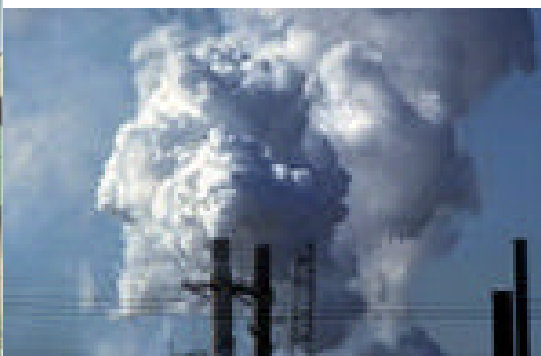


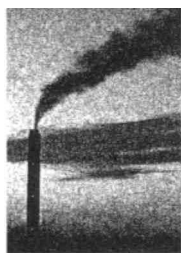
# Scraping the "Bottom of the Barrel" for Power:

**Why there is No Need to Relax Clean Air Safeguards on Dirty Power Plants to "Keep the Lights On"**

*A Rebuttal to the National Coal Council's Electricity Availability Report*



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## **Credits**

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November 8, 2001

## EXECUTIVE SUMMARY

In May 2001, the National Coal Council, an organization little-known outside Washington, D.C. energy circles, released a report claiming that:

- Approximately 40,000 megawatts of electrical production capacity is readily available from existing coal-fired power plants and could be recovered in about 36 months; and
- Relaxation of the requirements of the Clean Air Act's New Source Review (NSR) program would be necessary in order to recover that capacity.

The report, "Increasing Electricity Availability from Coal-Fired Generation in the Near-Term"<sup>1</sup> received extensive news coverage in the weeks preceding release of the Bush Energy Plan.<sup>2</sup> While ostensibly constituted as a neutral stakeholder advisory group under the Federal Advisory Committee Act (FACA), a review of the membership of the Coal Council makes clear that it is dominated by pro-coal interests and the authorship of the report demonstrates that it was simply another phase in the concerted coal industry campaign to influence the Bush Administration to relax environmental protections in order to favor increased coal use.<sup>3</sup>

Bush Administration officials initially rushed to embrace the claims of the report. While addressing the National Association of Manufacturers, Environmental Protection Agency (EPA) Administrator Whitman echoed the report's findings and characterized the NSR program -- without substantiation -- as having the unintended consequence of obstructing energy efficiency improvements that could yield significant environmental gains at older plants.<sup>4</sup> Department of Energy Secretary Abraham, for whom the Coal Council report was prepared, has stated that the report provided important information and recommendations and has requested a follow up study. In fact, important anti-clean air recommendations from the Coal Council report were incorporated in that portion of the Bush Administration's National Energy Policy devoted to addressing what the Administration has characterized as a nationwide electricity reliability "crisis":<sup>5</sup>

- A 90-day review by the EPA and DOE of the Clean Air Act's New Source Review (NSR) program to determine its impact on electric generating capacity; and
- Review by the Attorney General of the legal basis for pending Clean Air Act enforcement actions brought against the 13 corporate owners of over 50 older, coal-

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<sup>1</sup> "Increasing Electricity Availability from Coal-Fired Generation in the Near-Term," The National Coal Council, (May 2001) available online at: [www.nationalcoalcouncil.org/Documents/May2001report-revised.pdf](http://www.nationalcoalcouncil.org/Documents/May2001report-revised.pdf)

<sup>2</sup> See e.g., "Mining Firms Say Clean-Air Rule Damps Overhaul of Power Plants," by John J. Fialka, *Wall Street Journal*, May 1, 2001; "White House Debates Fate Of Pollution-Control Suits," by Katharine Q. Seelye, *The New York Times*, May 7, 2001; "Coal Is Vital, Utilities Say; Power Companies Seek to Alter Enforcement Of EPA Rule," by Peter Behr, *The Washington Post*, May 3, 2001.

<sup>3</sup> Id.

<sup>4</sup> EPA Administrator Christine Todd Whitman Delivers Remarks at the National Association of Manufacturers, June 12, 2001. Political Transcripts by Federal Document Clearing House (Copyright 2001 by Federal Document Clearing House, Inc.).

<sup>5</sup> National Energy Policy: Report of the National Energy Policy Development Group (May 2001).

fired power plants for making life-extending capital investments in the plants without upgrading their emission controls.

Given the statements of Administration officials denigrating the value of the NSR program, these reviews are widely seen as the initial step in rolling back environmental safeguards applicable to old, dirty coal-fired plants under the guise of meeting the nation's electricity needs.

With the EPA 90-day NSR review process currently stalled, efforts to revive the Administration attack on clean air protections will undoubtedly rely again on the claims of the Coal Council report. However, a critical review of the report and the assumptions on which it is based reveals a number of serious flaws:

- First, the underlying premise of the report -- that the recoverable capacity from old, coal-fired power plants is desperately needed because of an electricity shortage -- is unfounded. There is no nationwide electricity reliability crisis that justifies relaxation of clean air safeguards in order to allow greater utilization of old, coal-fired plants. In fact, the U.S. is in the midst of an unprecedented power plant building boom. Plant developers have announced the intent to build over 400,000 megawatts of new capacity between 2000 and 2005 -- ten times the generating capacity from old plants the Coal Council claims could be recovered. A more realistic estimate of likely increased capacity is about 260,000 megawatts -- an increase of approximately 30 percent above the current U.S. installed capacity. Almost all of this new capacity will be fueled by cleaner-burning natural gas that will be required to meet modern air emission standards.
- Clean air safeguards, such as the NSR program, are not blocking any significant potential environmental gains. An analysis of the potential emission reduction benefits of aggressive heat rate improvements demonstrates that there is no "treasure trove" of environmental benefits in potential efficiency upgrades at the nation's existing coal plant fleet. In fact, simply pursuing to successful completion the current NSR enforcement actions against the 13 companies charged with Clean Air Act violations would yield an order of magnitude more environmental benefits than aggressive heat rate improvements at *all* of the nation's coal-fired plants.
- Recovery of capacity from old, coal-fired plants would lead to thousands of tons of unnecessary pollution each year. The documented boom in new gas plant construction demonstrates that if the old, coal-fired capacity identified by the Coal Council report is not recovered, that demand for electricity will be met by relatively cleaner gas generation that complies with new source emission standards. Thus, it is possible to quantify the increase in emissions if incremental energy demand is met in the way the Coal Council proposes -- i.e., through the recovery of lost capacity and old, dirty coal-fired plants. Assuming that this recovered capacity is utilized during the period of peak summer demand, the resulting emissions would be about 20,000 tons of sulfur dioxide, over 9,000 tons of nitrogen oxides, and nearly 4 million tons of carbon dioxide. If that same demand was met through new, combined cycle natural gas plants, the respective emissions would be 0 tons of sulfur dioxide, 3,000 tons of nitrogen oxide, and 1.3 million tons of carbon dioxide.

- The fundamental finding of the study -- that recovery of a large amount of "lost" capacity at old, coal-fired plants is readily available -- also cannot withstand scrutiny. First and foremost, the Coal Council report used flawed methodology, making gross assumptions about recoverable capacity and then doubling them without support to reach its 40,000 megawatt claim. A closer examination of the Coal Council's claims reveals that any such capacity will be difficult and expensive to recover. An independent analysis was able to confirm only 35,000 megawatts of existing potential capacity lost to deratings or shutdowns (about 28,500 MW in deratings and about 6,500 MW in shutdowns). The capacity in shutdown mode constitutes only about 1 percent of the nation's total capacity. The capacity lost to deratings, while not an insubstantial amount of power, exists only in very small increments (an average of 24 megawatts per unit) at over 1,200 units, which would make recovery difficult and monumentally expensive.

In summary, when the U.S. is awash in new, relatively cleaner natural gas generation, we do not need to throw out clean air safeguards and scrape the "bottom of the barrel" for power from old, coal-fired power plants in order to "keep the lights on".

## **BACKGROUND**

There are more than 500 major coal-fired power plants in the U.S. today, and the vast majority are decades old. Because of a "grandfathering" loophole in the Clean Air Act, these oldest, dirtiest plants have been able to avoid modern pollution controls. This loophole was granted because it was expected that these old plants would retire and be replaced by cleaner new plants, and therefore should not be made to meet modern standards. But an important limitation was placed on this loophole to keep it from being abused. To limit this loophole, a key provision of the Clean Air Act known as "New Source Review" or "NSR" was created. New Source Review requires the plant owners to upgrade their pollution controls to modern standards whenever they make modifications that extend the life of the plants and significantly increase their emissions.

In the last ten years, however, it has become clear that all too often this did not happen. In the 1990s, the United States Environmental Protection Agency (EPA) and the U.S. Department of Justice (DOJ) began to investigate electric power producers for violations of New Source Review. The investigation showed that for years many plant owners had been making major capital investments, extending the lives of their plants while increasing pollution without upgrading pollution controls — all in clear violation of the Clean Air Act. As a result, to date EPA and DOJ have brought enforcement actions against thirteen power companies for violations at 51 power plants in twelve states.<sup>6</sup>

The National Coal Council report and its recommendations to scrap NSR requirements for older plants is an effort to give these "grandfathered" plants a new lease on life and to legitimize the illegal actions by companies that made major overhauls without upgrading pollution controls. In fact, the Coal Council report appears to be just one tactic in a larger industry effort to weaken New Source Review protections and stop the NSR enforcement actions.

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<sup>6</sup> U.S. EPA, Office of Enforcement and Compliance Assurance, "Summary of Power Plants Enforcement," available at <http://es.epa.gov/oeca/ore/aed/coal/ppsl.html>.

In an earlier report, "Power to Kill: Death and Disease from Power Plants Charged with Violating the Clean Air Act,"<sup>7</sup> the Clean Air Task Force found that pollution from the 51 power plants charged with NSR violations shortens the lives of between 5,500 and 9,000 people each year. Despite the high stakes for public health, the Bush Energy Plan has thrown into doubt the future of efforts to curb these emissions. The White House has directed EPA to conduct a 90-day "review" of its NSR policy, and has told the Justice Department to review the statutory and regulatory basis for its enforcement actions.<sup>8</sup>

To date, the Bush Administration's review of the NSR rules and enforcement cases has focused almost exclusively on claims, such as the Coal Council's, that the rules are onerous because they prevent them from making necessary repairs and upgrades to improve efficiency and reliability of their power plants. However, today's Clean Air Task Force report meets those claims head-on and concludes that clean air safeguards need not be relaxed in order to maintain electric system reliability and that our nation's power demands are being met by much cleaner new generating capacity.

