8	982.6	957.1	941.4
difference wrt MARAMA Base Case	-1.6	-233.4	-669.7	-661.2	-530.9	-485.1
National Total	3,750.9	2,435.5	1,791.6	1,809.3	1,590.7	1,585.1
difference wrt MARAMA Base Case	-2.2	-230.2	-669.7	-659.1	-525.8	-480.5

Source: ICF/MARAMA (May 2007).

The regional distribution of the NO_x reductions required by OTC's strategy is shown above. Overall, the strategy reduces CAIR-region NO_x emissions from 1.43 million annual tons to 0.94 million tons in 2018, a difference of 34% (banking results in smaller reductions than the 40% target.) The total NO_x reduction in CAIR states is roughly 0.5 million tons annually in 2018, peaking at nearly 0.7 million tons in 2012.

Cost Impacts

The cost impact of these SCR retrofits is measured by changes in marginal NO_x allowance prices and by annualized costs. ICF's analysis predicts that annual NO_x allowance prices would quadruple, from \$1,567/ton to \$6,266 in 2018, with similar changes in earlier periods:

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	2008	2009	2010	2012	2015	2018
MARAMA Base Case						
SO ₂	640	692	748	809	943	1,106
NO _x – Ozone ³	14,580	15,760	0	0	0	0
NO _x - Annual	NA	3,047	1,149	1,155	1,337	1,567
MARAMA CAIR Plus Policy Case						
SO ₂	806	872	942	1,019	1,188	1,392
difference wrt MARAMA Base Case	166	180	194	210	245	286
NO _x – Ozone	14,710	11,150	0	0	0	0
difference wrt MARAMA Base Case	130	-4,610	0	0	0	0
NO _x - Annual	NA	17,920	4,240	4,586	5,346	6,266
difference wrt MARAMA Base Case	NA	14,873	3,091	3,431	4,009	4,699

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

Source: ICF/MARAMA (May 2007).

ICF does not separate NO_x and SO₂ control costs in its regional summaries, but nearly all of the annualized capital costs within the CAIR region are for SCR retrofits. Overall, ICF estimates that the OTC CAIR-Plus strategy would increase overall annualized costs by \$2-3 billion relative to CAIR, for both SO₂ and NO_x:

OTC CAIR-Plus Annual Costs for SO₂ and NO_x
(Millions of 1999 \$)

Annualized costs	2012	2018
Variable O&M	\$490	\$257
Fixed O&M	\$263	\$120
Capital	\$2,235	\$1,748
Total	\$2,988	\$2,125

Source: ICF/MARAMA (May 2007).

Cost Note

All of ICF's cost estimates are in 1999 dollars, and should be adjusted upwards by 20% to reflect 2006 prices. An overall upward adjustment of at least 50% is warranted to cover this inflation factor plus recent construction cost increases for SCRs. With a 50% adjustment, ICF's projected capital costs for SCR retrofits in the CAIR region would increase from \$1.7 billion to ~\$2.5 billion. Fixed and variable O&M costs would further increase this to at least \$3.5 billion annually.

Increased costs for installing and operating SCR equipment would push many older and smaller coal units off the economic dispatch curve. ICF

estimates that the OTC CAIR-Plus strategy would increase retirements of coal capacity by ~5,000 MW, while increasing projected builds of new coal IGCC capacity by ~5,000 MW.

ICF's estimates of coal unit retirements are probably very conservative, particularly in view of the understated capital costs assumed in the IPM model. Approximately 20% of nameplate coal capacity in the east consists of units smaller than 200 MW and more than 40 years old (>40GW in the CAIR region.) These units survive under CAIR and CAMR because they can use allowances to avoid FGD and SCR costs. If confronted with SCR retrofits, utility planners may find it economic to replace substantial numbers of existing small plants with new baseload capacity – advanced coal, nuclear or LNG/gas.

ICF's findings for the regional distribution of OTC CAIR-Plus costs suggest that most eastern states would face significant shutdown and replacement requirements. These potential impacts are not recognized by the EPA RIA's limited assessment of EGU controls needed to meet a revised primary ozone standard. As recommended above, more refined assessments of control costs for multiple source categories, including incremental air quality cost-effectiveness measured in \$/ppb, are needed to determine whether measures such as the OTC Model Rules may be appropriate to help meet a revised primary ozone standard.

UJAE appreciates the opportunity to comment on these issues, and hopes that EPA will give due consideration to its recommendations.

Sincerely,

/s/

Eugene M. Trisko
General Counsel
Unions for Jobs and
the Environment