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Technical Support Document for the Prevention of Significant Deterioration and Nonattainment Area New Source Review: Emissions Increase Test for Electric Generating Units

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Technical Support Document for Prevention of Significant Deterioration And Nonattainment Area New Source Review: Emissions Increase Test for Electric Generating Units

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Chapter 1.
Overview

This Technical Support Document contains information and analyses supporting the proposed rule Prevention of Significant Deterioration, Nonattainment New Source Review, and New Source Performance Standards: Electric Generating Units (70 FR 61081). Our supplemental proposal contains additional regulatory and policy background for the proposed rule, as well as the specific regulatory language. This TSD contains specific information about three separate analyses conducted in support of the proposed regulatory approach, as included in the proposal and the supplemental proposal.

Our analyses rely on the Integrated Planning Model (IPM), which we describe in Chapter 2. Chapters 3 and 4 contain the results of our first analysis, that of the effect of changing from an annual to an hourly emissions increase test, under which a source may operate more hours annually. We call this analysis the NSR Availability Scenario. Chapter 3 examines the Availability Scenarios as they relate to SO_2 and NO_x emissions. Chapter 4 examines the Availability Scenarios as they relate to $PM_{2.5}$, VOC, and CO emissions.

Chapter 5 contains our second analysis, which we call the NSR Efficiency Analysis. This analysis assumes an increase in efficiency. Aside from independent factors such as climate and economy, efficiency is a primary determinant of the hours of operation of a given EGU. Neither the current annual emissions increase test nor any of the proposed EGU emission increase test alternatives directly measure an EGU's efficiency. However, the output-based alternatives (Alternatives 2, 4, and 6 in the proposal), which are expressed in a lb/KWh-hour format that measures mass emissions per unit of electricity, are closely related to an EGU's efficiency. Thus, an output-based test encourages efficient units, which has well-recognized benefits. We anticipate that the output-based alternatives in particular, and the other alternatives to a lesser extent, could have the effect of encouraging EGUs to increase their efficiency. As none of the emission increase tests would directly measure the effect of increased efficiency on emissions, we examined the effect of increasing efficiency in a separate analysis. Chapter 5 includes the result of the Efficiency Analysis as it relates to SO_2 and NO_x; Chapter 6 includes the results of the Efficiency Analysis as it relates to $PM_{2.5}$, VOC, and CO.

Chapter 2.
The Integrated Planning Model (IPM)

We use the IPM to analyze the projected impact of environmental policies on the electric power sector in the 48 contiguous States and the District of Columbia. The IPM is a multi-regional, dynamic, deterministic linear programming model of the entire electric power sector. It provides forecasts of least-cost capacity expansion, electricity dispatch, and emission control strategies for meeting energy demand and environmental, transmission, dispatch, and reliability constraints. We have used the IPM extensively to evaluate the cost and emissions impacts of proposed policies to limit emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) from the electric power sector. The IPM was a key analytical tool in developing the Clean Air Interstate Regulation (CAIR; see 70 FR 25162). However, the IPM capabilities and results are not limited to projections for CAIR States. It includes data for and projects emissions and controls for the electric sector in the contiguous United States.

Each IPM model run is based on emissions controls on existing units, State regulations, cost and performance of generating technologies, SO_2 and NO_x heat rates, natural gas supply and prices, and electricity demand growth assumptions. This input is updated on a regular basis. We used the IPM to project EGU SO_2 and NO_x controls, emissions, and air quality in 2020 considering projected emission controls under the Clean Air Interstate Rule, Clean Air Mercury Rule, and Clean Air Visibility Rule. For convenience, we refer to this projection as the CAIR/CAMR/CAVR 2020 Base Case

Scenario or, more simply, the Base Case Scenario. The IPM model used for this scenario is IPM v.2.1.9.[1]

The IPM v 2.1.9 is based on 2,053 model plants, which represent 13,819 EGUs, including 1,242 coal-fired EGUs.[2] This represents all existing EGUs in the contiguous United States as of 2004, as well as new units that are already planned or committed, and new units that are projected to come online by 2007. The underlying data for these plants is contained in the National Electric Energy Data System (NEEDS), which contains geographic location, fuel use, emissions control, and other data on each existing EGU. NEEDS data for existing EGUs comes from a number of sources, including information submitted to EPA under the Title IV Acid Rain Program and the NO_x Budget Program, as well as information submitted to the Department of Energy's Energy Information Agency, on Forms EIA 860 and 767. That is, the underlying data for each existing EGU in the IPM v.2.1.9 is information from an actual EGU in operation as of 2004 that has been submitted to the EPA or the DOE.

The IPM v.2.1.9 model also accounts for growth in the EGU sector that is projected to occur through new builds, including both planned-committed units and potential units. Planned-committed EGUs are those that are likely to come online, because ground has been broken, financing obtained, or other demonstrable factors indicate a high probability that the EGU will come online. Planned-committed units in

[1] Complete documentation for IPM, including the Base Case Scenario, is available at **http://www.epa.gov/airmarkets/progsregs/epa-ipm/index.html**. See also Docket Item EPA-HQ-OAR-2005-0163, DCN 01.

[2] See the NEEDS 2004 documentation for IPM v.2.1.9 in Exhibit 4-6, which can be found at **http://www.epa.gov/airmarkets/progsregs/epa-ipm/past-modeling.html**. See also Docket Item EPA-HQ-OAR-2005-0163, DCN 02.

IPM v.2.1.9 were based on two information sources: RDI NewGen database (RDI) distributed by Platts (www.platts.com) and the inventory of planned-committed units assembled by DOE, Energy Information Administration, for their Annual Energy Outlook. Potential EGUs are those units that may be built at a future date in response to electricity demand. In IPM v.2.1.9, potential new units are modeled as additional capacity and generation that may come online in each model region.

IPM v.2.1.9 also accounts for emission limitations due to State regulations and enforcement actions. It includes State regulations that limit SO_2 and NO_x emissions from EGUs. These are included Appendix 3-2 of the IPM documentation, available at **http://www.epa.gov/airmarkets/epa-ipm/**.[3] The IPM v.2.1.9 includes NSR settlement requirements for the following six utility companies: SIGECO, PSEG Fossil, TECO, We Energies (WEPCO), VEPCO and Santee Cooper. The settlements are included as they existed on March 19, 2004. A summary of the settlement agreements is included in Appendix 3-3 of the IPM documentation and is available at **http://www.epa.gov/airmarkets/epa-ipm/**.[4]

In the IPM, EPA does not attempt to model unit-specific decisions to make equipment change or upgrades to non-environmental related equipment that could affect efficiency, availability or cost to operate the unit (and thus the amount of generation). Modeling such decisions would require either obtaining or making assumptions about the condition of equipment at units and would greatly increase model size, limiting its applicability in policy analysis. Specifically, IPM does not project that any particular

[3] See also Docket Item EPA-HQ-OAR-2005-0163, DCN 03.

[4] See also Docket Item EPA-HQ-OAR-2005-0163, DCN 03.

existing EGU will make physical or operational changes that increase its efficiency, generation, or emissions. Therefore, IPM does not predict which particular EGUs will be subject to the major NSR applicability requirements. However, as discussed below, EPA has specially designed inputs to IPM that provide useful information directly related to major NSR applicability requirements. As we discuss below, these inputs are in the form of constraints to the IPM model rather than changes on a unit-by-unit basis.

Reliability is a critical element of power plant operation. Reliability is generally defined as whether an EGU is able to operate over sustained periods at the level of output required by the utility. One measure of reliability is availability, the percentage of total time in a given period that an EGU is available to generate electricity. An EGU is available if it is capable of providing service, regardless of the capacity level that can be provided. Availability is generally measured using the number of hours that an EGU operates annually. For example, if an EGU operated 8,760 hours in a particular year, it was 100 percent available. Each year, EGUs are not available for some number of hours due to planned outages, maintenance outages, and forced outages.

IPM v.2.1.9 uses information from the North American Electric Reliability Council (NERC)'s Generator Availability Data System (GADS) to determine the annual availability for EGUs. The GADS database includes operating histories—some dating back to the early 1960's—for more than 6,500 EGUs. These units represent more than 75 percent of the installed generating capacity in the United States and Canada. Each utility provides reports, detailing its units' operation and performance. The reports include types and causes of outages and deratings, unit capacity ratings, energy production, fuel use, and design information. GADS provides a standard set of definitions for determining how to classify an outage on a unit, including planned outages, maintenance outages, and forced outages. The GADS data are reported and summarized annually. A planned outage is the removal of a unit from service to perform work on specific components that is scheduled well in advance and has a predetermined start date and duration (for example, annual overhaul, inspections, testing). Turbine and boiler overhauls or inspections, testing, and nuclear refueling are typical planned outages.

A maintenance outage is the removal of a unit from service to perform work on specific components that can be deferred beyond the end of the next weekend, but requires the unit be removed from service before the next planned outage. Typically, maintenance outages may occur any time during the year, have flexible start dates, and may or may not have predetermined durations. For example, a maintenance outage would occur if an EGU experiences a sudden increase in fan vibration. The vibration is not severe enough to remove the unit from service immediately, but does require that the unit be removed from service soon to check the problem and make repairs.

A forced outage is an unplanned component failure or other breakdown that requires the unit be removed from service immediately, that is, within 6 hours, or before the end of the next weekend. A common cause of forced outages is boiler tube failure.

Each EGU must report the number of hours due to planned outages, maintenance outages, and forced outages to NERC annually. NERC summarized the data for all coal-fired EGUs over the period from 2000 - 2004 in its Annual Unit Performance Statistics Report.[5] For the years 2001 - 2004, the average annual planned outage hours for all

[5] The report is available at **http://www.nerc.com/~gads/** and in the Docket as Item EPA-HQ-OAR-2005-0163, DCN 04.

EGUs was 572.09 (about 23 days), the average annual maintenance outage hours for all EGUs was 156.27 (about 6 days), and the average annual forced outage hours for all coal-fired EGUs was 348.75 (about 14 days). The total annual unavailable hours were 1,087.57, which is 15.1 percent of the total annual hours of 8,760. Based on this data, the IPM v.2.1.9 assumed coal-fired EGUs were 85 percent available. As just noted, of the 1,087.57 total unavailable hours, 348.75 were forced outage hours, which means that coal-fired EGUs were unavailable due to forced outages approximately 4 percent of the hours in a year for the years 2000 - 2004.

We recently released a graphic presentation of electric power sector results under CAIR/CAMR/CAVR. Entitled "Contributions of CAIR/CAMR/CAVR to NAAQS Attainment: Focus on Control Technologies and Emission Reductions in the Electric Power Sector," it is available at **http://www.epa.gov/airmarkets/cair/analyses.html**.[6] As this presentation shows, under the CAIR/CAMR/CAVR 2020 Base Case Scenario, local SO_2 and NO_x emissions generally decrease, average SO_2 and NO_x emission rates decrease, and national SO_2 and NO_x emissions decrease. As this document also shows, half of the coal-fired generation is expected to have scrubbers and either SCR or SNCR by 2020. These effects occur throughout the contiguous 48 States, not just in the CAIR States.

[6] Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 05.

Chapter 3.
NSR Availability Scenarios- SO_2 and NO_x

3.1 NSR Availability Scenarios

We developed two IPM scenarios, which we call the CAIR/CAMR/CAVR NSR Availability Scenarios, or, more simply, the NSR Availability Scenarios, to examine how changes to major NSR applicability under the proposed regulations could, by allowing sources to make repairs or improvements that increase hours of operation, affect emissions and control technology installation. These IPM scenarios are based on the CAIR/CAMR/CAVR 2020 Scenario, which employs the IPM v.2.1.9 model that we describe in Chapter 2 of this document, including information for the electric sector in the contiguous United States. Chapter 2 also contains specific information on the assumptions about EGU assumptions in the IPM v.2.1.9.

The parameters in the IPM model are based on availability for 6,500 EGUs over the 5-year period from 2000 - 2004. In the NSR Availability scenarios, however, we changed the parameters in IPM v.2.1.9 consistent with the way EGUs might operate under the more flexible regulations that we are proposing. That is, we assumed that some owner/operators might make changes that increase the hours of operation of some EGUs. It is unlikely that an owner/operator would be able to make changes that reduce the hours that an EGU is unavailable due to a planned outage or a maintenance outage. However, EGUs would be able to make changes that increase their hours of operation as a result of a reduction in the number and length of forced outages. Specifically, with more flexibility concerning the number of hours EGUs operate annually, EGU owner/operators may replace broken-down equipment in an effort to reduce the number of forced outages.

Such actions would increase the safety, reliability, and efficiency of EGUs, consistent with one of our primary policy goals for our proposed regulations.

Therefore, in the NSR Availability Scenario, we assumed that coal-fired EGUs would be able to make changes that affect forced outage hours in two, alternative, ways: (1) coal-fired EGUs would reduce their forced outage hours by half (2 percent increase in availability); and (2) coal-fired EGUs would have no forced outage hours (4 percent increase in availability). Therefore, in the first model run, we increased the coal-fired availability by 2 percent, from 85 percent to 87 percent annually. In the second NSR EGU run, we increased coal-fired availability by 4 percent, to 89 percent annually. We believe it is unlikely that an EGU would be able to make repairs that completely eliminate forced outage hours. However, we wanted a robust examination of changes that could impact emissions and air quality.[7] We therefore made the very conservative assumption to increase to EGU availability by 2 percent and 4 percent over the actual historical hours of operation for 6,500 EGUs over the years 2000 - 2004. All other information in the NSR Availability Scenarios is the same as that in IPM v.2.1.9 used for the CAIR/CAMR/CAVR Scenario.

The NERC GADS calculates the average availability for an EGU by taking the actual total number of unavailable hours in a given year for all EGUs and dividing it evenly among the total number of EGUs. Based on the GADS data, the IPM assumes an upper bound of 85 percent availability for coal-fired EGUs. In GADS data for the years

[7] While we believe it is most likely that an EGU would increase its hours of operation under today's proposed regulations due to reducing the number of hours that the EGU is unavailable due to forced outage hours, the analysis is applicable to increases in hours of operation for other reasons.

2000 - 2004, some EGUs actually had more than 85 percent availability and some actually had less. The particular EGUs that had greater than 85 percent availability and less than 85 percent varied from year to year. Similarly, by eliminating forced outages, some EGUs could increase their availability by more than 2 - 4 percent and some EGUs could increase their availability by less than 2 - 4 percent. Likewise, the particular EGUs that were able to reduce their forced outage hours would also vary from year to year. For modeling purposes, it thus makes more sense to assume an average availability than to determine unit-by-unit availabilities for each and every EGU in a given year.

Our approach based on average availability is also consistent with actual historical operations at particular EGUs and plantsites, which are most directly related to local emissions and air quality. Variation in actual annual hours of operation at a given EGU and at given plantsites do occur under current major NSR applicability. It is not uncommon for actual hours of operation for a particular EGU to vary by 348 hours (4 percent availability) or more from year to year. It is also not uncommon for the variation in actual hours of operation to occur among EGUs at a particular plantsite by 4 percent or more from year to year. For example, in one year Unit A might run 7,800 hours and Unit B might run 7,400 hours. In the next year Unit B might run 7,800 hours and Unit A 7,400 hours. This pattern further supports an approach based on average availability for estimating local emissions. Changes in average availability, rather than the absolute availability of any given EGU, thus is appropriate for analyzing the impact of proposed changes to major NSR applicability.

3.2 SO_2 and NO_x Control Device Installation

As Table 3.1 shows, the NSR Availability Scenarios project retrofitting of more control devices than under the CAIR/CAMR/CAVR 2020 Scenario.[8] This result occurs whether hours of operation increase by 2 percent or by 4 percent. Significantly, under the 4 percent scenario, more Gigawatts (GW) of electric capacity are controlled than under the 2 percent scenario. For example, under NSR Availability 4%, there is 3.63 more GW of national EGU capacity with flue gas desulruization (FGD, also known as scrubbers) than under CAIR/CAMR/CAVR 2020. These results are consistent with what IPM generally projects, as noted above; that is, the more hours an EGU operates, the more likely it is to install controls.[9] We thus conclude that the more hours an EGU operates, the more likely it is to install controls, regardless of whether the major NSR applicability test is on an hourly basis or an annual basis.

Table 3.1 2020 National EGUs With Emission Controls Under NSR Availability Scenarios

	EGUs with Additional Controls Compared to 2004 Base Case		EGUs with Additional Controls Compared to CAIR/CAMR/CAVR 2020	
	NSR Availability 2%	NSR Availability 4%	NSR Availability 2%	NSR Availability 4%
FGD	109.62 GW	111.53 GW	1.71 GW	3.63 GW
SCR	73.47 GW	73.92 GW	0.62 GW	1.07 GW

[8] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 06. (System Summary Report for NSR Availability)

[9] See our report, "Contributions of CAIR/CAMR/CAVR to NAAQS Attainment: Focus on Control Technologies and Emission Reductions in the Electric Power Sector," on pages 39 and 43. The report is available at **http://www.epa.gov/air/cair/charts.html**. The report is also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 05.

3.3 SO_2 and NO_x National Emissions

As Table 3.2 shows, the NSR Availability Scenarios project essentially no changes in SO_2 or NO_x emissions nationally by 2020 as compared to emissions under the CAIR/CAMR/CAVR 2020 Scenario.[10] This result is consistent with the fact that under the NSR Availability Scenarios, the amount of controls increases, compared to CAIR/CAMR/CAVR 2020, and we find that these associated emissions decreases offset the emissions increases associated with the reduced forced outages and higher production levels.