### ***New Source Review Does Not Threaten Electric System Reliability***

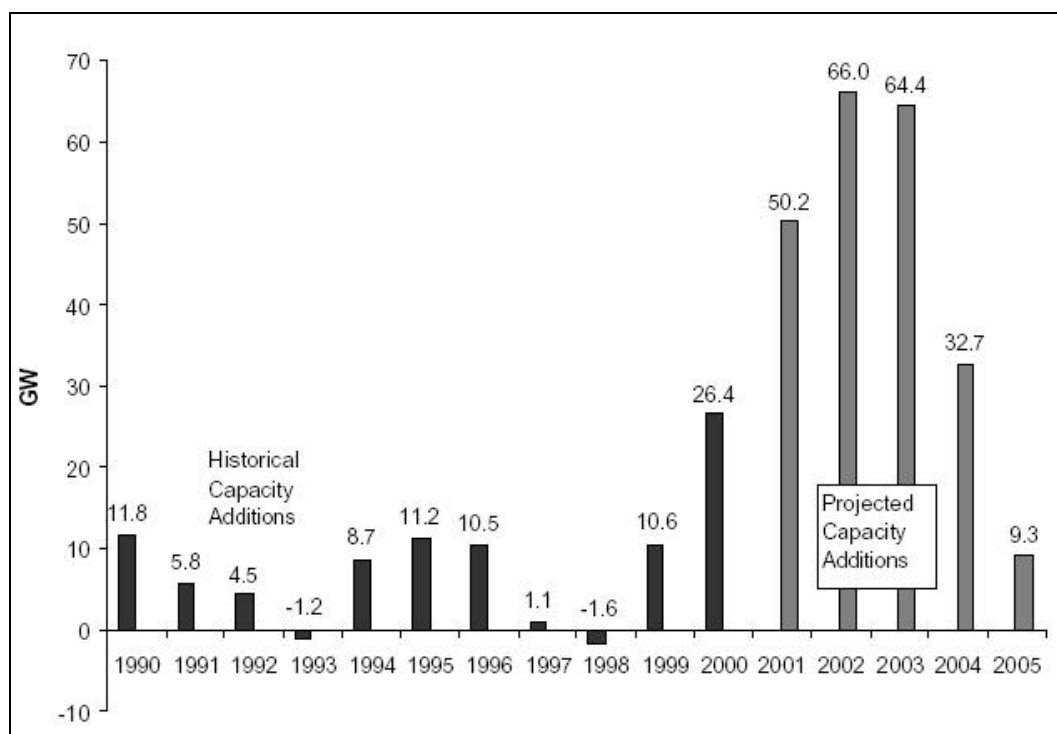
Industry representatives and some Administration officials have claimed that the NSR program threatens electric system reliability both by chilling new power plant development and preventing older plants from running harder. The facts tell a different story: power plant developers have announced that they will build over 400,000 megawatts of new capacity by 2005. The NorthBridge Group, an energy firm whose clients include Cinergy, Inc. and other coal-fired power companies, has found that nearly 260,000 of these announced megawatts are highly likely to go online by 2005.<sup>9</sup> This new capacity equals nearly one-third of the current installed capacity of the U.S. Figures 1 and 2 demonstrate the unprecedented boom in new power plant construction and the ample headroom (reserve margin) that results in each National Electricity Reliability Council region. The vast majority of this new generation will be powered by natural gas. NorthBridge found that in 1999 and 2000, most new capacity that became operational was gas combustion turbine peaking units. However, new base-load combined cycle units dominate the generation projected to become operational in 2002-2003. The bulk of the planned capacity growth takes place by 2004 -- the date by which the National Coal council claims its 40,000 megawatts could be recovered.

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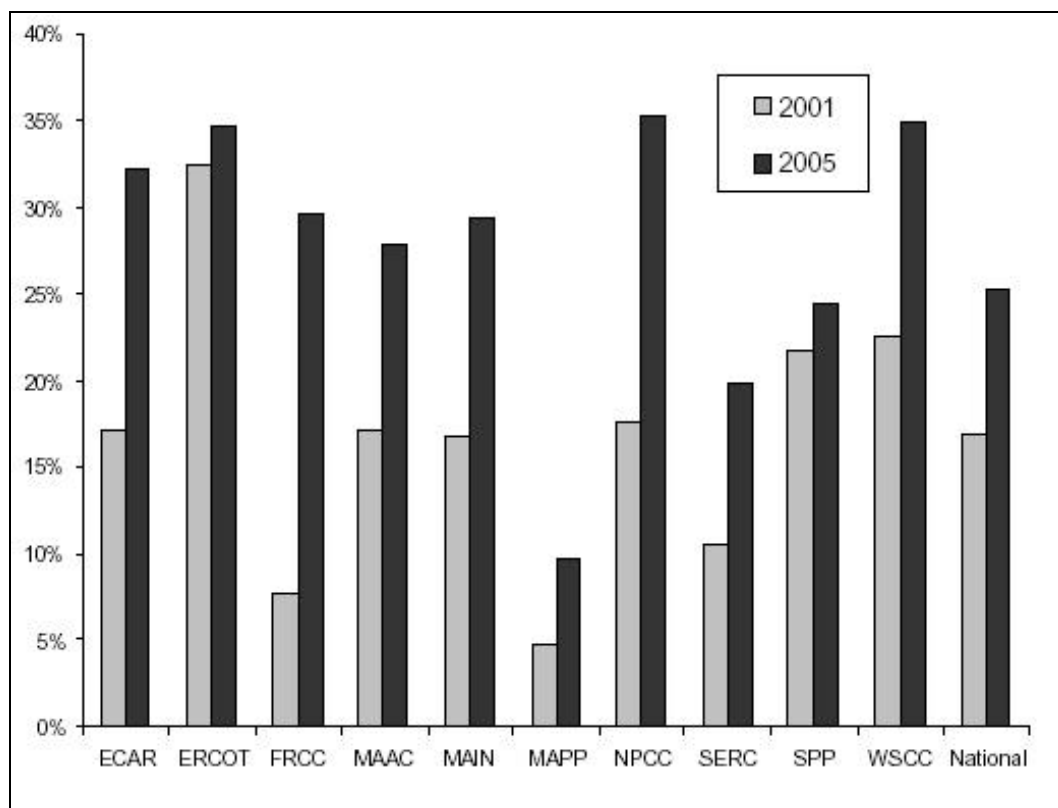
<sup>7</sup> Clean Air Task Force, "Power to Kill: Death and Disease from Power Plants Charged with Violating the Clean Air Act" (July 2001) available online at [www.cleartheair.org](http://www.cleartheair.org)