Table 3.2 National EGU Emissions Under NSR Availability Scenarios Compared to CAIR/CAMR/CAVR 2020 (tpy)

	CAIR/CAMR/CAVR	NSR 4%	NSR 2%	Change-NSR 4%	Change-NSR 2%
SO_2	4,277,000	4,271,000	4,261,000	-6,000 <1 % decrease	-16,000 <1 % decrease
NO_x	1,989,000	2,016,000	2,003,000	28,000 1% increase	14,000 1% increase

As noted above, the NSR Availability Scenarios examine emissions changes based on very conservative estimates developed using actual historical hours of operation for 6,500 EGUs over the years 2000 - 2004. We conclude that to any extent that EGU hours of operation increase under a maximum hourly test, as opposed to the current

[10] CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR SO_2 and NO_x Availability Emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_NSR_OAQPS_ 5_Pech_2020_07-05-06 (to EPA)] National totals for CAIR/CAMR/CAVR and NSR Availability include new units (IPM new units and planned-committed units).

average annual 5-year baseline test, such increased hours of operation would not increase national EGU SO_2 emissions. The increased efficiency would have very little effect on national EGU NO_x emissions, with approximately one percent increase nationally. This conclusion as to emissions in the contiguous 48 States supports extending the proposed rules nationwide, instead of limiting them to the States in the CAIR region.

3.4 SO_2 and NO_x Local Emissions Impact

We used the IPM runs -- the CAIR/CAMR/CAVR 2020 and the NSR Availability and Efficiency Scenarios – to project future emissions. The IPM is based on data from actual EGUs that are aggregated into model plants and that, after the IPM is run and results are recorded, can be disaggregated back to the actual EGUs. As a result, county-level emissions can be calculated. As we discuss in detail in Section 2, for both the CAIR/CAMR/CAVR 2020 and the NSR Availability Scenarios, the underlying data for each existing EGU is information from actual operations as of 2004. The information for each EGU is the same in both IPM scenarios, with the exception of the assumptions regarding higher availability for the NSR Scenario that we describe in Section 3.1, such as might occur under the proposed revisions to the major NSR emissions increase test. Of course, the other inputs into IPM were the same for both runs, and are independent of any major NSR applicability test. These include power system operation, financial, fuel, the ability of each owner/operator to have complete knowledge of the marketplace, and other assumptions. We describe these assumptions and uncertainties in detail in the documentation for the IPM.[11] The emission projections from the IPM Scenarios, based on these assumptions and methodologies, are illustrative of likely variation in effects at the local level under alternative scenarios rather than definitive projections of the emissions from individual (specific) EGUs or plants.

Based on our experience with cap-and-trade programs and our modeling using IPM, the IPM results suggest the following general considerations about the impact of the proposed NSR emissions increase tests on local emissions.

> The proposed revised NSR emissions increase test would likely result in a somewhat different pattern of local emissions, with some counties experiencing decreases and some experiencing increases. A substantial majority of counties experience little or no change in emissions.
>
> In those counties where emission decreases are projected, they often occur because EGUs are projected to install controls under the NSR Availability Scenario, but not under the CAIR/CAM/CAVR Scenario. This effect occurs because as EGUs increase their hours of operation, it becomes cost effective to install controls. This result is consistent with our earlier observations.[12] In other cases, decreases occur because more cost effective generation displaces less cost effective generation, and the less cost effective EGUs retire. This effect occurs even though the more cost effective EGUs increased their hours of operation. In both these situations where hours of operation increase, these EGUs would be unlikely to trigger major NSR under any of the alternative scenarios.
>
> Where emission increases do occur, they are generally small and sparsely distributed such that there is very little effect on local air quality. Furthermore, the increases are within the variability that actually occurred, as measured using CEMS, at individual EGUS over the period 2003-2004 under the current NSR emissions increase test.

To examine the effect of the maximum hourly test on local air quality, we compared 2020 county-level EGU SO_2 and NO_x emissions under the

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[11] Complete documentation for IPM, including the Base Case Scenario, is available at **http://www.epa.gov/airmarkets/progsregs/epa-ipm/index.html**. See also Docket Item EPA-HQ-OAR-2005-1063, DCN 03.

[12] These results are consistent with what IPM generally projects, as noted above; that is, the more hours an EGU operates, the more likely it is to install controls. See Footnote 9.

CAIR/CAMR/CAVR 2020 and NSR Availability (4%) Scenario.[13] Tables 3.3 and 3.4 show these comparisons.[14]

Table 3.3 Changes in County-level SO_2 Emissions NSR Availability (4%) Scenario Compared to CAIR/CAMR/CAVR 2020

Changes in SO_2 Emissions	Number of Counties
Total number of counties with decreases	65
Decreases between 20,000 and 36,941 tpy	2
Decreases between 3,000 and 20,000 tpy	13
Decreases between 1,000 and 3,000 tpy	12
Decreases between 40 and 1000 tpy	31
Decreases up to 39 tpy	7
No change in EGU emissions	780
Increases up to 39 tpy	30
Increases between 40 and 1000 tpy	255
Increases between 1,000 and 3,000 tpy	47
Increases between 3,000 and 6,801 tpy	6
Total number of counties with increases	338

[13] CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR SO_2 and NO_x Availability Emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_NSR_OAQPS_ 5_Pech_2020_07-05-06 (to EPA)]

[14] Emission increases of at least 0.5 tpy. Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units). New units (IPM new units and planned-committed units) were not included in CAIR/CAMR/CAVR 2020 and NSR Availability county-level emission totals because they had not been assigned to a county. New EGUs would not be subject to proposed rule. New EGUs would be subject to major NSR, including control technology review for installation of BACT/LAER.

Table 3.4 Changes in County-level NO_x Emissions NSR Availability (4%) Scenario Compared to CAIR/CAMR/CAVR 2020	
Changes in NO_x Emissions	**Number of Counties**
Total number of counties with decreases	238
Decreases between 3,000 and 10,720 tpy	2
Decreases between 1,000 and 3,000 tpy	9
Decreases between 40 and 1000 tpy	61
Decreases up to 39 tpy	166
No change in EGU emissions	540
Increases up to 39 tpy	126
Increases between 40 and 1000 tpy	269
Increases between 1,000 and 3,000 tpy	9
Increases between 3,000 and 3,172 tpy	1
Total number of counties with increases	405

As Tables 3.3 and 3.4 show, the proposed revised NSR applicability tests would, under the very conservative assumptions described above, result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same. This pattern is consistent with the fact that most coal-fired EGUs are in the CAIR region and therefore subject to regulations implementing the CAIR cap. According to the DOE's Energy Information Agency, for the years 2003 - 2004, approximately 80 percent of the coal steam electric generation and 75 percent of all electric generation occurred in CAIR States.[15] Furthermore, EGUs are subject to national SO_2 caps under the Acid Rain Program.

[15] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 08. (2000 - 2004 Electric Generation)

For these reasons, an increase in emissions in one area results in a decrease elsewhere. This dynamic occurs regardless of the major NSR applicability test for existing EGUs. Nonetheless, the NSR Availability Scenario demonstrates that this pattern continues to occur when increased availability is assumed, such as we assume for present purposes would occur under the proposed maximum hourly tests.

In counties with an SO_2 emissions increase of at least 40 tons per year (tpy), emission increases ranged from 43 to 6,801 tpy. The degree of county-level emission decreases was higher than that of the increases, ranging from 10 to 36,941 tpy. This pattern also occurred with NO_x emissions. As Table 3.4 shows, in counties with a NO_x emissions increase of at least 40 tpy, emission increases ranged from 41 to 3,172 tpy. The degree of county-level emission decreases was higher than that of the NO_x increases, ranging from 1 to 10,720 tpy. The increases and decreases occurred in CAIR and non-CAIR States.

To gain a further perspective on the projected county-level SO_2 and NO_x increases under the NSR Availability (4%) Scenario, we compared them to recorded actual annual EGU SO_2 and NO_x emissions in 2003 - 2004.[16] We examined actual annual emissions from CEMS data transmitted to the Agency on these EGUs. In 2004, 2 EGUs had emissions increases greater than 3,721 tpy NO_x as compared to 2003. In 2004, 15 EGUs had emissions increases greater than 6,801 tpy SO_2 as compared to 2003. Thus, the highest county-level projected emissions increases for SO_2 and NO_x under the NSR Availability (4%) Scenario are less than the emissions increases that actually occurred,

[16] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 15. (2003 - 2004 Emission Changes)

measured using CEMS, at individual EGUs over the period of 2003 - 2004. As this perspective shows, the local emissions increases that the IPM results indicate could theoretically occur from the proposed emissions increase test are not large. They are also within the variability that occurred under the current emissions increase test between the years 2003 - 2004. Furthermore, under the current actual-to-projected-actual emissions increase test, EGU owner/operators can select any 24-month baseline period within the 5-year period immediately preceding the beginning of actual construction of the project. Owner operators can select a baseline period of higher annual emissions under the existing emissions increase test to avoid triggering major NSR applicability. The emission increases observed under the NSR Availability Scenario are within the range of the recorded actual annual emissions. Thus, we believe it unlikely that the emission increases under the NSR Availability Scenario would lead to a different applicability result under the proposed hourly tests compared to the existing annual emissions increase test.

We next examined the reasons for the largest increases and decreases in county-level emissions under the NSR Availability (4%) Scenario. As we discussed in detail in Section III. B., the difference in the assumptions in the NSR Availability Scenario as compared to the CAIR/CAMR/CAVR 2020 Scenario is the hours of operation. Therefore, the changes in county level emissions are a direct function of our IPM assumptions concerning the hours of operation. We did not assume that any existing

EGU would increase its capacity in the NSR Availability Scenario. Table 3.5 shows the counties with the largest decreases and increases in SO_2 and NO_x emissions.[17]

Table 3.5 Largest County-level Decreases and Increases Under NSR Availability (4%) Scenario (tpy)

5 counties with largest decrease in SO_2 emissions under the NSR Availability Scenario			
State	**County**	**Decrease**	**Variations in unit-level data that would explain the decrease**
GA	Monroe	-36,941	Unit installs SCR and FGD in 4% run, no control in CAIR/CAMR/CAVR 2020
AL	Jackson	-27,572	Widow Creek Units 1-6 are retired in the 4% run
TN	Sumner	-17,282	Units are partially retrofitted in BART, fully retrofitted in 4%
MN	Itasca	-10,759	FGD goes on unit 3 in the 4% run
TX	Titus	-10,552	Welsh unit 1 gets FGD in 4% run
5 counties with largest decrease in NO_x emissions under NSR Scenario			
State	**County**	**Decrease**	**Variations in unit-level data that would explain the increase**
GA	Monroe	-10,720	Scherer units get SCR and FGD retrofits in the 4% run
OH	Lucas	-3,038	Bay Shore units 2,3 get SCR and FGD retrofits in the 4% run
OH	Montgomery	-2,722	Hutchings units 1-6 retire
PA	Clearfield	-1,782	Shawville unit 1 retires
WI	Buffalo	-1,770	Alma units 4 & 5 retire

[17] Analysis of largest county-level emission changes available as Docket Item EPA-HQ-OAR-2005-0163, DCN 15. CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR Availability SO_2 and NO_x Emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_NSR_OAQPS_ 5_Pech_2020_07-05-06 (to EPA)] Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units).

Table 3.6 Largest County-level Decreases and Increases Under NSR Availability (4%) Scenario (tpy)

State	County	Increase	Variations in unit-level data that would explain the increase
5 counties with largest increase in SO_2 emissions under the NSR Availability Scenario			
State	**County**	**Increase**	**Variations in unit-level data that would explain the increase**
GA	Bartow	6,801	No change in controls, total fuel use increases
MI	Monroe	5,065	No change in controls, total fuel use increases
MI	St. Clair	4,011	No change in controls, total fuel use increases
GA	Heard	3,720	No change in controls, total fuel use increases
KY	Jefferson	3,401	No change in controls, total fuel use increases
5 counties with largest increase in NO_x emissions under the NSR Availability Scenario			
State	**County**	**Increase**	**Variations in unit-level data that would explain the increase**
NM	San Juan	3,172	No change in controls, total fuel use increases
MT	Rosebud	1,543	No change in controls, total fuel use increases
ND	Mercer	1,445	No change in controls, total fuel use increases
AZ	Coconino	1,379	No change in controls, total fuel use increases
WI	Grant	1,306	SCR on Nelson plant in CAIR/CAMR/CAVR 2020, no SCR under NSR 4%; decrease in utilization in NSR 4% compared to CAIR/CAMR/CAVR 2020.

For most counties in Table 3.5 where SO_2 and NO_x emission decreases are projected (Monroe, Georgia; Sumner, Tennessee; Itasca, Minnesota; Titus, Texas; and Lucas, Ohio), the decreases occur because EGUs are projected to install controls under the NSR Availability (4%) Scenario but are not projected to install controls under CAIR/CAMR/CAVR. This effect occurs because as these EGUs increase their hours of operation, they reach a break-even point where it becomes cost effective to install controls rather than to buy allowances. For other counties in Table 3.5 (Jackson County, Alabama; Montgomery County, Ohio; Clearfield County, Pennsylvania), decreases occur because EGUs are projected to retire under the NSR Availability (4%) Scenario but are not projected to be retired under CAIR/CAMR/CAVR 2020. This effect occurs because more cost effective generation from EGUs that increased their availability under the NSR Availability Scenario displaces less cost effective generation from other EGUs, which then retire.

As Table 3.5 shows, county-level SO_2 and NO_x increases are small and sparsely distributed. The increases are small even in the counties where the highest SO_2 and NO_x increases are projected. In most of the counties in Table 3.5, the emission increases are due to increased fuel use by the EGUs within those counties, consistent with increased hours of operation. The exception is Grant County, Wisconsin, where SCR for the Nelson plant is projected under CAIR/CAMR/CAVR 2020, but not under the NSR Availability (4%) Scenario. In this instance, the projected increases at the Nelson plant occur because under the CAIR/CAMR/CAVR 2020 IPM, it is modeled as putting on controls. In the NSR Availability run, however, the Nelson plant decreases its utilization compared to CAIR/CAMR/CAVR 2020, and as a result it does not install the projected SCR controls. This result occurs because Nelson is less efficient compared to other EGUs. If this particular EGU (or any other EGU) were to increase its efficiency and utilization, it is likely that it would put on controls, consistent with our finding that the more hours an EGU operates, the likelier it is to install controls.

To gain further perspective on the magnitude of the SO_2 and NO_x emissions changes under the NSR Availability Scenario, we compared them to total SO_2 and NO_x emissions at the State level. Specifically, we compared the net change in statewide EGU SO_2 and NO_x emissions under the NSR Availability Scenario to the total State SO_2 and NO_x emissions under CAIR/CAMR/CAVR 2020. As Appendix A shows, in States where SO_2 emissions increase under the NSR Availability Scenario as compared to

CAIR/CAMR/CAVR 2020, the net emissions increase is at most 3 percent of the total SO_2 emissions in the State. As Appendix A shows, in States where NO_x emissions increase under the NSR Availability Scenario as compared to CAIR/CAMR/CAVR 2020, the net emissions increase ranges is at most 2 percent of the total NO_x emissions in the State. Thus where SO_2 and NO_x emissions increase under the NSR Availability Scenario, they are small in comparison to total SO_2 and NO_x emissions at the State level.

As we discussed in Section 3.1, our approach is based on average availability, assuming a constraint of 89 percent availability. Due to the variation in EGU hours of operation from year to year, for modeling purposes it makes sense to assume an average availability rather than to determine unit-by-unit availabilities for each and every EGU in a given year. We therefore believe the NSR Availability Scenario provides a very conservative estimate of the emissions increases that would theoretically occur under our proposed regulations.

3.5 SO_2 and NO_x Impact on Air Quality

As we discussed above, projected emissions changes under proposed revised NSR applicability tests would result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same. As we also noted, the degree and pattern of these emission changes is consistent with those under CAIR/CAMR/CAVR 2020. Moreover, the emission changes under the NSR Availability Scenario are projected using very conservative assumptions, as described above. Figures 3.1 and 3.2 compare projected county-level SO2 and NOx emissions under NSR Availability 4% to those projected under CAIR/CAMR/CAVR 2020.[18]

[18]CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163. DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA) 07-11-05]. NSR Availability SO_2 and NO_x Emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_NSR_OAQPS_5_Pech_2020_07-05-06 (to EPA)]

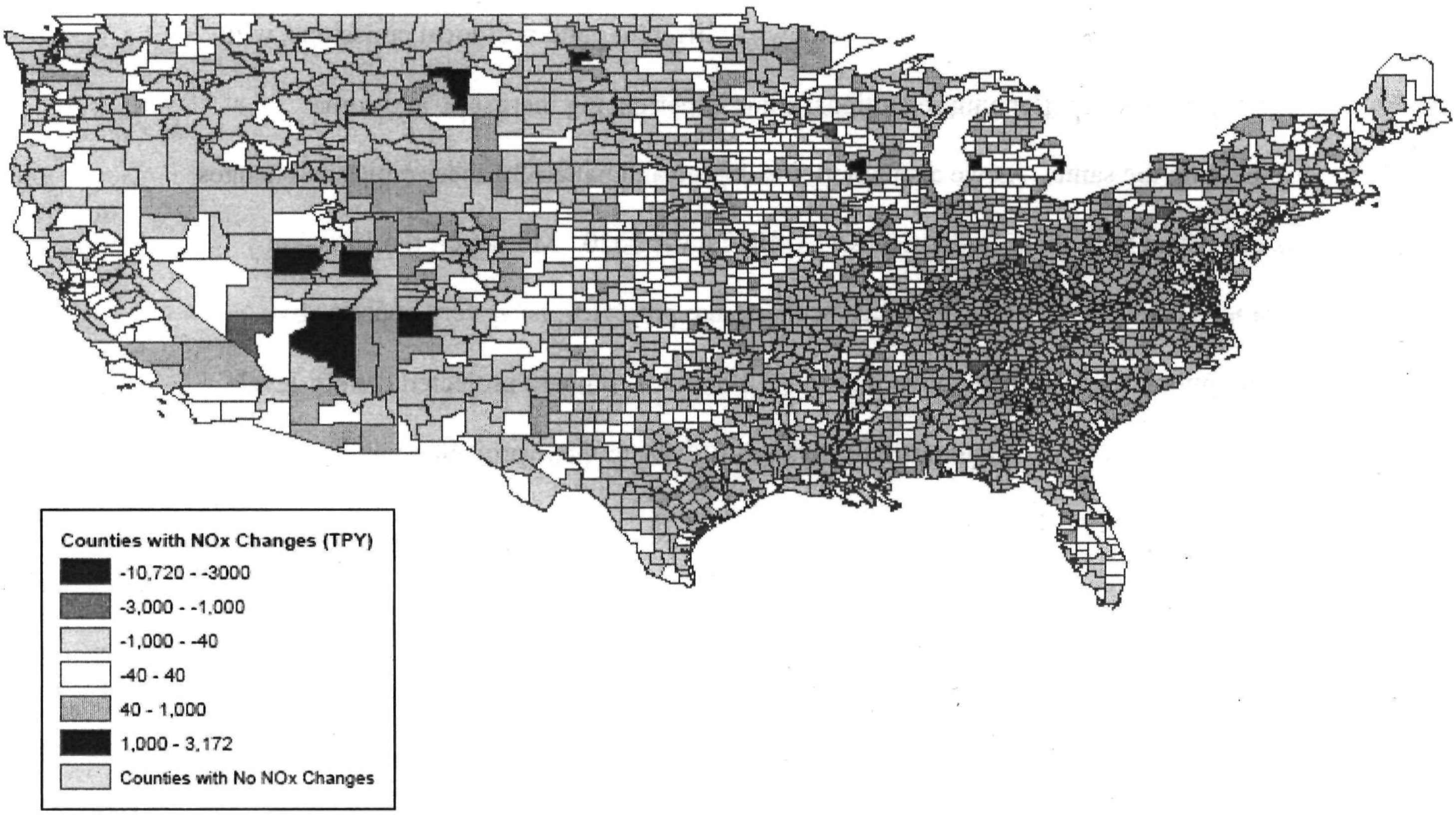

Figure 3.1 2020 County-level SO_2 Emissions Changes With a 4% Increase in EGU Availability

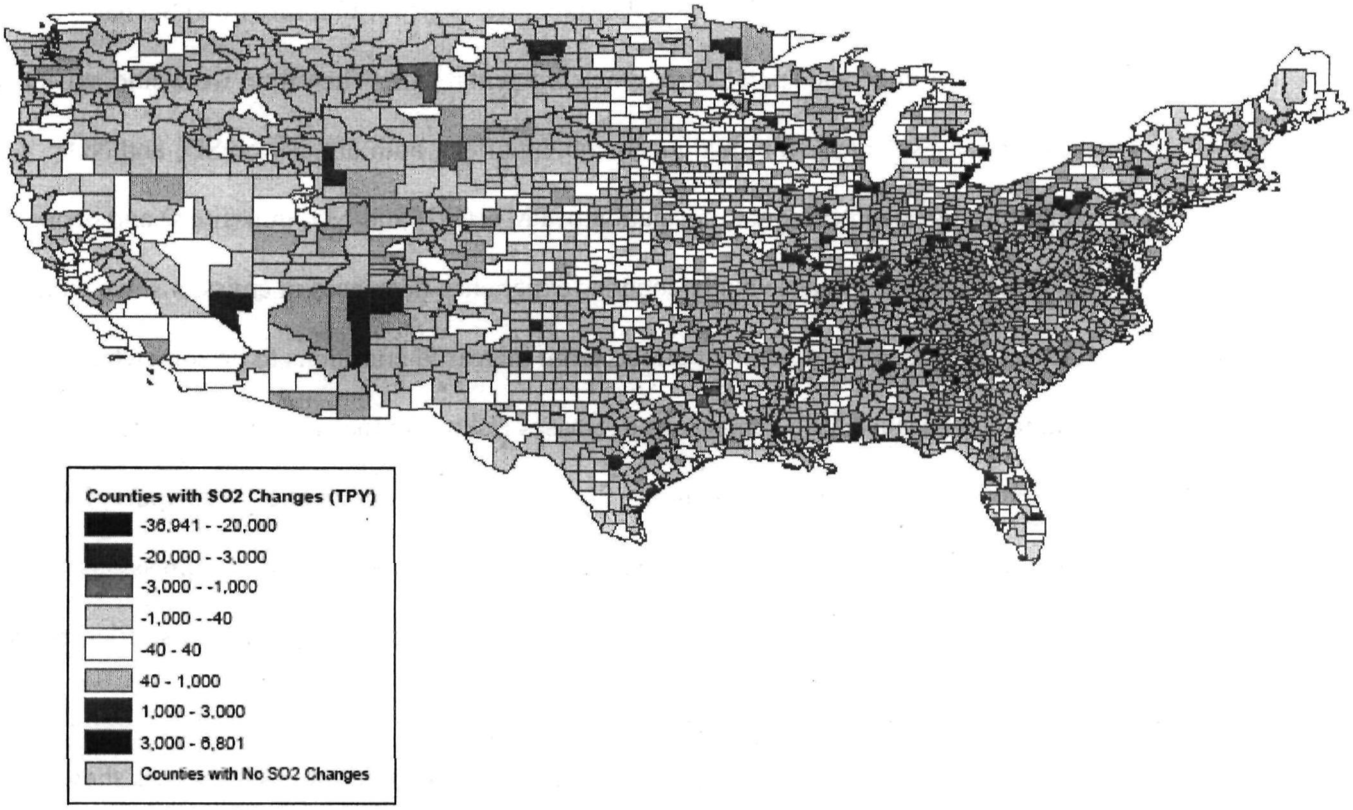

Figure 3.2 2020 County-level NO_x Emissions Changes With a 4% Increase in EGU Availability

As Figures 3.1 and 3.2 show, projected increases in SO_2 and NO_x emissions due to increased hours of operation at EGUs under the NSR Availability (4%) Scenario are small in magnitude and sparse across the continental U.S. Therefore, we would expect these increases to cause minimal local ambient effect, both directly on SO_2 and NO_x emissions and as precursors to formation of $PM_{2.5}$ (SO_2 and NO_x emissions) and ozone (NO_x emissions). Because many counties experience decreases in emissions, we would further expect any local ambient effects from increased emissions to be somewhat diminished because of the emissions decreases elsewhere that yield regionwide improvements in air quality, including SO_2, NO_x, $PM_{2.5}$, and ozone. We expect similar outcomes with respect to the NSR Availability (2%) Scenario where the emissions changes are smaller and exhibit a pattern of increases and decreases that is similar to that of the NSR Availability (4%) Scenario.

Based on the spatial distribution of SO_2 and NO_x emissions changes as shown in Figures 3.1 and 3.2, we expect patterns of air quality changes respectively under the NSR Availability (4%) Scenario to be consistent with projections under CAIR/CAMR/CAVR in 2020. We thus believe that the local air quality under today's proposed regulations would be commensurate with that under the CMAQ modeling based on CAIR/CAMR/CAVR 2020 Scenario emissions projections. [19]

[19] As part of the CAIR/CAMR/CAVR analyses, we examined the air quality impact of EGU SO_2 and NO_x emissions on SO_2, NO_x, $PM_{2.5}$ (for which SO_2 and NO_x emissions are precursors), and 8-hour ozone concentrations (for which NO_x is a precursor). Specifically, we modeled the change in annual average concentrations of SO_2 and NO_x under CAIR/CAMR/CAVR 2020 and compared these results to the base case emissions in 2001 using the CMAQ model. We also modeled the change in annual average concentrations of $PM_{2.5}$ under CAIR/CAMR/CAVR 2020 and compared these results to the base case emissions in 2001 using the CMAQ model. The CMAQ modeling was conducted as part of EPA's multipollutant legislative assessment and the results are available at **http://www.epa.gov/airmarkets/progsregs/cair/multi.html**. Multipollutant Regulatory Analysis: The Clean Air Interstate Rule, The Clean Air Mercury Rule, and the Clean Air Visibility Rule (EPA promulgated rules, 2005). The specific technical support document on air quality modeling for CAIR/CAMR/CAVR, Technical Support Document for Air Quality Modeling Technique, is available at **http://www.epa.gov/airmarkets/progsregs/cair/multi.html** by clicking on the Technical Support Document - Air Quality Modeling Technique used for Multi-Pollutant Analysis link. It is also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 09.

Finally, we modeled the annual average concentrations of 8-hour ozone under CAIR/CAMR/CAVR 2020 and compared these results to the average ambient concentrations for 1999 - 2003.) This information by county is contained in a spreadsheet file available on our website. The information on 8-hour ozone concentrations is available at **http://www.epa.gov/airmarkets/progsregs/cair/multi.html** (Air quality Modeling Results Excel File, Impact on Ozone concentrations, by county.) It is also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 16.

Chapter 4.

NSR Availability Scenarios- $PM_{2.5}$, VOC, and CO

4.1 NSR Availability Scenario

We used the NSR Availability Scenarios that we describe in Chapter 3 to examine the $PM_{2.5}$, VOC, and CO emissions and air quality impacts of the proposed hourly emissions increase test. This chapter provides the results of our analyses.

4.2 $PM_{2.5}$, VOC, and CO Control Device Installation

As we discuss in the $PM_{2.5}$ NAAQS RIA, our NEEDS indicates that as of 2004, 84 percent of all coal-fired EGUS have an electrostatic precipitator (ESP) in operation, about 14 percent of EGUs have a fabric filter, and roughly 2 percent have wet $PM_{2.5}$ scrubbers.[20] Gas-fired turbines are clean burning and Best Available Control Technology (BACT) or the Lowest Achievable Emission Rate (LAER) for these EGUs is no control. BACT/LAER for VOC and CO is good combustion control. Furthermore, EGU owner/operators have natural incentives to reduce VOC emissions. VOCs are products of incomplete combustion. These compounds are discharged into the atmosphere when fuel remains unburned or is burned only partially during the combustion process. Fuel is a significant portion of total costs for EGUs, particularly for older EGUs where capital costs are paid off. EGU owner/operators have in fact improved combustion practices to increase combustion efficiency, thereby limiting unburned fuel. Cost effective operation

[20] See Regulatory Impact Analysis for $PM_{2.5}$ rule at pg 3-34. Available at **http://www.epa.gov/ttn/ecas/ria.html** and as Docket Item EPA-HQ-OAR-2005-0163, DCN 10.

is especially desirable in areas where a cap and trade program increases the cost of operation by creating a cost to pollute, as is the case in the CAIR region where most ozone and $PM_{2.5}$ nonattainment areas are located.

4.3 $PM_{2.5}$, VOC, and CO National Emissions

As Table 4.1 shows, EGUs contribute a small percentage of national $PM_{2.5}$, CO, and VOC emissions.[21]

Table 4.1 EGU Emissions As Percent of 2020 National Emissions (tpy)

	EGU	National	EGU as % National
$PM_{2.5}$	533,000	6,206,000	8.6%
VOC	45,000	12,414,000	0.4%
CO	718,000	82,852,000	0.9%

As Table 4.2 shows, the NSR Availability Scenarios project essentially no changes in $PM_{2.5}$, VOC, or CO emissions nationally by 2020 as compared to emissions under the CAIR/CAMR/CAVR Scenario.[22]

[21] CO emissions information from Clear Air Interstate Rule Emissions Inventory Technical Support Document, available at **http://www.epa.gov/interstateairquality/pdfs/finaltech01.pdf**. CO emissions rounded to nearest thousand ton level. Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 11. $PM_{2.5}$ and VOC emissions information from $PM_{2.5}$ NAAQS RIA, available at **http://www.epa.gov/ttn/ecas/ria.html**. Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 10.

[22] Emissions information Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 17. [NSR Availability $PM_{2.5}$, VOC, and CO] National totals for CAIR/CAMR/CAVR and NSR Availability include new units (IPM new units and planned-committed units).

Table 4.2 National EGU Emissions Under NSR Availability Scenario Compared to CAIR/CAMR/CAVR 2020 (tpy)

	CAIR/CAMR/CAVR	NSR 4%	Change-NSR 4%
$PM_{2.5}$	526,642	524,245	(2,397)
VOC	45,020	45,391	371
CO	716,184	711,254	(4,930)

As described in Chapter 3, the NSR Availability Scenarios examine emissions changes based on very conservative estimates developed using actual historical hours of operation for 6,500 EGUs over the years 2000 - 2004. We conclude that to any extent that EGU hours of operation increase under a maximum hourly test as opposed to the current average annual 5-year baseline test, such increased hours of operation would not increase national EGU $PM_{2.5}$ and CO emissions, and would have very little effect on VOC emissions. This conclusion as to emissions in the contiguous 48 States supports extending the proposed rules nationwide, instead of limiting them to the States in the CAIR region.

4.4 $PM_{2.5}$, VOC, and CO Local Emissions Impact

To examine the effect of the maximum hourly test on local air quality, we compared 2020 county-level EGU $PM_{2.5}$, VOC, and CO emissions under the CAIR/CAMR/CAVR 2020 and NSR Availability (4%) Scenario.[23]

[23] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 17. [NSR Availability $PM_{2.5}$, VOC, and CO]

Tables 4.3 through 4.5 show these comparisons.[24]

Table 4.3 Changes in County-level $PM_{2.5}$ Emissions NSR Availability (4%) Scenario	
Changes in $PM_{2.5}$ Emissions	**Counties**
Total # of counties with decreases in EGU emissions	133
# of counties with decreases in EGU emissions between -1,001 and -2,074 tpy	1
# of counties with decreases in EGU emissions between -40 and -1,000 tpy	27
# of counties with decreases in EGU emissions between -1 and -39 tpy	105
# of counties with no change in EGU emissions	437
# of counties with increases in EGU emissions between 1 and 39 tpy	250
# of counties with increases in EGU emissions between 40 and 536 tpy	134
Total # of counties with increases in EGU emissions	384

Table 4.4 Changes in County-level VOC Emissions NSR Availability (4%) Scenario	
Changes in VOC Emissions	**Counties**
Total # of counties with decreases in EGU emissions	89
# of counties with decreases in EGU emissions between -40 and -87 tpy	2
# of counties with decreases in EGU emissions between -1 and -39 tpy	87
# of counties with no change in EGU emissions	569
# of counties with increases in EGU emissions between 1 and 22 tpy	296
Total # of counties with increases in EGU emissions	296

[24] Emission increases of at least 0.5 tpy. Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units). New units (IPM new units and planned-committed units) were not included in CAIR/CAMR/CAVR 2020 and NSR For the reasons we discuss in Section 3.4, the modeling results are illustrative of likely variations in effects at the local level under alternative scenarios rather than definitive projections of the emissions from individual (specific) EGUs or plants. Availability county-level emission totals because they had not been assigned to a county. New EGUs would not be subject to proposed rule. New EGUs would be subject to major NSR, including control technology review for installation of BACT/LAER.

Table 4.5 Changes in County-level CO Emissions NSR Availability (4%) Scenario	
Changes in CO Emissions	**Counties**
Total # of counties with decreases in EGU emissions	240
# of counties with decreases in EGU emissions between -40 and -735 tpy	55
# of counties with decreases in EGU emissions between -1 and -39 tpy	185
# of counties with no change in EGU emissions	334
# of counties with increases in EGU emissions between 1 and 39 tpy	247
# of counties with increases in EGU emissions between 40 and 755 tpy	133
Total # of counties with increases in EGU emissions	380

As Tables 4.3 through 4.5 show, the proposed revised NSR applicability tests would, under the very conservative assumptions described in Chapter 3, result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same. That is, this pattern occurs when increased availability is assumed, such as we assume for present purposes would occur under the proposed maximum hourly tests. The increases and decreases in county-level EGU $PM_{2.5}$, VOC, and CO emissions are small and sparsely distributed.

As Table 4.3 shows, the highest county-level $PM_{2.5}$ emissions increase was 536 tpy. As Table 4.4 shows, county-level VOC emissions increases ranged from 1 to 22 tpy. As Table 4.5 shows, the highest county-level CO emissions increase was 755 tpy. The increases and decreases occurred in CAIR and non-CAIR States.

To gain a further perspective on the projected county-level $PM_{2.5}$, VOC, and CO increases under the NSR Availability (4%) Scenario, we compared them to actual annual EGU $PM_{2.5}$, VOC, and CO emissions in 2003 - 2004. We calculated the actual annual $PM_{2.5}$, VOC, and CO emissions for each EGU using the actual heat input (MMBtu)

CEMS data and an emission factor.[25] Based on this analysis, we believe it unlikely that the emission increases under the NSR Availability Scenario would lead to a different applicability result under the proposed hourly tests compared to the existing annual emissions increase test.

In 2004, one EGU had an emissions increase of 3,845 tpy $PM_{2.5}$ and 56 EGUs had emission increases of greater than 536 tpy as compared to 2003. Thus, the highest county-level projected emissions increases for $PM_{2.5}$ under the NSR Availability (4%) Scenario are significantly less than the emissions increases that actually occurred, based on measured data, at individual EGUs over the period of 2003 - 2004. The emission decreases observed under the NSR Availability Scenario are within the range of the actual annual emissions based on recorded data. Furthermore, under the current actual-to-projected-actual emissions increase test, EGU owner/operators can select any 24-month baseline period within the 5-year period immediately preceding the beginning of actual construction of the project. Owner operators can select a baseline period of higher annual emissions under the existing emissions increase test to avoid triggering major NSR applicability.

In 2004, actual VOC emission changes compared to 2003 ranged from a 38 tpy decrease to 53 tpy increase. Thus, the greatest county-level projected emissions decreases for VOC under the NSR Availability (4%) Scenario are less than the emissions decreases that actually occurred, based on measured data, at individual EGUs over the period of 2003 - 2004. The highest county-level projected emission increases in the NSR

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[25] Analysis and emission factors used available as Docket Item EPA-HQ-OAR-2005-0163, DCN 15. [2003-2004 PM2.5, VOC, and CO Emissions]

Availability Scenarios are 19, 19, 20, 22, and 23. In 2004, the five highest emission increases at individual EGUs as compared to 2003 were 27, 29, 31, 35, and 53. Thus, the highest VOC emission increases under the NSR Availability (4%) Scenario are less than the emissions increases that actually occurred, based on measured data, at individual EGUs over the period of 2003 - 2004.