<sup>8</sup> *The National Energy Policy: Report of the National Energy Policy Development Group* (May 2001) available online at: <http://www.whitehouse.gov/energy/>.

<sup>9</sup> See Appendix A.



**Figure 1. U.S. Historical and Projected Capacity Additions (NorthBridge Group).**

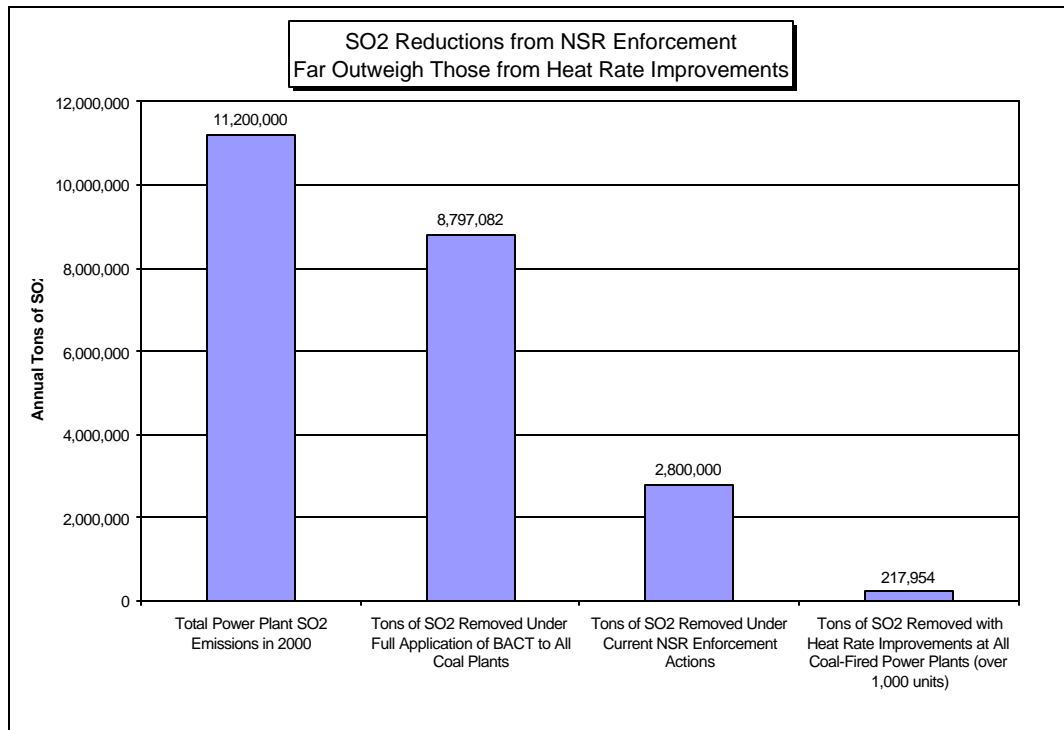


**Figure 2. Regional Reserve Margin (NorthBridge Group).**

Those who would seek to discard our clean air safeguards have used the myth of a nationwide electricity reliability crisis as a justification for rolling back NSR requirements. This data on new power plant construction debunks the myth of a nationwide electricity crisis. Moreover, natural gas prices continue to fall. Even despite the documented building boom in new gas plants, forward price quotes for natural gas through 2003 are flat or trend downward.<sup>10</sup>

***New Source Review Is Not Obstructing Meaningful Environmental Improvement.***

Power companies charged with violating the Clean Air Act have claimed that NSR is a well-intentioned program that, due to misguided implementation, is obstructing environmental improvement by creating disincentives for efficiency improvements at power plants. Even EPA Administrator Whitman recently echoed this line while addressing the National Association of Manufacturers.<sup>11</sup> In fact, MSB Energy Associates has calculated the potential emission benefits from aggressive heat rate improvements at the nation's coal fleet.<sup>12</sup> Figures 3, 4, and 5 illustrate that the incremental emissions benefits entailed in these efficiency improvements are dwarfed by the benefits of



**Figure 3. SO<sub>2</sub> Reductions from NSR Enforcement Far Outweigh Those from Heat Rate Improvements (MSB Energy Associates).**

requiring these plants to meet Best Available Control Technology. When compared to the heat rates of new power plants (in the 7,000 Btu/kWh range), the real efficiency loss derives from maintaining an un-level regulatory playing field between old and new sources that encourages running cheap old coal plants (with an average heat rate of