In 2004, actual CO emission changes compared to 2003 ranged from a 580 tpy decrease to a 623 tpy increase. Thus, the highest county-level projected emissions increases for CO under the NSR Availability (4%) Scenario are less and the greatest county-level projected CO emission decreases are greater, than the emissions increases and decreases that actually occurred, based on measured data, at individual EGUs over the period of 2003 - 2004.

As this analysis shows, the local $PM_{2.5}$, VOC, and CO emissions increases that the IPM results indicate could theoretically occur from this action are not large. They are also within the variability that occurred under the current emissions increase test between the years 2003 - 2004. Therefore, we believe it is unlikely that the emission increases under the NSR Availability Scenario would lead to a different applicability result under the proposed hourly tests compared to the existing annual emissions increase test.

We next examined the reasons for the largest decreases and increases in county-level emissions under the NSR Availability (4%) Scenario. As we discussed in detail in Section III. B., the difference in the assumptions in the NSR Availability Scenario as compared to the CAIR/CAMR/CAVR 2020 Scenario is the hours of operation. Therefore, the changes in county level emissions are a direct function of our IPM assumptions concerning the hours of operation. We did not assume that any existing EGU would increase its capacity in the NSR Availability Scenario.

Tables 4.6 through 4.8 show the counties with the largest decreases and increases in EGU $PM_{2.5}$, VOC, and CO emissions.[26]

[26] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 17. [NSR Availability $PM_{2.5}$, VOC, and CO] Emission increases of at least 0.5 tpy. Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units).

Table 4.6 Largest County-level Decreases and Increases of Primary $PM_{2.5}$ Under NSR Availability (4%) Scenario (tpy

5 counties with largest decrease in Primary $PM_{2.5}$ emissions under the NSR Availability Scenario

State	County	County-level Emissions			Variations in unit-level data that would explain the decrease
		NSR Availability (4%)	CAIR/CAMR/CAVR 2020	Decrease	
Alabama	Jackson	1,384	3,457	-2,073	6 of 8 Widows Creek units retire
Pennsylvania	Lawrence	208	914	-706	New Castle units 3 and 4 retire
Ohio	Montgomery	2	670	-668	Hutchings units 1-6 retire
Ohio	Pickaway	1	649	-648	Picway retires
Pennsylvania	Snyder	0	614	-614	Sunbury retires

5 counties with largest increase in Primary $PM_{2.5}$ emissions under the NSR Availability Scenario

State	County	County-level Emissions			Variations in unit-level data that would explain the increase
		NSR Availability (4%)	CAIR/CAMR/CAVR 2020	Increase	
Minnesota	Sherburne	11,897	11,361	536	Heat input and emissions increased at Sherburne Co's 3 units
Missouri	New Madrid	10,899	10,408	491	Heat input increased at New Madrid's 2 units
Oklahoma	Mayes	8,230	7,863	367	Heat input increased
New Mexico	San Juan	7,969	7,609	360	Heat input increased
Texas	Titus	3,414	3,175	239	Heat input increased

Table 4.7 Largest County-level Decreases and Increases of VOC Under NSR Availability (4%) Scenario (tpy)

5 counties with largest decrease in VOC emissions under the NSR Availability Scenario

State	County	County-level Emissions: NSR Availability (4%)	County-level Emissions: CAIR/CAMR/CAVR 2020	County-level Emissions: Decrease	Variations in unit-level data that would explain the decrease
Georgia	Monroe	346	433	-87	Heat input decreased at all 4 Scherer Units
Alabama	Jackson	99	167	-68	6 of 8 Widows Creek units retired
Nevada	Clark	271	299	-28	Heat input decrease
Ohio	Montgomery	1	27	-26	Hutchings units 1-6 retire
Texas	Rusk	489	515	-26	Heat input decrease

5 counties with largest increase in VOC emissions under the NSR Availability Scenario

State	County	County-level Emissions: NSR Availability (4%)	County-level Emissions: CAIR/CAMR/CAVR 2020	County-level Emissions: Increase	Variations in unit-level data that would explain the increase
New Mexico	San Juan	496	473	23[27]	Heat input increased for all units
North Dakota	Mercer	501	479	22	Heat input increased for all units
Kentucky	Muhlenberg	442	422	20	Heat input increased
New York	Oswego	49	30	19	Heat input increased
Massachusetts	Barnstable	38	19	19	Heat input increased

[27] The EGU VOC emissions for San Juan County, New Mexico under CAIR/CAMR/CAVR 2020 are projected to be 473.4 tons and under NSR Availability 2020 are projected to be 495.7 tons, shown in Table 4.7 as 473 and 496 tons due to rounding. The actual increase is 22.3 tons.

Table 4.8 Largest County-level Decreases and Increases of CO Under NSR Availability (4%) Scenario (tpy)

5 counties with largest decrease in CO emissions under the NSR Availability Scenario					
		County-level Emissions			
State	County	NSR Availability (4%)	CAIR/CAMR/CAVR 2020	Decrease	Variations in unit-level data that would explain the decrease
Georgia	Monroe	2,913	3,648	-735	Emissions decreased at Scherer's 4 units an other units
California	Los Angeles	7,050	7,765	-715	Emissions decreased for El Segundo's unit , Haynes' 3 units, and Scattergood's 2 units
Alabama	Morgan	754	1,418	-664	Heat input decreased
Massachusetts	Essex	256	915	-659	Heat input decreased
Alabama	Jackson	825	1,394	-569	Heat input decreased
5 counties with largest increase in CO emissions under the NSR Availability Scenario					
		County-level Emissions			
State	County	NSR Availability (4%)	CAIR/CAMR/CAVR 2020	Increase	Variations in unit-level data that would explain the increase
New York	Oswego	1,916	1,161	755	Sithe Independence 6 units' emissions increa
Massachusetts	Barnstable	1,483	757	726	Heat input increased
Texas	Robertson	13,166	12,572	594	Heat input increased
Oklahoma	Le Flore	9,804	9,362	442	Heat input increased at AES Shady Point's 2 units
Florida	Duval	9,017	8,608	409	Heat input increased

For some counties in Tables 4.6 though 4.8 where $PM_{2.5}$, CO, and VOC emission decreases are projected, the decreases occur because heat input and emissions decreased at existing units. This effect occurs because more cost effective generation from EGUs that increased their availability under the NSR Availability Scenario displaces less cost effective generation from other EGUs. The less efficient EGUs then decrease their usage, reflected by decreased heat input and emissions. In Jackson Co., Alabama, decreases occur because EGUs are projected to retire under the NSR Availability (4%) Scenario but are not projected to be retired under CAIR/CAMR/CAVR 2020. This effect also occurs because more cost effective generation from EGUs that increased their availability under the NSR Availability Scenario displaces less cost effective generation from other EGUs, which then retire. In other counties, $PM_{2.5}$, VOC, and CO emission decreases occur because less new generation was projected for that county under the NSR Availability Scenario as opposed to under CAIR/CAMR/CAVR.

As noted previously, county-level increases are small and sparsely distributed. As Tables 4.6 through 4.8 show, the $PM_{2.5}$, VOC, and CO increases are small even in the counties where the highest increases are projected. In many of the counties shown here, the emission increases are due to increased fuel use by the EGUs within those counties, consistent with increased hours of operation. In other counties, emission increases occur where more new generation was projected for that county under the NSR Availability Scenario as opposed to under CAIR/CAMR/CAVR. Increased generation due to new EGUs would be subject to major NSR review and would not be affected by the proposed emissions increase test.

4.5 $PM_{2.5}$, VOC, and CO Air Quality

As Figures 4.1 through 4.3 show,[28] projected $PM_{2.5}$, VOC, and CO emissions changes under the proposed revised NSR applicability tests would result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same compared to emissions changes under CAIR/CAMR/CAVR 2020. As Figures 4.1 through 4.3 show, projected increases in EGU $PM_{2.5}$, VOC, and CO emissions due to increased hours of operation at EGUs under the NSR Availability (4%) Scenario are small in magnitude and sparse across the continental U.S. Therefore, we would expect these increases to cause minimal changes in local ambient effect in comparison to that observed under CAIR/CAMR/CAVR for $PM_{2.5}$ and ozone (for which VOC is a precursor). Because many counties experience decreases in emissions, we would further expect any local ambient effects from increased emissions to be somewhat diminished because the emissions decreases elsewhere yield regionwide improvements in air quality.

Furthermore, as noted in Table 4.1, EGU VOC emissions are less than one percent of national VOC emissions. Also national VOC emissions and national EGU VOC emissions are declining. According to our latest analysis, 2020 national VOC emissions are projected to be 5,219,000 tons less than 2001 national VOC emissions;

[28] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 17. [NSR Availability $PM_{2.5}$, VOC, and CO]

2020 national EGU VOC emissions are projected to be 8,000 tons less than 2001 national EGU VOC emissions.[29]

For these reasons, EGUs do not contribute significantly to national or local VOC emissions. Furthermore, EGU owner/operators have natural incentives to reduce VOC emissions. VOCs are products of incomplete combustion. These compounds are discharged into the atmosphere when fuel remains unburned or is burned only partially during the combustion process. Fuel is a significant portion of total costs for EGUs, particularly for older EGUs, where capital costs are paid off. EGU owner/operators have in fact improved combustion practices to increase combustion efficiency, thereby limiting unburned fuel. Cost effective operation is especially desirable in areas where a cap and trade program increases the cost of operation by creating a cost to pollute, as is the case in the CAIR region where most ozone nonattainment areas are located.

We have not modeled national or regional air quality improvements in CO concentrations. As noted in Table 4.1, however, EGU CO emissions are less than one percent of national CO emissions. According to our latest analysis, 2020 national CO emissions are projected to be 19,892,017 tons less than 2001 national CO emissions.[30] Local CO emissions are generally a function of traffic congestion from mobile sources. For these reasons, EGUs do not contribute significantly to national or local CO emissions. Furthermore, as with VOCs, EGU owner/operators have natural incentives to reduce CO emissions, as fuel costs are a significant portion of total costs for EGUs.

[29] See the $PM_{2.5}$ NAAQS RIA at 1-9. Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 10.

[30] See the Clean Air Interstate Rule Emissions Inventory Technical Support Document at pgs 7 and 38. Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 11.

There currently are only five CO nonattainment areas: El Paso, Texas; Las Vegas, NV; Los Angeles South Coast Air Basin, CA; Missoula, MT; and Reno, NV. For these five local areas, we computed the net emissions change in the EGU CO emissions between CAIR/CAMR/CAVR 2020 and NSR Availability. Appendix B of this document includes this analysis. As Appendix B shows, in most of these counties IPM projects no change or a decrease in emissions in the NSR Availability Scenario compared to CAIR/CAMR/CAVR 2020. No emissions increase of greater than 40 tpy $PM_{2.5}$ is projected for any local area in the NSR Availability Scenario compared to CAIR/CAMR/CAVR 2020. The projected increases in CO emissions due to increased hours of operation at EGUs under the NSR Availability (4%) Scenario thus are small in magnitude and sparse across the continental U.S. We would expect these increases to cause minimal local ambient effect on CO. Therefore, based on the small increases and sparse distribution of CO emissions compared to CAIR/CAMR/CAVR 2020, and the small contribution of EGU emissions to national and local CO levels, we project no notable local impact on air quality from EGU CO emissions from NSR Availability 4%.

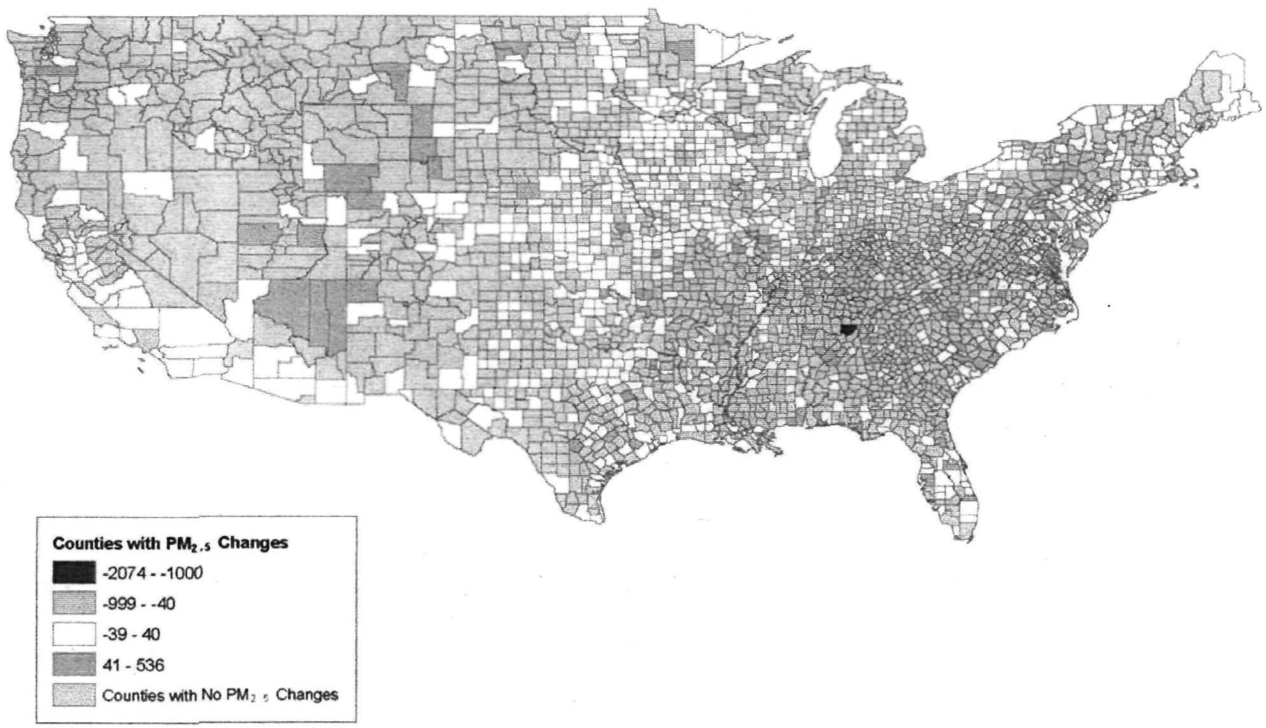

Figure 4.1 2020 $PM_{2.5}$ County-level Emissions Changes With a 4% Increase in EGU Availability

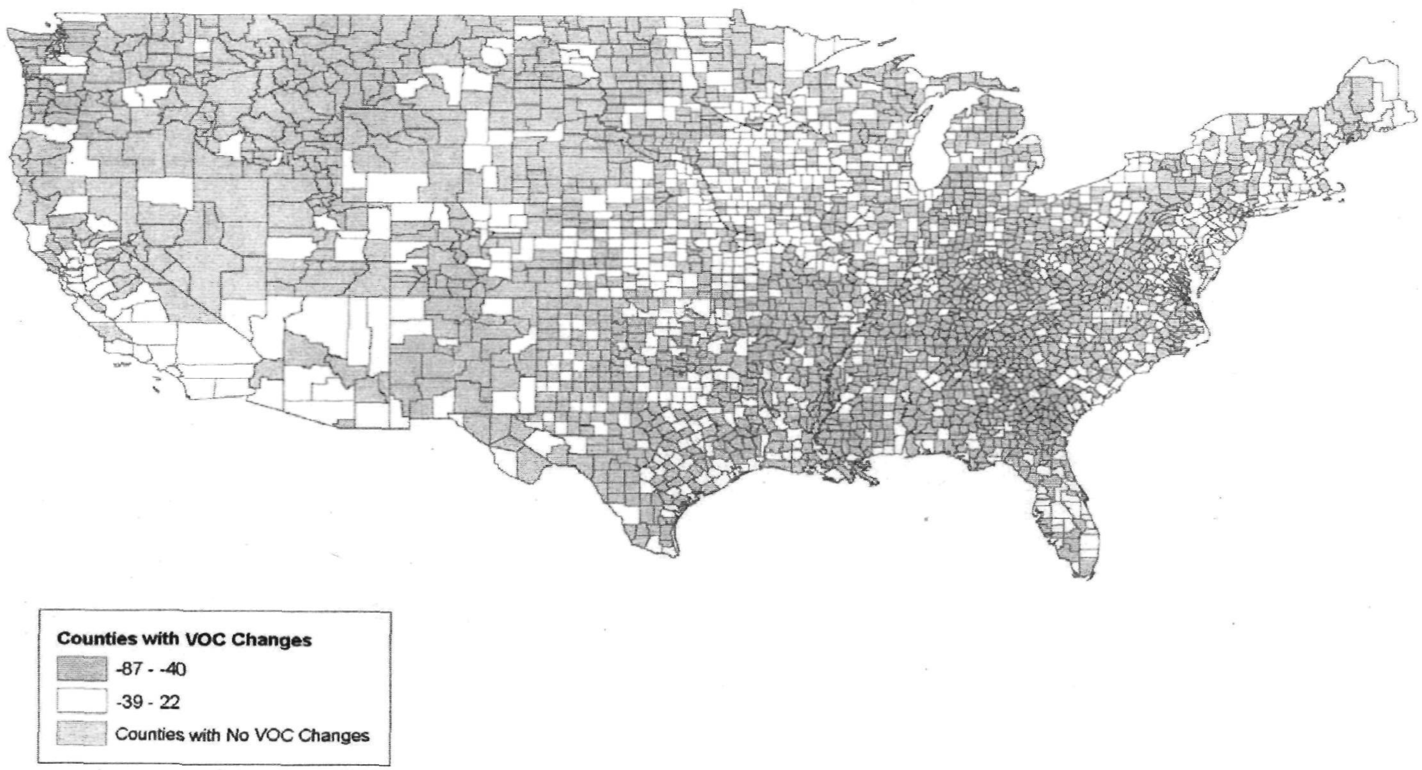

Figure 4.2 2020 County-level VOC Emissions Changes With a 4% Increase in EGU Availability

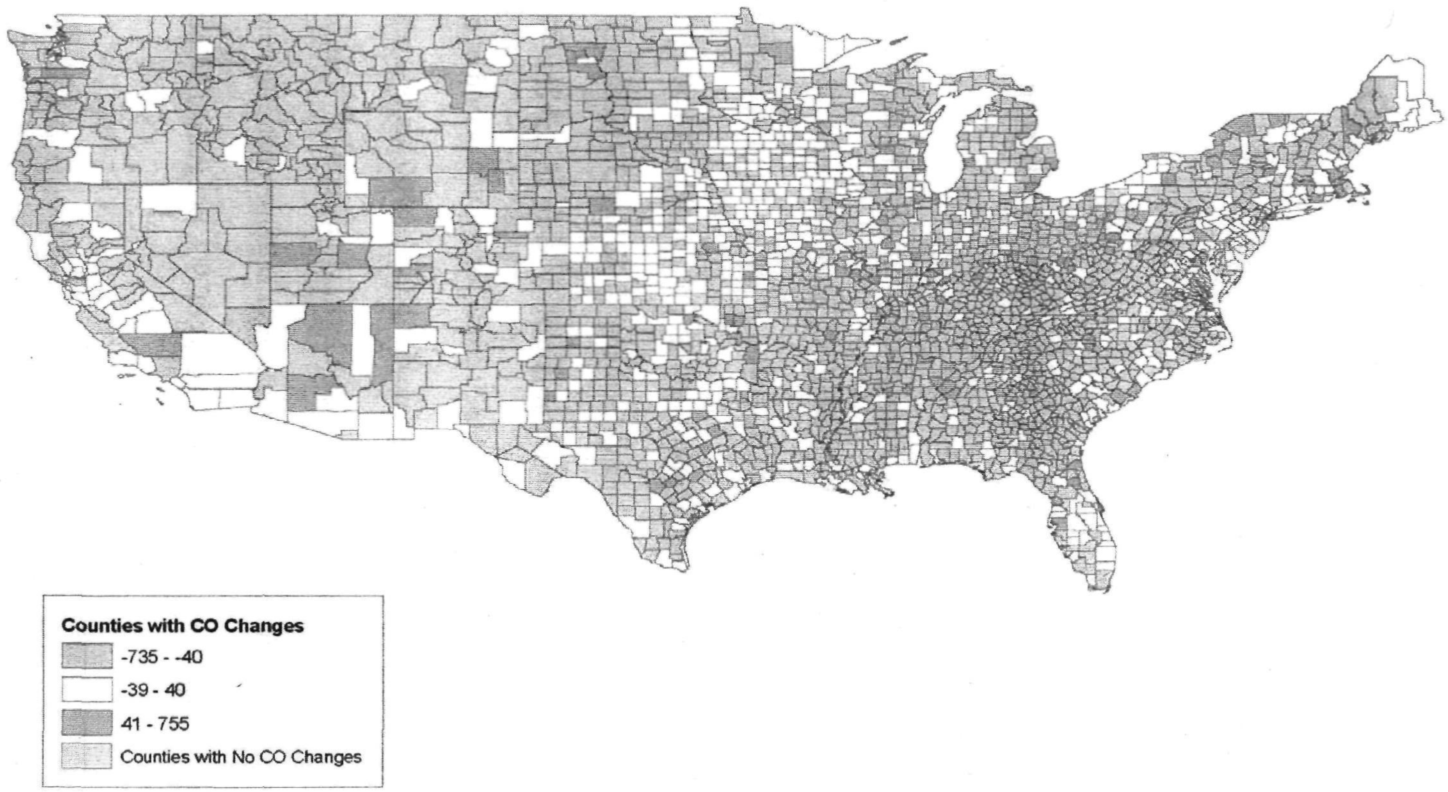

Figure 4.3 2020 County-level CO Emissions Changes With a 4% Increase in EGU Availability

Chapter 5.

NSR Efficiency Scenarios- SO_2 and NO_x

5.1 NSR Efficiency Scenario

We designed another IPM model run to evaluate whether efficiency improvements that sources may make as a result of today's proposed regulations would lead to local emissions increases and adverse effects on ambient air quality. We call this run the NSR Efficiency Scenario.

Heat rates describe the efficiency of a unit—that is, the amount of electricity generated per fuel input. In EPA's NEEDS, used to populate the IPM, heat rates are expressed as Btus per KWh.[31] Heat rates for coal steam EGUs in the IPM model 2.1.9, used in the NSR Efficiency Scenario, range from 8,300 to 14,500 Btu/KWh. Heat rates are often converted to an efficiency percent. (1 KWh =3,412 Btu) Utility boiler thermal efficiencies generally range from approximately 31 to 38 percent. The more efficient an EGU, the less fuel it uses and the less it emits for a given period of operation. For example, a 50 MW combustion turbine that operates 500 hours a year, for 25,000 MWh per year at an emission rate of 75 ppmvd NO_x, would emit 46 tons of NO_x per year at 25 percent efficiency, 41 tons of NO_x per year at 28 percent efficiency, 37 tons of NO_x per year at 31 percent efficiency, or 34 tons of NO_x per year at 34 percent efficiency.

[31] IPM v.2.1.9 Documentation can be viewed and downloaded at **www.epa.gov/airmarkets/epa-ipm**. It is also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 01 and EPA-HQ-OAR-2005-0163, DCN 03. For more information on heat rates used in the IPM modeling, see Chapter 3 of the IPM documentation on the website above. It is also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 3.

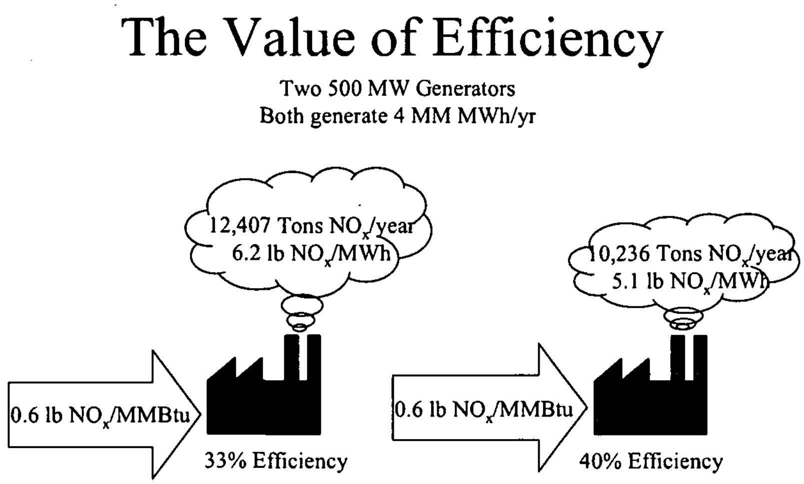

Figure 5.1 The Value of Efficiency

The more efficient an EGU is, the less fuel it has to burn to generate the same amount of electricity. Since fuel costs are typically the biggest operating expense for an EGU, this will generally translate to lower-cost electricity. The lower the cost to generate electricity from a given EGU, the more likely it is to be dispatched and to operate more hours. Aside from independent factors such as climate and economy, efficiency is a primary determinant of the hours of operation of a given EGU. Neither the current annual emissions increase test nor any of the proposed EGU emission increase test alternatives directly measure an EGU's efficiency. However, the output-based alternatives (Alternatives 2, 4, 6, and 8), which are expressed in a lb/KWh format that measures mass emissions per unit of electricity, are closely related to an EGU's efficiency. Thus, an output-based test encourages efficient units, which has well-recognized benefits. We anticipate that the output-based alternatives in particular, and the other alternatives to a lesser extent, could have the effect of encouraging EGUs to increase their efficiency. For these reasons, we focused on efficiency to examine whether the hourly test could result in emissions increases as compared to the annual emissions increase test. Of all coal-fired EGUs nationally, we identified the least efficient 35 percent. These EGUs all have heat rates of 11,000 Btu/KWh or higher. We also identified a reasonable amount of efficiency increase. Based on a review of the literature, the extent to which heat rates can be improved at existing plants is estimated to be at best 3 to 5 percent. This is because heat rate is primarily dependent on unit design, and the design of a plant cannot be changed once built.[32] We therefore assumed a 4 percent efficiency increase in our NSR IPM run. We also constrained the IPM model such that there was no option for any EGU to increase capacity, heat rate, or availability. Thus, under the NSR Efficiency Scenario, there was no increase in the existing operating and physical capacity of each coal steam EGU, as measured in MMBtu/hr.[33] Because it is unlikely that 35 percent of all coal-fired EGUs would increase their efficiency, and because a 4 percent efficiency increase is on the outer bounds of possible efficiency increases, our analysis provides a very conservative approach based on a worst-case scenario that may overestimate emission increases at individual units.

[32] Review of Potential Efficiency Improvements at Coal-Fired Power Plants, available in Docket as item . See also Demonstration of EPRI Heat-Rate Improvement Guidelines, available in Docket as item EPA-HQ-OAR-2005-0163, DCN 19.

[33] We believe it is unlikely that an EGU would increase its efficiency without also increasing its operating and physical capacity. Nonetheless, we designed the IPM Scenario to assess the impact of efficiency increases on actual emissions. This analysis was only possible through constraining the model such that no increases in operating and physical capacity are allowed.

We did not assume efficiency increases in combustion turbines in the NSR EGU Efficiency Scenario analysis. Combustion turbines are generally used as peaking units and therefore provide only a small percentage of net generation. In 2004, as measured from actual recorded fuel use (MMBtu) submitted to EPA for all EGUs subject to the Acid Rain Program, combustion turbines accounted for approximately 2.5 percent of total heat input, and coal steam EGUs accounted for approximately 85.7 percent of total heat input.[34]

We ran the IPM with this scenario (4 percent efficiency increase for 371 coal-fired EGU, no increase in physical and operating existing capacity) and compared the results to the CAIR/CAVR/CAMR IPM model. We found approximately the same results from the NSR Efficiency Scenario as from the NSR Availability Scenarios.

5.2 SO_2 and NO_x Control Device Installation

As Table 5.1 shows, the NSR Efficiency Scenario projects retrofitting of more control devices than under the CAIR/CAMR/CAVR 2020.[35] These results are consistent with what IPM generally projects. The more efficient an EGU is, the more cost effective it is to operate. The more cost effective it is to operate, the more hours it will operate. The more hours it operates, the more likely it is to install controls.[36] We thus conclude

[34] Based on actual data submitted to EPA by EGUs subject to the Acid Rain Program. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 20. (ARPunitlevel2004)

[35] Information from system summary report for the NSR Efficiency IPM Run. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 13. (System Summary Report for NSR Efficiency)

[36] See our report, "Contributions of CAIR/CAMR/CAVR to NAAQS Attainment: Focus on Control Technologies and Emission Reductions in the Electric Power Sector," on pages 39 and 43. The report is available at **http://www.epa.gov/air/interstateairquality/charts.html**. It is also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 05.

that the more efficiently an EGU operates, the more likely it is to install controls, regardless of whether the major NSR applicability test is on an hourly basis or an annual basis.

Table 5.1 2020 National EGUs with Emission Controls Under NSR Efficiency

	EGUs with Additional Controls Compared to 2004 Controls Case	EGUs with Additional Controls Compared to CAIR/CAMR/CAVR 2020
FGD	109 GW	1.5 GW
SCR	74 GW	1.0 GW

5.3 SO_2 and NO_x National Emissions

As Table 5.2 shows, the NSR Efficiency Scenarios project reductions in SO_2 and NO_x emissions nationally by 2020 as compared to emissions under the Base Case Scenario.[37] This result is consistent with the fact that under the NSR Efficiency Scenario, the amount of controls increases, compared to the Base Case.

[37] CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR Efficiency SO_2 and NO_x Emissions Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 07. [EPA 219b_NSR_OAQPS_ 2a_Pechan_2020_(to EPA) 4-27-06] National totals for CAIR/CAMR/CAVR and NSR Efficiency include new units (IPM new units and planned-committed units).

Table 5.2 National EGU Emissions Under NSR Efficiency Scenario Compared to CAIR/CAMR/CAVR 2020 (tpy)			
	Total Emissions Under CAIR/CAMR/CAVR	Total Emissions Under NSR Efficiency	Emissions Change Under NSR Efficiency Compared to CAIR/CAMR/CAVR
SO2	4,277,000	4,265,000	-12,000
NOx	1,989,000	1,984,000	-5,000

As noted above, the NSR Efficiency Scenarios examine emissions changes based on very conservative estimates of technically feasible improvements in efficiency. We conclude that to any extent that EGU efficiency increases under a maximum hourly test, as opposed to the current average annual 5-year baseline test, such increased efficiency would not increase national EGU SO_2 and NO_x emissions. This conclusion as to emissions in the contiguous 48 States supports extending the proposed rules nationwide, instead of limiting them to the States in the CAIR region.

5.4 SO_2 and NO_x Local Emissions Impact

To examine the effect of the maximum hourly test on local air quality, we compared 2020 county-level EGU SO_2 and NO_x emissions under the CAIR/CAMR/CAVR 2020 and NSR Efficiency Scenario.[38] Tables 5.3 and 5.4 show these comparisons.[39]

[38] CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR Efficiency SO_2 and NO_x Emissions Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 07. [EPA 219b_NSR_OAQPS_ 2a_Pechan_2020_(to EPA) 4-27-06]

[39] Emission increases of at least 0.5 tpy. Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units). New units (IPM new units and planned-committed units) were not included in CAIR/CAMR/CAVR 2020 and NSR Efficiency county-level emission totals because they had not been assigned to a county.

Table 5.3 Changes in County-level SO_2 Emissions NSR Efficiency Scenario Compared to CAIR/CAMR/CAVR 2020

Emissions Change	Number of Counties
Total # of counties with decreases in EGU Emissions	142
# of counties with EGU emissions decreases between 3,000 and 17,384 tpy	5
# of counties with EGU emissions decreases between 1,000 and 3,000 tpy	13
# of counties with EGU emissions decreases between 40 and 1,000 tpy	110
# of counties with EGU emissions decreases up to 39 tpy	14
# of counties with no change in EGU emissions	976
# of counties with EGU emissions increases up to 39 tpy	12
# of counties with EGU emissions increases between 40 and 1,000 tpy	40
# of counties with EGU emissions increases between 1,000 and 3,000 tpy	9
# of counties with EGU emissions increases between 3,000 and 34,276 tpy	4
Total # of counties with increases in EGU Emissions	65

Table 5.4 Changes in County-level NO_x Emissions NSR Efficiency Scenario Compared to CAIR/CAMR/CAVR 2020

Emissions Change	Number of Counties
Total # of counties with decreases in EGU Emissions	285
# of counties with EGU emissions decreases between 1,000 and 2,297 tpy	3
# of counties with EGU emissions decreases between 40 and 1,000 tpy	109
# of counties with EGU emissions decreases up to 39 tpy	173
# of counties with no change in EGU emissions	802
# of counties with EGU emissions increases up to 39 tpy	61
# of counties with EGU emissions increases between 40 and 1,000 tpy	30
# of counties with EGU emissions increases between 1,000 and 3,098 tpy	5
Total # of counties with increases in EGU Emissions	96

New EGUs would not be subject to proposed rule. New EGUs would be subject to major NSR, including control technology review for installation of BACT/LAER. For the reasons we discuss in Section 3.4, the modeling results are illustrative of likely variation in effects at the local level under alternative scenarios rather than definitive projections of the emissions from individual (specific) EGUs or plants.

As we discuss in Section 5.1, it is unlikely that 35 percent of all coal-fired EGUs would increase their efficiency, and because a 4 percent efficiency increase is on the outer bounds of possible efficiency increases, our analysis provides a very conservative approach based on a worst-case scenario that may overestimate emission increases at individual units. As Tables 5.3 and 5.4 show, the proposed revised NSR applicability tests would, under our very conservative assumptions, result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same. This pattern is consistent with the fact that most coal-fired EGUs are in the CAIR region and therefore subject to regulations implementing the CAIR cap. According to the DOE's Energy Information Agency, for the years 2003 - 2004, approximately 80 percent of the coal steam electric generation and 75 percent of all electric generation occurred in CAIR States.[40] Furthermore, EGUs are subject to national SO_2 caps under the Acid Rain Program.

For these reasons, as under the NSR EGU Availability Scenarios, an increase in emissions will also result in a decrease in emissions elsewhere. As noted elsewhere, the presence of a regionwide cap under CAIR results in the same phenomenon within the CAIR region. That is, an increase in emissions in one area results in a decrease elsewhere. This dynamic occurs regardless of the major NSR applicability test for existing EGUs. Nonetheless, the NSR Efficiency Scenario demonstrates that this pattern continues to occur when increased efficiency is assumed, such as we assume for present purposes would occur under the proposed

[40] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 08. (2000-2004 Electric Generation)

maximum hourly tests.

To gain a further perspective on the projected county-level SO_2 and NO_x increases under the NSR Efficiency Scenario, we compared them to recorded actual annual EGU SO_2 and NO_x emissions in 2003 - 2004.[41] We examined actual annual emissions from CEMS data transmitted to the Agency on these EGUs. In 2004, six EGUs had emissions increases greater than 3,098 tpy NO_x as compared to 2003. In 2004, ten EGUs had emissions increases greater than 8,035 tpy SO_2 as compared to 2003. Thus, with the exception of Humphreys County, TN, the highest county-level projected emissions increases for SO_2 and NO_x under the NSR Efficiency Scenario are less than the emissions increases that actually occurred, measured using CEMS, at individual EGUs over the period of 2003 - 2004. As this perspective shows, the local emissions increases that the IPM results indicate could theoretically occur from this action are not large. Concerning the 34,275 tpy SO_2 projected increase in Humphreys County, as shown in Table 5.5, these plants have not really increased emissions as compared to historical operation, and they certainly have not increased emissions because they have made changes that avoid major NSR. Rather, the increase is due to plants operating differently under two model runs with different assumptions. We next examined the reasons for the largest increases and decreases in county-level emissions under the NSR Efficiency Scenario. Table 5.5 shows the counties with the greatest SO_2 and NO increases and decreases.[42]

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[41] Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 15. (2003-2004 Emission Changes)

[42] CAIR/CAMR/CAVR SO2 and NOx emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR Efficiency SO2 and NOx Emissions Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 07. [EPA 219b_NSR_OAQPS_ 2a_Pechan_2020_(to EPA) 4-27-06] Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units).