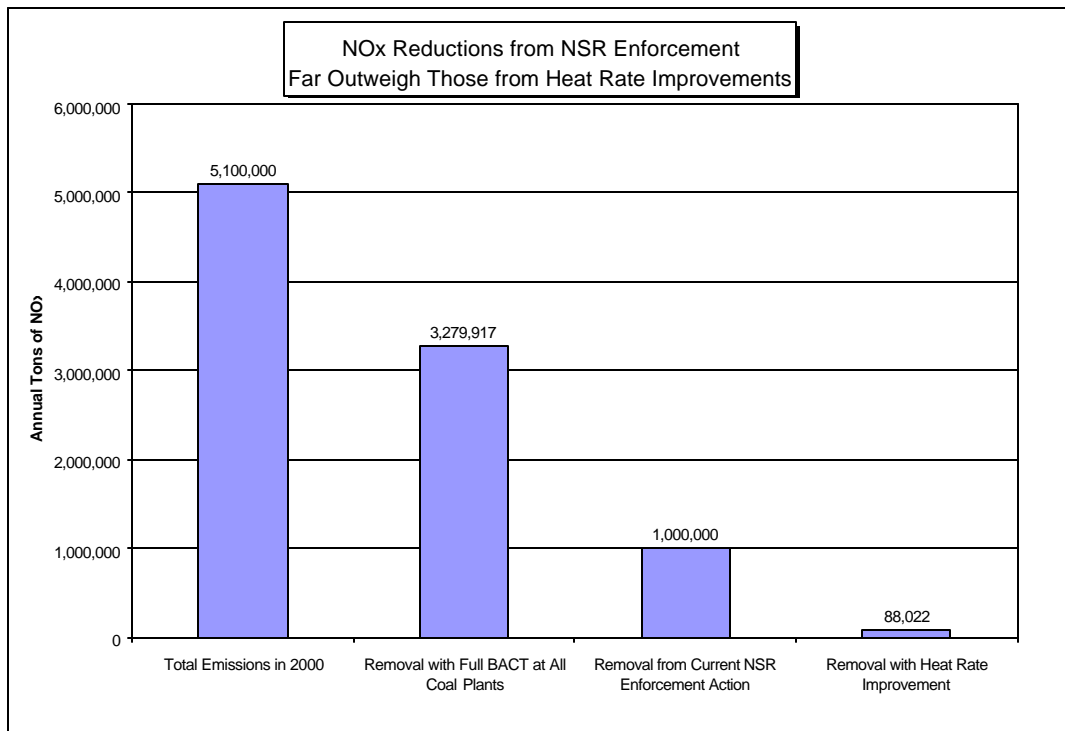
<sup>10</sup> "Monthly Gas Update", Energy and Environmental Analysis, Inc. Vol. 1, Issue 11 (October 2001).

<sup>11</sup> See note 4.

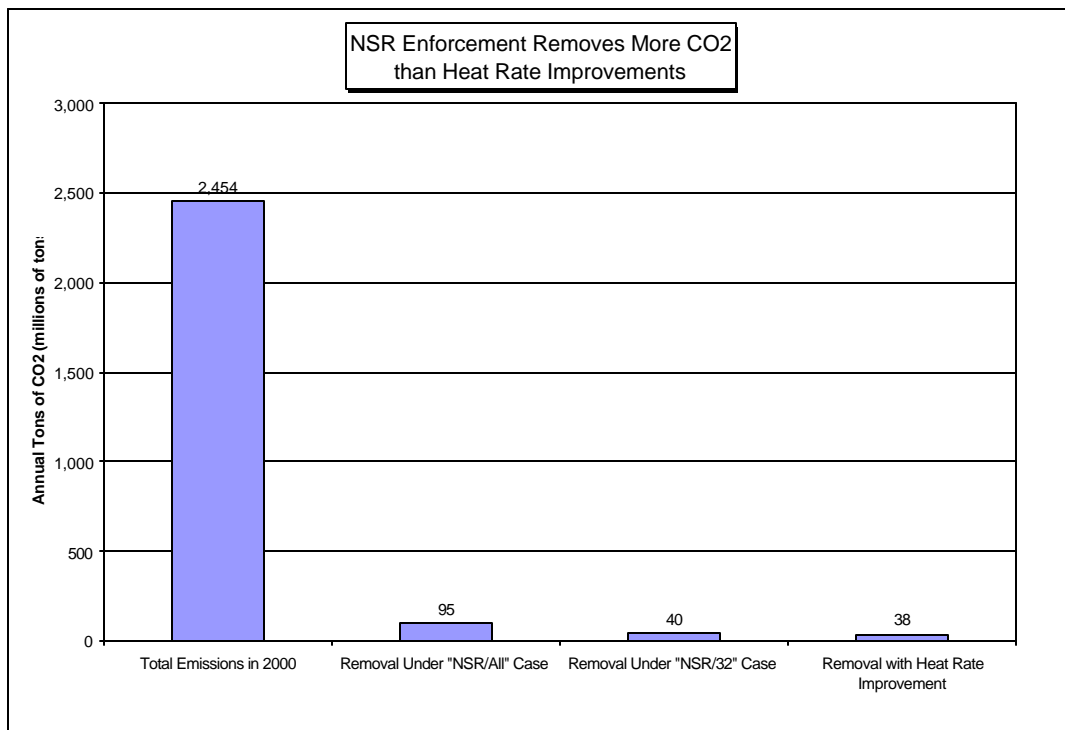
<sup>12</sup> See Appendix B.



10,500 Btu/kWh) instead. There is no "treasure trove" of environmental benefits to be found in efficiency upgrades at older plants.