Table 5.5 Largest County-level Decreases and Increases of SO_2 and NO_x Under NSR Efficiency Scenario (tpy)

5 counties with largest decrease in SO_2 emissions under the NSR Efficiency Scenario

State	County	County-level Emissions: NSR Efficiency	County-level Emissions: CAIR/CAMR/CAVR 2020	County-level Emissions: Decrease	Variations in unit-level data that would explain the decrease
TN	Sumner	2,157	19,541	17,384	Units 1-4 partially retrofit in CAIR/CAMR/CA fully retrofit in NSR Efficiency
MN	Itasca	14,938	26,403	11,465	FGD goes on Clay Boswell unit 3 in NSR Efficiency run
SC	Berkeley	17,493	23,486	5,993	FGD goes on Jeffries unit 3 in NSR run
OH	Lucas	3,785	8,070	4,285	FGD goes on Bayshore units 2 & 3 in NSR Efficiency run
PA	Clearfield	2,494	6,736	4,242	Shawville unit 1 retires under NSR Efficienc Run

5 counties with largest decrease in NO_x emissions under the NSR Efficiency Scenario

State	County	County-level Emissions: NSR Efficiency	County-level Emissions: CAIR/CAMR/CAVR 2020	County-level Emissions: Decrease	Variations in unit-level data that would explain the increase
OH	Lucas	1,907	4,204	2,297	Bayshore 2 & 3 put on SCR and FGD unde Efficiency
PA	Clearfield	1,149	2,997	1,848	Shawville unit 1 retires under NSR Efficienc
OH	Clermont	6,898	8,035	1,137	Beckjord unit 3 installs SCR and FGD unde NSR Efficiency
MO	Greene	6,296	7,264	968	Southwest 1 installs a SNCR under NSR Efficiency
MI	Ottawa	22,453	23,271	818	Campbell units decrease fuel use in NSR Efficiency

Table 5.5 Largest County-level Decreases and Increases of SO_2 and NO_x Under NSR Efficiency Scenario (tpy)

5 counties with largest increase in SO_2 emissions under the NSR Efficiency Scenario					
		County-level Emissions			
State	County	NSR Efficiency	CAIR/CAMR/CAVR 2020	Increase	Variations in unit-level data that would explain the increase
TN	Humphreys	48,773	14,498	34,275	Johnsonville Units 1-8 retire under CAIR/CAMR/CAVR
PA	Berks	8,035	0	8,035	Titus units 1-3 retire under CAIR/CAMR/CA
OH	Coshocton	17,980	12,045	5,935	Conesville units 1 & 2 retire under CAIR/CAMR/CAVR
PA	Snyder	7,824	4,274	3,550	Sunbury units 1-3 retire under CAIR/CAMR/CAVR
GA	Coweta	7,811	5,479	2,332	Yates units 2 & 3 Increase total fuel use unc NSR Efficiency Run

5 counties with largest increase in NO_x emissions under the NSR Efficiency Scenario					
		County-level Emissions			
State	County	NSR Efficiency	CAIR/CAMR/CAVR 2020	Increase	Variations in unit-level data that would explain the increase
OH	Coshocton	6,889	3,791	3,098	Conesville units 1 & 2 retire under CAIR/CAMR/CAVR
PA	Berks	2,409	130	2,279	Coal units retire in CAIR/CAMR/CAVR, but under NSR Efficiency
TN	Humphreys	2,926	870	2,056	Johnsonville Units 1-8 retire under CAIR/CAMR/CAVR
PA	Snyder	3,131	1,167	1,964	Sunbury units retire under CAIR/CAMR/CA\ but not under NSR Efficiency
WI	Grant	3,753	2,220	1,533	Units put on SCR in CAIR/CAMR/CAVR, bu under NSR Efficiency

For most counties in Table 5.5 where SO_2 and NO_x emission decreases are projected (Sumner, TN; Itasca, MN; Berkeley, SC; Lucas, Ohio; Clermont, OH; and Greene, MO), the decreases occur because EGUs are projected to install controls under the NSR Efficiency Scenario but are not projected to install controls under CAIR/CAMR/CAVR . This effect occurs because as these EGUs increase their hours of operation, they reach a break-even point where it becomes cost effective to install controls rather than to buy allowances. In Clearfield, PA, SO_2 decreases occur because EGUs are projected to retire under the NSR Efficiency Scenario but are not projected to be retired under CAIR/CAMR/CAVR 2020. This effect occurs because more cost effective generation from EGUs that increased their efficiency under the NSR Efficiency Scenario displaces less cost effective generation from other EGUs, which then retire. In Clermont, OH, NO_x decreases occur because Beckjord installs SCR and FGD in NSR Efficiency, but not under CAIR/CAMR/CAVR 2020. The IPM projects that this unit would not install SCR under the CAIR/CAMR/CAVR Scenario because its utilization is not as high in comparison to its utilization under the NSR Efficiency Scenario. This result is consistent with what IPM generally projects—the more hours an EGU operates, the more likely it is to install controls.

As Table 5.5 shows, the highest SO_2 and NO_x increases are projected for the following counties: Berks, Pennsylvania; Coshocton, Ohio; Humphreys, TN; Snyder, Pennsylvania; Coweta, Georgia; and Grant, Wisconsin. As under the NSR Availability Scenario, even these emission increases are generally small. In most of these counties, emission increases are due to units projected to retire under the CAIR/CAMR/CAVR 2020 IPM, but not to retire under the NSR Efficiency Scenario. Comparing the NSR run to the Base Case, it appears that emissions in these counties have increased. However, these plants have not really increased emissions as compared to historical operation, and they certainly have not increased emissions because they have made changes that avoid major NSR. Rather, the increase is due to plants operating differently under two model runs with different assumptions. This is true of the largest SO_2 emissions increase (34,275 tpy) projected in Humphreys County, Tennessee. We also note that SO_2 emissions in nearby Sumner County decrease by 17,384 tpy.

Likewise, in Grant County, Wisconsin, emission increases are projected to occur where SCR for the Nelson plant is projected under CAIR/CAMR/CAVR 2020, but not under the NSR Efficiency Scenario. The IPM projects that this unit would not install SCR under the NSR Efficiency Scenario because it decreases utilization in comparison to its utilization under CAIR/CAMR/CAVR Scenario. This is because other more efficient units have increased their utilization. If the Nelson unit were to increase its utilization, it would then be a good candidate to install SCR.

To gain further perspective on the magnitude of the SO_2 and NO_x emissions changes under the NSR Efficiency Scenario, we compared them to total SO_2 and NO_x emissions at the State level. Specifically, we compared the net change in statewide EGU SO_2 and NO_x emissions under the NSR Efficiency Scenario to the total State SO_2 and NO_x emissions under CAIR/CAMR/CAVR 2020. As Appendix A shows, in States where SO_2 emissions increase under the NSR Efficiency Scenario as compared to CAIR/CAMR/CAVR 2020, the net emissions increase ranges is at most 6 percent of the total SO_2 emissions in the State. As Appendix A also shows, in States where NO_x emissions increase under the NSR Availability Scenario as compared to CAIR/CAMR/CAVR 2020, the net emissions increase ranges is at most 2 percent of the total NO_x emissions in the State. Thus where SO_2 and NO_x emissions increase under the

NSR Efficiency Scenario, they are small in comparison to total SO_2 and NO_x emissions at the State level.

5.5 SO_2 and NO_x Air Quality Impact

As we discussed above, projected emissions changes under proposed revised NSR applicability tests would result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same. As we also noted, the degree and pattern of these changes is consistent with those under CAIR/CAMR/CAVR 2020. Moreover, the emission changes under the NSR Efficiency Scenario are projected assuming very conservative assumptions, as described above.

Figures 5.2 and 5.3 compare projected county-level SO_2 and NO_x emissions under the NSR Efficiency Scenario to those projected under CAIR/CAMR/CAVR 2020.[43] Projected increases in emissions of these pollutants due to increased efficiency at EGUs under the NSR Efficiency Scenario are generally small in magnitude and sparse across the continental U.S. Therefore, we would expect these increases to cause minimal local ambient effect, both directly on SO_2 and NO_x emissions and as precursors to formation of $PM_{2.5}$ (SO_2 and NO_x emissions) and ozone (NO_x emissions). Because many counties experience decreases in emissions, we would further expect any local ambient effects from increased emissions to be somewhat diminished

[43] CAIR/CAMR/CAVR emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 09. CAIR/CAMR/CAVR SO_2 and NO_x emissions available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14. [EPA 219b_BART 13_2020_Pechan (to EPA)07-11-05]. NSR Efficiency SO_2 and NO_x Emissions Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 07. [EPA 219b_NSR_OAQPS_ 2a_Pechan_2020_(to EPA) 4-27-06]

because of the emissions decreases elsewhere that yield regionwide improvements in air quality, including SO_2, NO_x, $PM_{2.5}$, and ozone.

Based on the spatial distribution of SO_2 and NO_x emissions changes as shown in Figures 5.1 and 5.2, we expect patterns of air quality changes respectively under the NSR Efficiency Scenario to be consistent with projections under CAIR/CAMR/CAVR in 2020. We thus believe that the local air quality under today's proposed regulations would be commensurate with that under the CMAQ modeling based on CAIR/CAMR/CAVR 2020 Scenario emissions projections.[44]

[44] As we discussed in Section 2.5, our projections of 2020 air quality under CAIR/CAMR/CAVR are on our website and in the docket for this rulemaking.

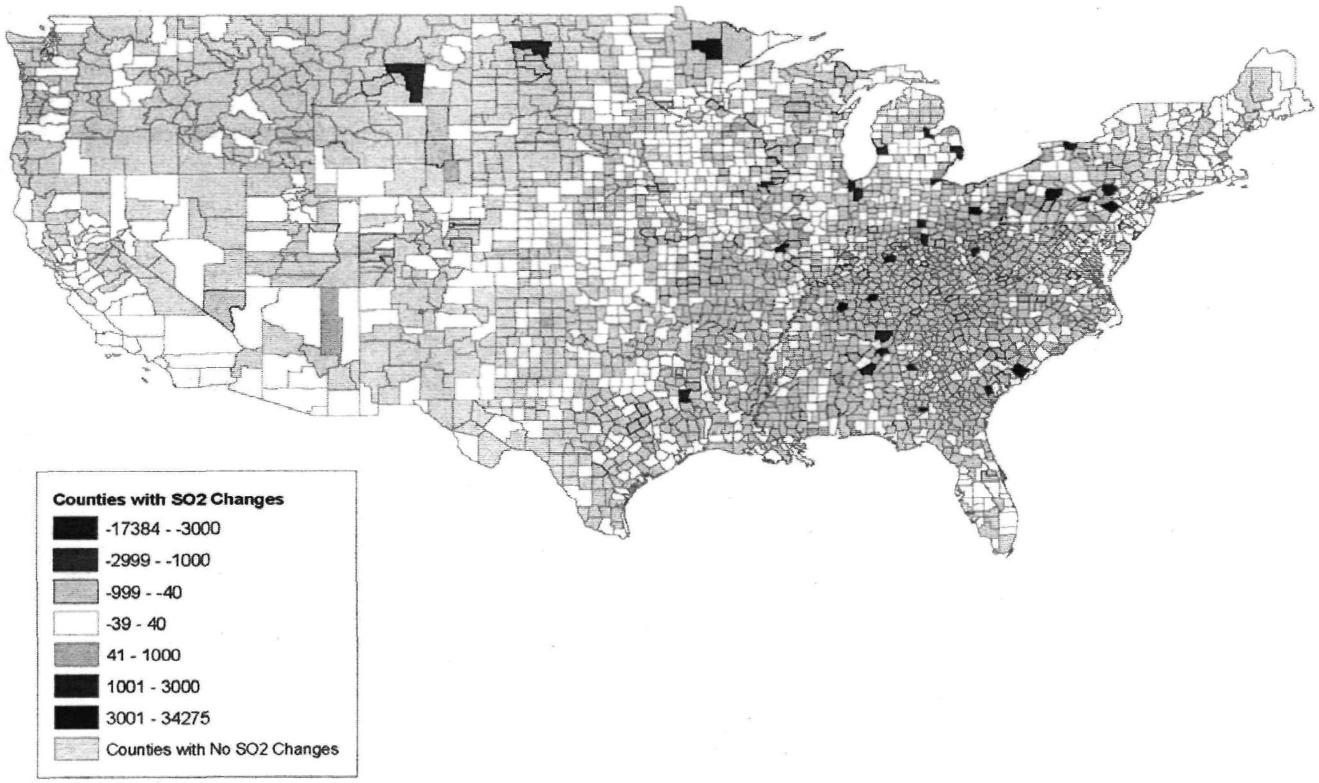

Figure 5.2 2020 County-level SO_2 Emissions Changes with Efficiency Increase

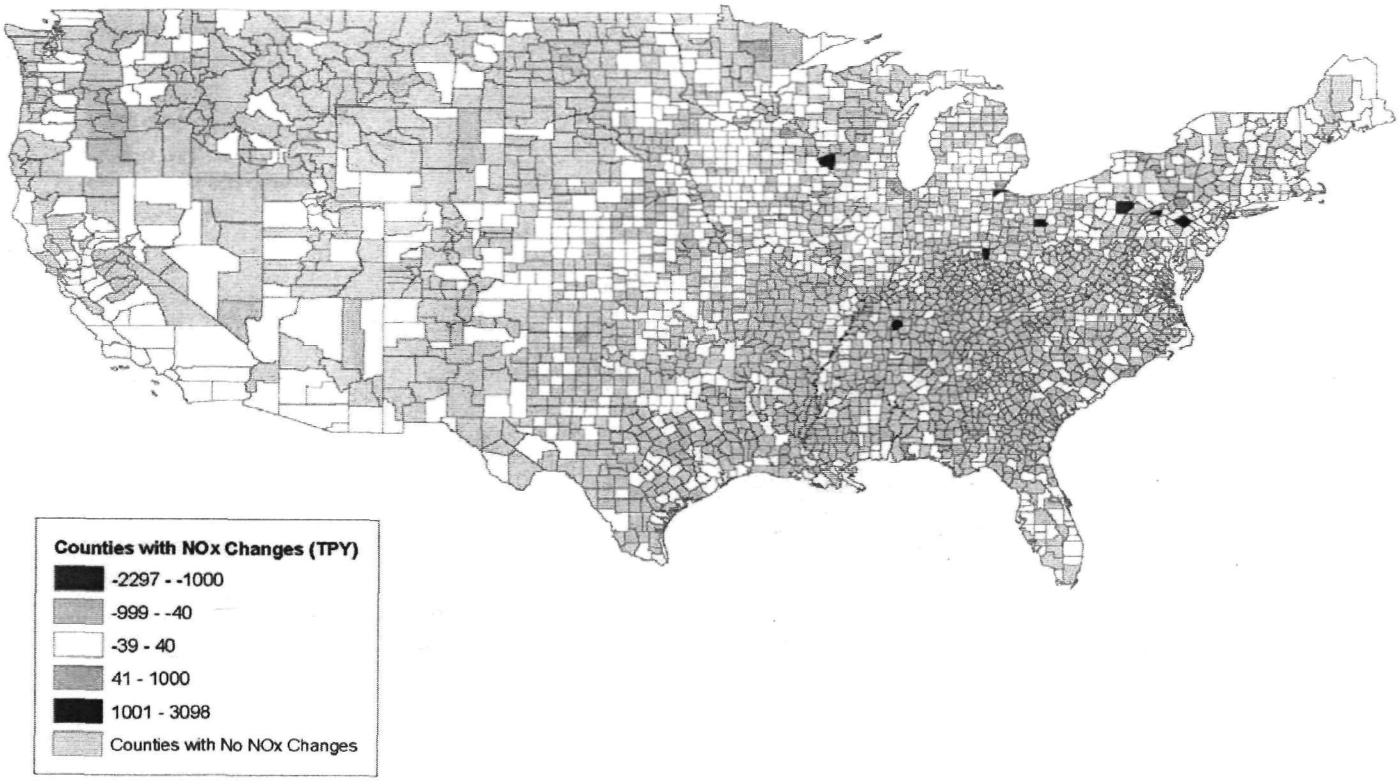

Figure 5.3 2020 County-level NO_x Emissions Changes with Efficiency Increase

Chapter 6.
NSR Efficiency Scenarios- $PM_{2.5}$, VOC, and CO

6.1 NSR Efficiency Scenario

We used the NSR Efficiency Scenarios that we describe in Chapter 5.1 to examine the $PM_{2.5}$, VOC, and CO emissions and air quality impacts of the proposed hourly emissions increase test. This chapter provides the results of our analyses.

6.2 $PM_{2.5}$, VOC, and CO Control Device Installation

As we discussion the $PM_{2.5}$ NAAQS RIA, our NEEDS indicates that as of 2004, 84 percent of all coal-fired EGUS have an ESP in operation, about 14 percent of EGUs have a fabric filter, and roughly 2 percent have wet $PM_{2.5}$, scrubbers.[45] Gas-fired turbines are clean burning and BACT/LAER for these EGUs is no control. BACT/LAER for VOC and CO is good combustion control. Furthermore, EGU owner/operators have natural incentives to reduce VOC emissions. VOCs are products of incomplete combustion. These compounds are discharged into the atmosphere when fuel remains unburned or is burned only partially during the combustion process. Fuel is a significant portion of total costs for EGUs, particularly for older EGUs where capital costs are paid off. EGU owner/operators have in fact improved combustion practices to increase combustion efficiency, thereby limiting unburned fuel. Cost effective operation is especially desirable in areas where a cap and trade program increases the cost of operation by

[45] See Regulatory Impact Analysis for $PM_{2.5}$ rule at pg 3-34. Available at **http://www.epa.gov/ttn/ecas/ria.html** and as Docket Item EPA-HQ-OAR-2005-0163, DCN 10.

creating a cost to pollute, as is the case in the CAIR region where most ozone and $PM_{2.5}$ nonattainment areas are located.

6.3 $PM_{2.5}$, VOC, and CO National Emissions

As Table 6.1 shows, EGUs are a small percentage of national $PM_{2.5}$, CO, and VOC emissions.[46]

Table 6.1 EGU Emissions As Percent of 2020 National Emissions (tpy)

	EGU	National	EGU as % National
$PM_{2.5}$	533,000	6,206,000	8.6%
VOC	45,000	12,414,000	0.4%
CO	717,889	82,851,643	0.9%

As Table 6.2 shows, the NSR Efficiency Scenarios project essentially no changes in $PM_{2.5}$, VOC, or CO emissions nationally by 2020 as compared to emissions under the CAIR/CAMR/CAVR Scenario.[47]

[46] CO emissions information from Clear Air Interstate Rule Emissions Inventory Technical Support Document, available at **http://www.epa.gov/air/interstateairquality/technical.html**. Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 11. $PM_{2.5}$ and VOC emissions information from $PM_{2.5}$ NAAQS RIA, available at **http://www.epa.gov/ttn/ecas/ria.html**. Also available as Docket Item EPA-HQ-OAR-2005-0163, DCN 10.

[47] Emissions information available as Docket Item EPA-HQ-OAR-2005-0163, DCN 18. [NSR Efficiency $PM_{2.5}$, VOC, and CO.] National totals for CAIR/CAMR/CAVR and NSR Efficiency include new units (IPM new units and planned-committed units).

Table 6.2 National EGU Emissions Under NSR Efficiency Scenario Compared to CAIR/CAMR/CAVR 2020 (tpy)

	CAIR/CAMR/CAVR	NSR Efficiency	Change-NSR Efficiency
$PM_{2.5}$	526,642	529,647	3,005
VOC	45,019	44,835	-184
CO	716,184	711,314	-4,870

As described in Chapter 5, the NSR Efficiency Scenarios examine emissions changes based on very conservative estimates of technically feasible improvements in efficiency. We conclude that to any extent that EGU hours of operation increase under a maximum hourly test, as opposed to the current average annual 5-year baseline test, such increased hours of operation would not increase national EGU $PM_{2.5}$, VOC, and CO emissions. The increased efficiency would have very little effect on national $PM_{2.5}$ emissions, with less than half of a percent increase nationally. This conclusion as to emissions in the contiguous 48 States supports extending the proposed rules nationwide, instead of limiting them to the States in the CAIR region.

6.4 $PM_{2.5}$, VOC, and CO Local Emissions Impact

To examine the effect of the maximum hourly test on local air quality, we compared 2020 county-level EGU $PM_{2.5}$, VOC, and CO emissions under the CAIR/CAMR/CAVR 2020 and NSR Efficiency Scenario.[48] Tables 6.3 through 6.5 show these comparisons.[49]

Table 6.3 Changes in County-level $PM_{2.5}$ Emissions NSR Efficiency Scenario

Changes in $PM_{2.5}$ Emissions	Counties
Total # of counties with decreases in EGU emissions	187
# of counties with decreases in EGU emissions between -40 and -599 tpy	33
# of counties with decreases in EGU emissions between -1 and -39 tpy	154
# of counties with no change in EGU emissions	713
# of counties with increases in EGU emissions between 1 and 39 tpy	31
# of counties with increases in EGU emissions between 40 and 1,000 tpy	22
# of counties with increases in EGU emissions between 1,001 and 3,672 tpy	2
Total # of counties with increases in EGU emissions	55

[48] Emissions information available as Docket Item EPA-HQ-OAR-2005-0163, DCN 18. [NSR Efficiency $PM_{2.5}$, VOC, and CO.] Emission increases of at least 0.5 tpy. Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units). New units (IPM new units and planned-committed units) were not included in CAIR/CAMR/CAVR 2020 and NSR Efficiency county-level emission totals because they had not been assigned to a county. New EGUs would not be subject to proposed rule. New EGUs would be subject to major NSR, including control technology review for installation of BACT/LAER.

[49] For the reasons we discuss in Section 3.4, the modeling results are illustrative of likely variation in effects at the local level under alternative scenarios rather than definitive projections of the emissions from individual (specific) EGUs or plants.

Table 6.4 Changes in County-level VOC Emissions NSR Efficiency Scenario

Changes in VOC Emissions	Counties
Total # of counties with decreases in EGU emissions	131
# of counties with decreases in EGU emissions between -1 and -20 tpy	131
# of counties with no change in EGU emissions	792
# of counties with increases in EGU emissions between 1 and 39 tpy	31
# of counties with increases in EGU emissions between 40 and 88 tpy	1
Total # of counties with increases in EGU emissions	32

Table 6.5 Changes in County-level CO Emissions NSR Efficiency Scenario

Changes in CO Emissions	Counties
Total # of counties with decreases in EGU emissions	269
# of counties with decreases in EGU emissions between -40 and -659 Tpy	39
# of counties with decreases in EGU emissions between -1 and -39 tpy	230
# of counties with no change in EGU emissions	591
# of counties with increases in EGU emissions between 1 and 39 tpy	83
# of counties with increases in EGU emissions between 40 and 7 31 tpy	12
Total # of counties with increases in EGU emissions	95

As Tables 6.3 through 6.5 show, the proposed revised NSR applicability tests would, under the very conservative assumptions described in Chapter 5, result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same. That is, this pattern occurs when increased efficiency is assumed, such as we assume for present purposes would occur under the proposed maximum hourly test. The increases and decreases in county-level EGU $PM_{2.5}$, VOC, and CO emissions are small and sparsely distributed.

As Table 6.3 shows, the highest county level $PM_{2.5}$, emission increase was 3,672 tpy. VOC emission increases ranged from 28 to 88 tpy. The highest county level CO emissions increase was 731 tpy. The increases and decreases occurred in CAIR and non-CAIR States.

To gain a further perspective on the projected county-level $PM_{2.5}$, VOC, and CO increases under the NSR Efficiency Scenario, we compared them to actual annual EGU $PM_{2.5}$,, VOC, and CO emissions in 2003 - 2004. As we discussed in Chapter 4, we calculated the actual annual $PM_{2.5}$, VOC, and CO emissions for each EGU using the actual heat input (MMBtu) CEMS data and an emission factor.[50] In 2004, $PM_{2.5}$, emissions changes ranged from a 2,080 tpy decrease to a 3,845 tpy increase as compared to 2003. Thus, the highest county-level projected emissions increases and decreases for $PM_{2.5}$, under the NSR Efficiency Scenario are within the range of the emissions changes that actually occurred.

In 2004, actual VOC emission changes compared to 2003 ranged from a 38 tpy decrease to 53 tpy increase. Thus, the greatest county-level projected emissions increases and decreases for VOC under the NSR Efficiency Scenario are commensurate with the emissions increases and decreases that actually occurred, based on measured data, at individual EGUs over the period of 2003 - 2004.

In 2004, actual CO emission changes compared to 2003 ranged from a 580 tpy decrease to a 623 tpy increase. Thus, the highest county-level projected emissions increases and the greatest projected county-level decreases for CO under NSR Efficiency are commensurate with

[50] Analysis and emission factors used available as Docket Item EPA-HQ-OAR-2005-0163, DCN 15. [2003-2004 $PM_{2.5}$, VOC, and CO Emissions]

the emissions increases and decreases that actually occurred, based on measured data, at individual EGUs over the period of 2003 - 2004.

As this analysis shows, the local emissions increases that the IPM results indicate could theoretically occur from the proposed emissions increase test are not large. They are also within the variability that occurred under the current emissions increase test between the years 2003 - 2004. Furthermore, under the current actual-to-projected-actual emissions increase test, EGU owner/operators can select any 24-month baseline period within the 5-year period immediately preceding the beginning of actual construction of the project. Owner operators can select a baseline period of higher annual emissions under the existing emissions increase test to avoid triggering major NSR applicability. The emission increases observed under the NSR Efficiency Scenario are within the range of the recorded actual annual emissions. Thus, we believe it unlikely that the emission increases under the NSR Efficiency Scenario would lead to a different applicability result under the proposed hourly tests compared to the existing annual emissions increase test.

We next examined the reasons for the largest decreases and increases in county-level emissions under the NSR Efficiency Scenario. Tables 6.6 through 6.8 show the counties with the largest decreases and increases in EGU $PM_{2.5}$,, VOC, and CO emissions.[51]

[51] Emissions information available as Docket Item EPA-HQ-OAR-2005-0163, DCN 18. [NSR Efficiency $PM_{2.5}$, VOC, and CO.] Does not include emissions due to new EGUs (IPM new units and IPM planned-committed units).

Table 6.6 Largest County-level Decreases and Increases of Primary $PM_{2.5}$ Under NSR Efficiency

State	County	Emissions Change (tpy)	Reason for Variations in Unit-level Data
Change in unit-level data for the five counties where Primary $PM_{2.5}$ emissions decrease most			
Pennsylvania	Clearfield	-599	Shawville Unit 1 retires under NSR Efficiency
South Carolina	Berkeley	-471	FGD goes on Jeffries Unit 3 in NSR Efficiency
Missouri	St. Louis	-233	Fuel use decreases under NSR Efficiency
Ohio	Clermont	-200	Beckjord Unit 3 installs SCR and FGD under NSR Efficiency
Indiana	Floyd	-167	Fuel use decreases under NSR Efficiency
Change in unit-level data for the five counties where Primary $PM_{2.5}$ emissions increase most			
State	**County**	**Emissions Change (tpy)**	**Reason for Variations in Unit-level Data**
Tennessee	Humphreys	3,672	Johnsonville units 1-8 retire in CAIR/CAMR/ CAVR
Ohio	Coshocton	1,508	Conesville Units 1-2 retire in CAIR/CAMR/CAVR
Pennsylvania	Berks	958	Titus Units 1-2 retire in CAIR/CAMR/CAVR
Pennsylvania	Snyder	514	Sunbury units retire in CAIR/CAMR/CAVR
New York	Monroe	407	Fuel use increases under NSR Efficiency

Table 6.7 Largest County-level VOC Decreases and Increases Under NSR Efficiency Scenario

State	County	Emissions Change (tpy)	Reason for Variations in Unit-level Data
Change in unit-level data for the five counties where VOC emissions decrease			
Texas	Rusk	-20	Fuel use decreases under NSR Efficiency
Massachusetts	Essex	-17	Fuel use decreases under NSR Efficiency
Kansas	Pottawatomie	-12	Fuel use decreases under NSR Efficiency
Pennsylvania	Clearfield	-10	Shawville Unit 1 retires under NSR Efficiency
North Dakota	Mercer	-10	Fuel use decreases under NSR Efficiency
Change in unit-level data for the five counties where VOC emissions increase most			
State	**County**	**Emissions Change (tpy)**	**Reason for Variations in Unit-level Data**
Tennessee	Humphreys	88	Johnsonville units 1-8 retire in CAIR/CAMR/CAVR
Ohio	Coshocton	28	Conesville Units 1-2 retire in CAIR/CAMR/CAVR
Pennsylvania	Berks	19	Titus Units 1-2 retire in CAIR/CAMR/CAVR
Massachusetts	Barnstable	16	Fuel use increases under NSR Efficiency
Alabama	Morgan	15	Fuel use increases under NSR Efficiency

Table 6.8 Largest County-level CO Decreases and Increases Under NSR Efficiency Scenario

State	County	Emissions Change (tpy)	Reason for Variations in Unit-level Data
Change in unit-level data for the five counties where CO emissions decrease most			
Massachusetts	Essex	-659	Fuel use decreases under NSR Efficiency
Texas	Robertson	-503	Fuel use decreases under NSR Efficiency
Texas	Newton	-352	Fuel use decreases under NSR Efficiency
Mississippi	Benton	-259	Fuel use decreases under NSR Efficiency
Mississippi	Lowndes	-230	Fuel use decreases under NSR Efficiency
Change in unit-level data for the five counties where CO emissions increase most			
State	**County**	**Emissions Change (tpy)**	**Reason for Variations in Unit-level Data**
Tennessee	Humphreys	731	Johnsonville units 1-8 retire in CAIR/CAMR/CAVR
Massachusetts	Barnstable	614	Fuel use increases under NSR Efficiency
Alabama	Morgan	580	Fuel use increases under NSR Efficiency
Iowa	Muscatine	209	Fuel use increases under NSR Efficiency
Pennsylvania	Berks	152	Titus Units 1-2 retire in CAIR/CAMR/CAVR

For some counties in Tables 6.6 though 6.8 where $PM_{2.5}$, CO, and VOC emission decreases are projected, the decreases occur because heat input and emissions decreased at existing units. This effect occurs because more cost effective generation from EGUs that increased their efficiency under the NSR Efficiency Scenario displaces less cost effective generation from other EGUs, which then are operated less. In Clearfield and Snyder Counties, Pennsylvania, decreases occur because EGUs are projected to retire under the NSR Efficiency Scenario, but are not projected to be retired under CAIR/CAMR/CAVR 2020. This effect occurs because more cost effective generation from EGUs that increased their efficiency under the NSR Efficiency Scenario displaces less cost effective generation from other EGUs, which then retire.

As noted previously, county-level increases are small and sparsely distributed. As Tables 6.6 through 6.8 show, the $PM_{2.5}$, VOC, and CO increases are small even in the counties where the highest increases are projected. In most of the counties shown here, the emission increases are due to increased fuel use by the EGUs within those counties, consistent with increased utilization for more efficient units. In Humphreys County, Tennessee, emission increases are due to units projected to retire under the CAIR/CAMR/CAVR 2020 IPM, but not to retire under the NSR Efficiency Scenario. Comparing the NSR run to the Base Case, it appears that emissions in these counties have increased. However, these EGUs have not really increased emissions as compared to historical operation, and they certainly have not increased emissions because they have made changes that avoid major NSR. Rather, the increase is due to plants operating differently under two model runs with different assumptions.

6.5 $PM_{2.5}$, VOC, and CO Air Quality

As Figures 6.1 through 6.3 show,[52] projected $PM_{2.5}$, VOC, and CO emissions changes under the proposed revised NSR applicability tests would result in a somewhat different pattern of local emissions, with some counties experiencing reductions, some experiencing increases, and some remaining the same compared to emissions changes under CAIR/CAMR/CAVR 2020. As Figures 6.1 through 6.3 also show, projected increases in EGU $PM_{2.5}$, VOC, and CO emissions due to increased efficiency at EGUs under the NSR Efficiency Scenario are small in magnitude and sparse across the continental U.S. Therefore, we would expect these increases to

[52] Emissions information available as Docket Item EPA-HQ-OAR-2005-0163, DCN 18. [NSR Efficiency $PM_{2.5}$, VOC, and CO.]

cause minimal changes in local ambient effect in comparison to that observed under CAIR/CAMR/CAVR for $PM_{2.5}$ and ozone (for which VOC is a precursor). Because many counties experience decreases in emissions, we would further expect any local ambient effects from increased emissions to be somewhat diminished because of the emissions decreases elsewhere that yield regionwide improvements in air quality.

Furthermore, as noted in Table 4.1, EGU VOC emissions are less than one percent of national VOC emissions. Also national VOC emissions and national EGU VOC emissions are declining. For these reasons, EGUs do not contribute significantly to national or local VOC emissions. Moreover, as we also discussed in Section 4.1, EGU owner/operators have natural incentives to reduce VOC emissions.

The Agency has not conducted regional modeling for CO. Nonetheless, due to the small magnitude and sparse distribution of CO increases, we would expect these increases to cause minimal changes in local ambient effect in comparison to current air quality. As noted in Table 4.1, EGU CO emissions are less than one percent of national CO emissions. As we also note, local CO emissions are generally a function of traffic congestion from mobile sources. For these reasons, EGUs do not contribute significantly to national or local CO emissions. Furthermore, as with VOCs, EGU owner/operators have natural incentives to reduce CO emissions.

There currently are only five CO nonattainment areas: El Paso, Texas; Las Vegas, NV; Los Angeles South Coast Air Basin, CA; Missoula, MT; and Reno, NV. For these five local areas, we computed the net emissions change in the EGU CO emissions between CAIR/CAMR/CAVR 2020 and NSR Availability. Appendix B of this document includes this analysis. As Appendix B shows, in all of these counties, IPM projects no change or a decrease in emissions in the NSR Efficiency Scenario compared to CAIR/CAMR/CAVR 2020. We would expect these changes to cause minimal local ambient effect on CO. Therefore, based on lack of emission increases compared to CAIR/CAMR/CAVR 2020, and the small contribution of EGU emissions to national and local CO levels, we project no notable local impact on air quality from EGU CO emissions from the NSR Efficiency Scenario.