**Figure 4. NO<sub>x</sub> Reductions from NSR Enforcement Far Outweigh Those from Heat Rate Improvements (MSB Energy Associates).**



**Figure 5. NSR Enforcement Removes More CO<sub>2</sub> than Heat Rate Improvements (MSB Energy Associates).**

### ***The Coal Council's Prescription: Bring Back the Dinosaurs***

Though nearly 90 pages in length, the Coal Council report's analysis boils down to this: the report compares the maximum generating capacity (nameplate) for coal plants with their current operating capacity and finds a difference of 20,000 megawatts. The Coal Council then doubles that amount to 40,000 megawatts by assuming the potential to increase nameplate capacity by an additional 20,000 megawatts, without support for that assumption.

MSB Energy Associates attempted to replicate the Coal Council results, by trying to quantify the capacity lost in (a) deferred or cold shutdown mode and (b) deratings of existing power plants.<sup>13</sup> In addition, MSB assessed the likelihood of this capacity being recovered and the potential emission increases if the derated and shutdown capacity was brought back into service. MSB then compared the increased emissions from this capacity with the emissions from meeting that demand with new natural gas generation.

#### ***Hard to Recover Stray "Cats and Dogs"***

By performing a unit-by-unit analysis, MSB Energy Associates was able to establish that there are 28,474 megawatts of deratings at over 1,200 units. These 1,200 units represent approximately 65 percent of all operating units. While not insignificant in total megawatts, MSB found that the capacity potentially available from recovering deratings tends to come in small increments -- the average amount of capacity derating is 24 megawatts per unit -- and would require plant upgrades at about two-thirds of the nation's generating units.

This makes recovery of this capacity difficult and expensive. There is no pool of a few plants with a large amount of derated capacity just waiting to be recovered. Indeed, because of the number of units that would be affected, recovery would require coordinating repair outages among a large percentage of currently operating plants over a 36 month timeframe, which in itself would pose a challenge to system reliability.

MSB also found only about 6,500 megawatts of capacity currently in deferred or shutdown mode. While this capacity comes in larger chunks, whole units at a time, the total capacity in this category totals only about 1.4 percent of current U.S. capacity. Of course, restarting these plants would literally involve bringing old plants back "from the dead" -- likely the least efficient and most polluting of all possible power sources -- without requiring them to update their pollution controls to modern standards. In sum, a rigorous analysis of the potential for capacity recovery from deratings and deferred/shutdown plants reveals only a modest amount of capacity that would be difficult and expensive to recover.

#### ***The Critical Difference: Unnecessary Pollution***

Based on the NorthBridge Group analysis, it appears highly likely that without the rollbacks of clean air safeguards recommended by the Coal Council, new near-term electricity demand will be met by new natural gas generation. It is possible to calculate

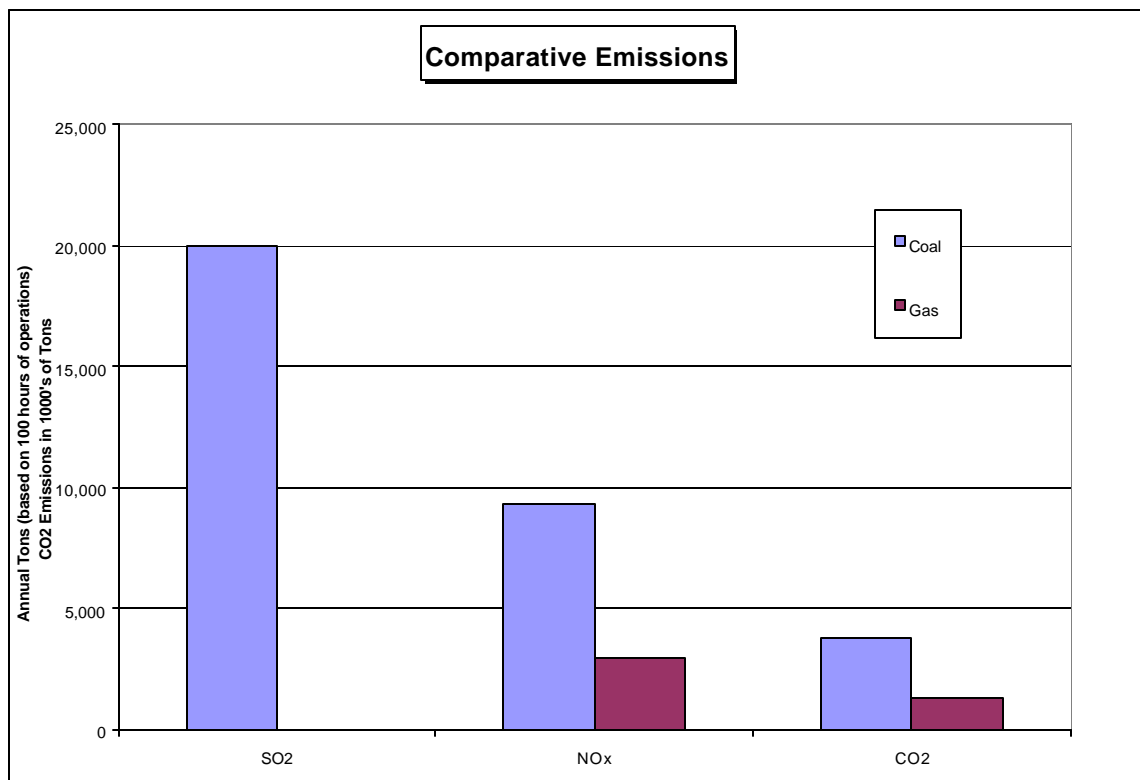
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<sup>13</sup> See Appendix C.

the emission increases that will result if that demand were met by dirty, old coal plants (under the Coal Council's assumption that NSR rules must be relaxed to recover this capacity). It is possible then to compare those emissions to the emissions that would occur if new natural gas capacity met this same demand.