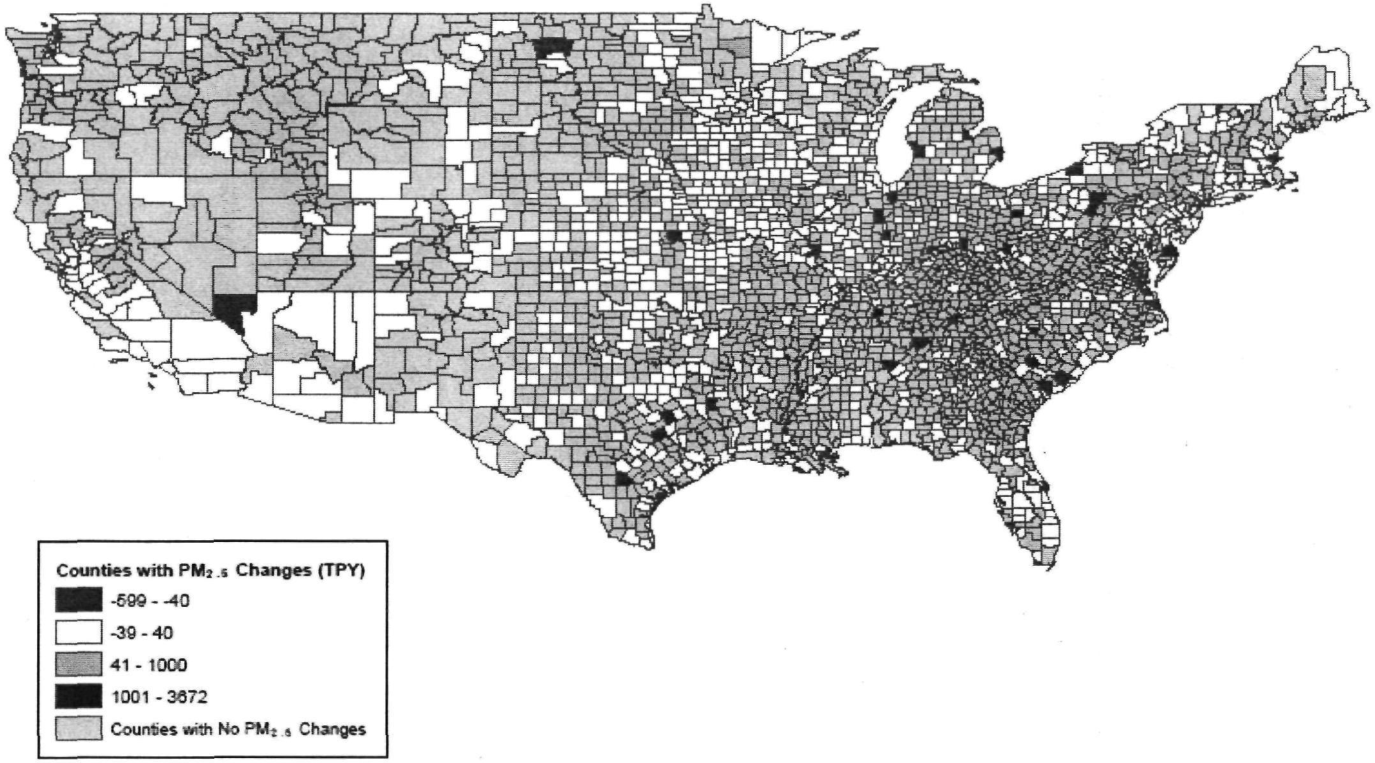

Figure 6.1 2020 County Level $PM_{2.5}$ Emissions Changes – Efficiency Scenario

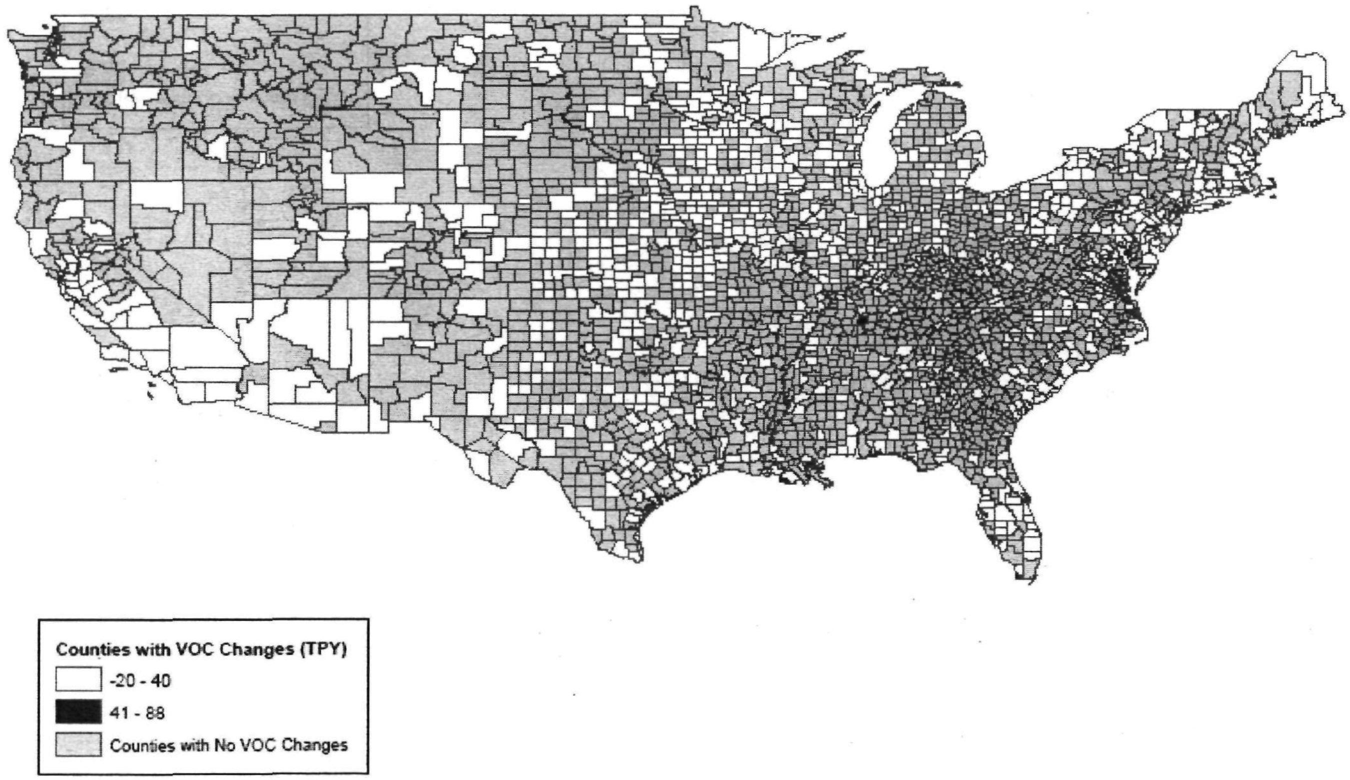

Figure 6.2 2020 County Level VOC Emissions Changes – Efficiency Scenario

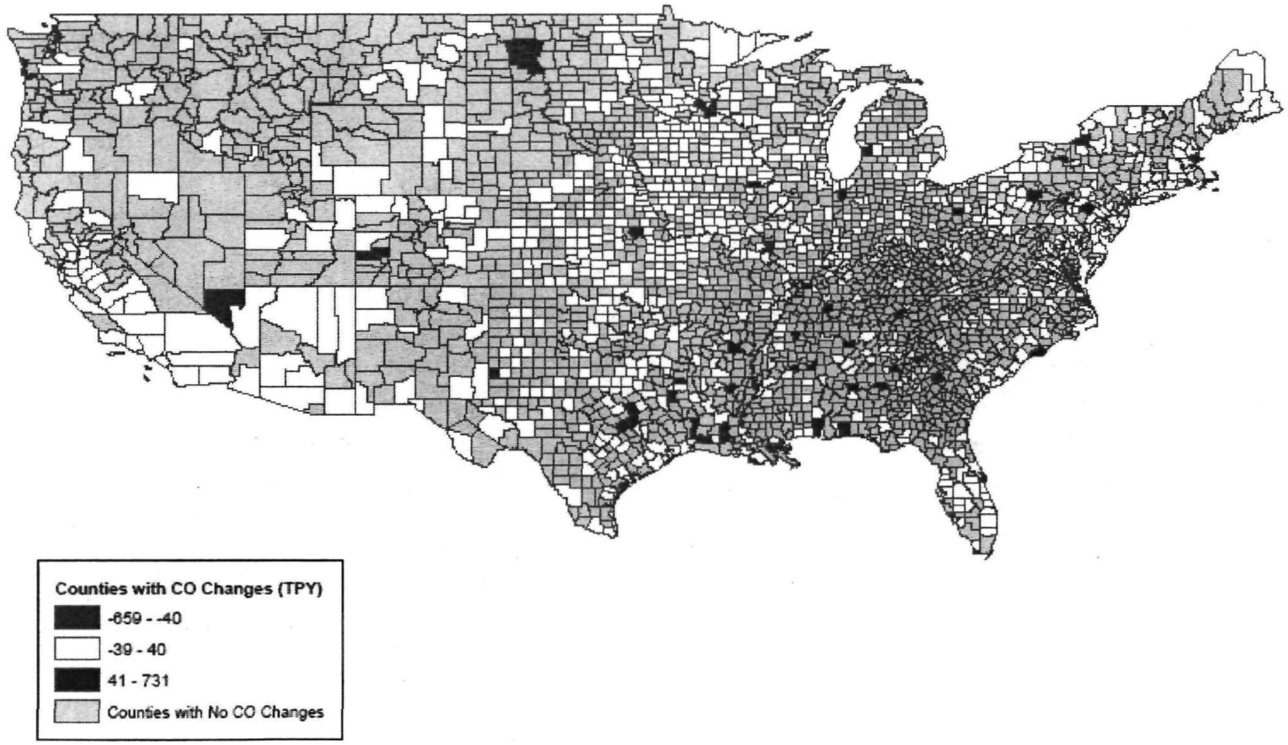

Figure 6.3 2020 County Level CO Emissions Changes – Efficiency Scenario

Appendices

Appendix A

Net Change in 2020 EGU SO_2 and NO_x Emissions Under NSR Availability and Efficiency Compared to Total State SO_2 and NO_x Emissions

Appendix A-1. Net Change in 2020 NSR EGU State SO_2 Emissions Compared to Total State SO_2 Emissions

State	Net Change in EGU SO_2 Emissions NSR Efficiency (TPY)	Net Change in EGU SO_2 Emissions NSR Availability (TPY)	Statewide SO_2 Emissions CAIR/CAMR/CAVR 2020 (TPY)	Efficiency Change as % Total	Availability Change as % Total
Alabama	-1,822	-20,740	404,008	0%	-5%
Alaska	0	0	21,260	0%	0%
Arizona	316	1,856	106,516	-2%	0%
Arkansas	0	1,077	160,747	0%	1%
California	-6	239	92,092	0%	0%
Colorado	-492	2,713	78,121	-1%	3%
Connecticut	0	184	23,036	-8%	-7%
Delaware	-101	1,307	103,137	0%	1%
District of Columbia	0	0	8,992	-3%	-3%
Florida	-55	8,780	350,121	0%	3%
Georgia	6,516	-24,179	303,711	2%	-8%
Hawaii	0	0	59,337	0%	0%
Idaho	0	0	33,119	0%	0%
Illinois	-531	11,881	606,029	-2%	0%
Indiana	-1,488	10,404	544,567	-1%	2%
Iowa	-1,230	5,893	281,328	-3%	0%
Kansas	-1,631	2,763	90,953	-2%	3%
Kentucky	-3,759	10,965	345,501	-3%	2%
Louisiana	0	2,929	496,455	0%	1%
Maine	0	325	68,154	-3%	-2%
Maryland	0	1,112	132,385	-2%	-1%
Massachusetts	163	641	138,055	-2%	-2%
Michigan	-4,601	17,313	544,906	-1%	3%
Minnesota	-11,670	-8,724	130,026	-9%	-7%
Mississippi	285	2,123	134,670	0%	2%
Missouri	-2,605	8,749	445,291	-1%	2%
Montana	-1,835	-1,505	57,540	-3%	-3%
Nebraska	-711	1,735	61,335	-1%	3%
Nevada	-829	-3,507	33,831	-2%	-10%
New Hampshire	0	0	29,980	-12%	-12%
New Jersey	-293	119	103,058	0%	0%
New Mexico	0	2,497	181,326	0%	1%
New York	2,058	-1,762	314,928	0%	-1%

Appendix A-1. Net Change in 2020 NSR EGU State SO_2 Emissions Compared to Total State SO_2 Emissions

State	Net Change in EGU SO_2 Emissions NSR Efficiency (TPY)	Net Change in EGU SO_2 Emissions NSR Availability (TPY)	Statewide SO_2 Emissions CAIR/CAMR/CAVR 2020 (TPY)	Efficiency Change as % Total	Availability Change as % Total
North Carolina	1,575	2,391	215,595	-1%	-1%
North Dakota	-2,177	2,884	214,795	-1%	1%
Ohio	626	-12,045	437,903	0%	-3%
Oklahoma	-115	2,108	92,440	0%	2%
Oregon	0	474	58,030	0%	1%
Pennsylvania	9,791	-8,017	364,935	3%	-2%
Rhode Island	0	0	10,153	-4%	-4%
South Carolina	-7,632	1,902	173,698	-7%	-1%
South Dakota	0	163	27,631	0%	1%
Tennessee	16,582	-18,791	266,366	6%	-7%
Texas	-2,872	-7,409	618,508	-2%	-3%
Utah	-206	1,775	62,308	0%	3%
Vermont	0	0	11,606	-6%	-6%
Virginia	9	421	187,486	-2%	-2%
Washington	0	578	77,584	0%	1%
West Virginia	-941	4,081	200,548	-1%	1%
Wisconsin	-1,152	339	290,184	-1%	-1%
Wyoming	-110	-6,576	116,317	0%	-6%

Availability from EPA219b_NSR_OAQPS_5_Pec_2020_(To EPA) 07-05-06.xls. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14.

Efficiency from EPA219b_NSR_OAQPS_2a_Pech_2020 (to EPA) 4-27-06.xls. Available as Docket Item. Efficiency SO_2 and NO_x Emissions Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 07.

Statewide emissions data from EPA Analyses on Multipollutant Legislation. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 09.

Appendix A-2. Net Change in 2020 NSR EGU State NO_x Emissions Compared to Total State NO_x Emissions

State	Net Change in EGU NO_x Emissions NSR Efficiency (TPY)	Net Change in EGU NO_x Emissions NSR Availability (TPY)	Statewide NO_x Emissions CAIR/CAMR/CAVR 2020 (TPY)	Efficiency Change as % Total	Availability Change as % Total
Alabama	857	-53	278,013	-1%	-1%
Alaska	0	0	86,419	0%	0%
Arizona	-72	2,834	277,013	-1%	0%
Arkansas	-86	1,321	220,397	0%	0%
California	-49	-87	775,856	-1%	-1%
Colorado	-669	2,491	204,480	0%	1%
Connecticut	-5	246	77,563	-2%	-2%
Delaware	-144	479	44,155	0%	1%
District of Columbia	0	0	9,977	-2%	-2%
Florida	51	1,706	413,481	-2%	-1%
Georgia	1,644	-9,581	346,886	-1%	-4%
Hawaii	0	0	64,149	0%	0%
Idaho	0	0	115,895	0%	0%
Illinois	176	1,923	451,611	0%	0%
Indiana	-1,074	1,485	372,156	-1%	0%
Iowa	-415	476	197,735	-1%	-1%
Kansas	-942	1,815	232,808	-1%	1%
Kentucky	-328	2,286	308,910	0%	1%
Louisiana	-233	1,199	688,070	0%	0%
Maine	0	41	60,407	-1%	-1%
Maryland	0	72	164,694	-1%	-1%
Massachusetts	-78	670	171,707	-1%	0%
Michigan	-1,362	3,883	443,323	-1%	0%
Minnesota	-119	1,664	269,632	0%	1%
Mississippi	-214	264	232,760	0%	0%
Missouri	-1,746	1,567	286,013	-1%	1%
Montana	-142	1,745	129,714	0%	1%
Nebraska	-596	1,957	147,473	0%	1%
Nevada	-432	-882	86,789	-2%	-2%
New Hampshire	0	34	39,228	-2%	-2%
New Jersey	-149	60	197,531	0%	0%
New Mexico	-8	3,421	264,963	0%	1%
New York	278	1,382	421,630	-1%	-1%
North Carolina	80	1,824	257,614	-2%	-1%
North Dakota	-977	1,784	107,842	-1%	2%

Appendix A-2. Net Change in 2020 NSR EGU State NO_x Emissions Compared to Total State NO_x Emissions

State	Net Change in EGU NO_x Emissions NSR Efficiency (TPY)	Net Change in EGU NO_x Emissions NSR Availability (TPY)	Statewide NO_x Emissions CAIR/CAMR/CAVR 2020 (TPY)	Efficiency Change as % Total	Availability Change as % Total
Ohio	-228	-5,988	439,737	0%	-2%
Oklahoma	-387	2,291	275,407	-1%	0%
Oregon	0	379	144,461	0%	0%
Pennsylvania	2,842	-2,925	485,111	0%	-1%
Rhode Island	0	0	23,814	0%	0%
South Carolina	-513	1,114	175,163	-3%	-2%
South Dakota	-8	57	41,845	0%	0%
Tennessee	1,893	560	251,093	1%	0%
Texas	-2,025	860	1,163,006	-2%	-1%
Utah	-111	2,519	157,523	0%	2%
Vermont	0	0	19,740	-1%	-1%
Virginia	61	454	339,589	-1%	-1%
Washington	0	639	184,239	-1%	0%
West Virginia	91	1,806	168,983	0%	1%
Wisconsin	1,143	1,010	216,712	-1%	-1%
Wyoming	-425	2,508	210,178	0%	1%

Availability from EPA219b_NSR_OAQPS_5_Pec_2020_(To EPA) 07-05-06.xls. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 14.

Efficiency from EPA219b_NSR_OAQPS_2a_Pech_2020 (to EPA) 4-27-06.xls. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 07.

Statewide emissions data from EPA Multipollutant Analyses. Available as Docket Item EPA-HQ-OAR-2005-0163, DCN 09.

Appendix B

Net EGU CO Emissions Change in Counties that are Nonattainment for CO NAAQS

Appendix B. Net EGU CO Emissions Change in Counties that are Nonattainment for CO

State	Class I Name(s)	Counties	CAIR/CAMR/CAVR CO Emissions 2020 (tpy)	NSR CO Availability (tpy)	Net CO Emissions Change (NSR Availability Minus CAIR/CAMR/CAVR 2020)	NSR CO Efficiency (tpy)	Net CO Change (N N CAIR/CAM
CA	Los Angeles South Coast Air Basin	Los Angeles	7,765	7,050	-715	7,764	
		Orange	43	43	0	43	
		Riverside	12	12	0	12	
		San Bernardino	540	553	13	540	
NV	Reno	Washoe	-	-	-	-	
NV	Las Vegas	Clark	4,691	4,493	-198	4,619	
MT	Missoula	Missoula	-	-	-	-	
TX	El Paso	El Paso	3	0	-3	3	

CAIR/CAMR/CAVR data and availability emissions information available as Docket Item EPA-HQ-OAR-2005-0163, DCN 17. [NSR Availability $PM_{2.5}$, VOC, and CO.]

Efficiency emissions information available as Docket Item EPA-HQ-OAR-2005-0163, DCN 18. [NSR Efficiency $PM_{2.5}$, VOC, and CO.]

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