The tightest reserve margins in the electric system typically occur during peak demand on hot summer days. For purposes of analysis, MSB assumed 100 hours of peak load per year would be met by the recovered capacity from the older units. MSB assumed the current emission rates for derated units and further assumed that the shutdown units would have that same emission rate, although in all likelihood they would be even dirtier. Figure 6 compares the estimated emissions from the nearly 35,000 megawatts of recovered old, coal-fired capacity run for 100 hours a year, to the estimated emissions from meeting that demand from new gas plants.

The National Coal Council plan would add nothing to electric system reliability, but would mean tens of thousands of tons of unnecessary air pollution.



**Figure 6. Comparative Emissions from Coal and Natural Gas (MSB Energy Associates).**

## CONCLUSION

So, if the Coal Council's call for recovery of generation capacity from old, dirty, "grandfathered" power plants through relaxation of NSR requirements would not improve system reliability, yield meaningful environmental improvement, and would be costly to

recover, why is the Coal Council making these recommendations? The answer is simple: to protect coal's market share and coal-fired power companies' "bottom line".

The current NSR program provides no impediment to plant owners upgrading their facilities -- they simply have to pay to meet modern pollution standards when they do.<sup>14</sup> This means they must make the capital investments in pollution controls that they have evaded for decades -- capital investments that will reduce the profitability of their old plants. However, if these plants are worth upgrading, they are worth cleaning up, as intended by Congress. No doubt, facing nearly 260,000 megawatts of new gas-powered competition, owners of old coal plants want to secure their market share and maintain their "pollution subsidy" -- the cost of avoiding modern pollution controls, which today amounts to over half a cent per kilowatt hour. For the Coal Council, representing coal producers and owners of old, coal-fired power plants, the campaign to roll back NSR requirements is about trying to remain competitive in the face of a glut of new cleaner fossil generation -- a fight that in a competitive market should be played out on a level playing field of economic and environmental regulation.

*At bottom, the National Coal Council is seeking to use electric system reliability and promise of environmental improvement as a convenient "fig leaf" for protecting coal's market share that has been gained and maintained by keeping old, dirty plants running longer and harder.*

## RECOMMENDATIONS

- The Department of Energy should reject the flawed, unsupported, and biased findings of the Coal Council's May 2001 "Electricity Availability" report. The report fails to: support the claim that 40,000 megawatts of generation are readily recoverable; explain that the tremendous difficulty and expense of recovering this capacity in very small increments makes recovery highly unlikely; disclose just how dirty this recovered capacity would be; and acknowledge the tremendous boom in new electricity generation from cleaner gas-fired plants that relieves the need for recovering this power at all.
- **EPA should reaffirm the NSR rules and redouble its commitment to the NSR enforcement actions against coal-fired plants that broke the law.** In spite of industry claims to the contrary, EPA to date has cited no evidence that NSR rules are inhibiting energy production. Moreover, there is no basis for industry's claims that EPA has unfairly reinterpreted NSR. The NSR provisions of the Clean Air Act are not new. Major modifications that extend the lives of grandfathered plants and significantly increase their pollution cannot be made without also upgrading their emission controls; this approach is indispensable to continued air quality improvement. EPA and the Department of Justice should complete their review, reaffirm the NSR safeguards, and redouble their efforts to enforce them.

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<sup>14</sup> The Coal Council report dangles the possibility of repowering older facilities with advanced coal technologies. If technologies such as Integrated Gasification Combined Cycle (IGCC) demonstrate the environmental performance claimed in the report, then they should have no difficulty meeting New Source Review requirements.

- **The "Lethal Loophole" should be closed for all power plants.** To protect public health in a comprehensive fashion, all fossil power plants should meet modern emission control standards. Ultimately, the nation's power fleet should be held to nationwide caps on all four of the key power plant pollutants, including nitrogen oxides, sulfur dioxide, mercury, and carbon dioxide. A 75 percent reduction in power plant sulfur dioxide and nitrogen oxide emissions would result in substantial health and environmental benefits, and is readily achievable with existing control technologies. The deaths and disease due to power plant pollution can be reduced comprehensively only when the Clean Air Act's 30-year loophole for, old coal-fired power plants is finally closed.

## **Appendix A**

### **Electric Power New Capacity Additions Update**

Erin O'Neill  
The NorthBridge Group  
October 31, 2001

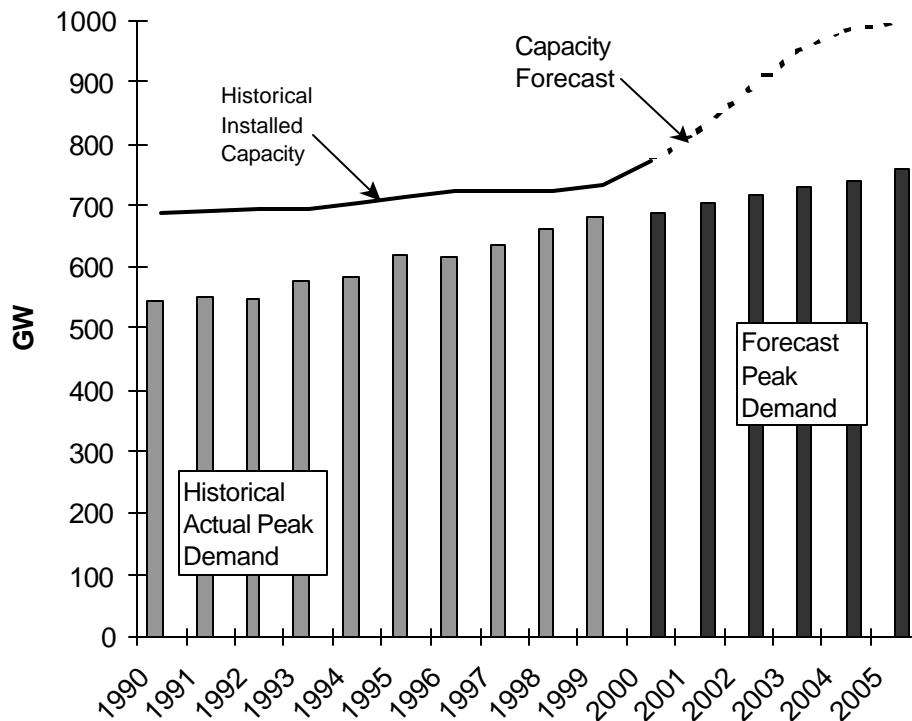
This report provides an overview of the current trend in power plant development across the U.S. and the implication for regional capacity reserves. We analyzed two sources of information. The first source of information we examined was the 1999 North American Electric Reliability Council's (NERC) Electricity Supply and Demand database (ES&D). This database contains information on historical installed capacity across the country as well as historical and forecast peak demand. The second source of information we examined was Resource Data International's (RDI) NEWGen database, Release October, 2001. This database contains detailed information on the status of new plant development across the country.

This analysis suggests a number of key findings:

- There is a large amount of capacity expected to become operational in the next five years;
- Plant developers have announced the intent to build over 400,000 MW of capacity between 2000 and 2005;
- We estimate that a more realistic expectation of increased capacity is about 259,000 MW – an increase of approximately 30 percent above the current installed capacity level;
- This amount of capacity would restore the national reserve margin, or the margin between installed capacity and projected peak demand, to well above the 1990 level of 25 percent from the low in 1999 of only 8 percent;
- While there is variation across the country and uncertainty surrounding exactly which plants will be built, we expect every region of the country to see an increase in reserve margin by 2005.

## Detailed Findings

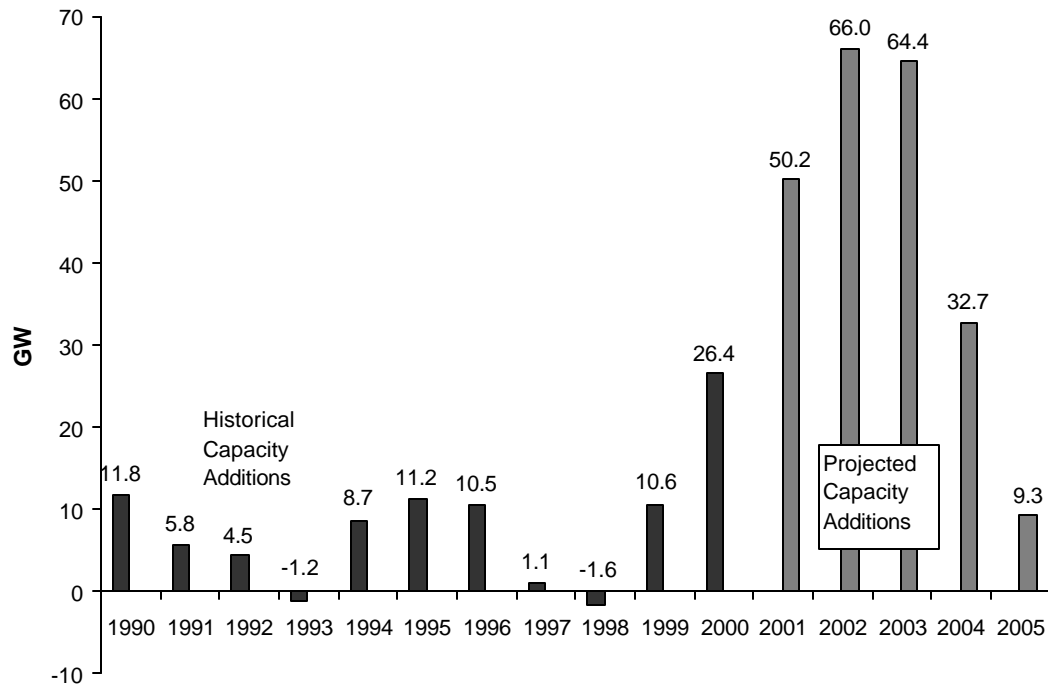
The peak electric demand in the United States grew at approximately 2.7 percent per year over the 1990s. The amount of installed electric capacity grew at approximately 0.9 percent per year over the same time period. This caused a significant reduction in the national reserve margin from over 25 percent in 1990 to less than 8 percent in 1999.<sup>1</sup> This growth imbalance has resulted in significant reliability concerns in various parts of the country. However, with the current level of plant development activity, our analysis suggests that this reduction in national reserve margin will be reversed by 2005. The bars in Figure 1 show the historical and forecast peak demand from the NERC ES&D database. The solid line in Figure 1 shows the historical installed capacity and the dashed line shows the forecast of installed capacity. The steep increase in the installed capacity line over the next few years follows the extremely flat trend across the 1990s.



**Figure 1 – Continental United States Capacity Position**

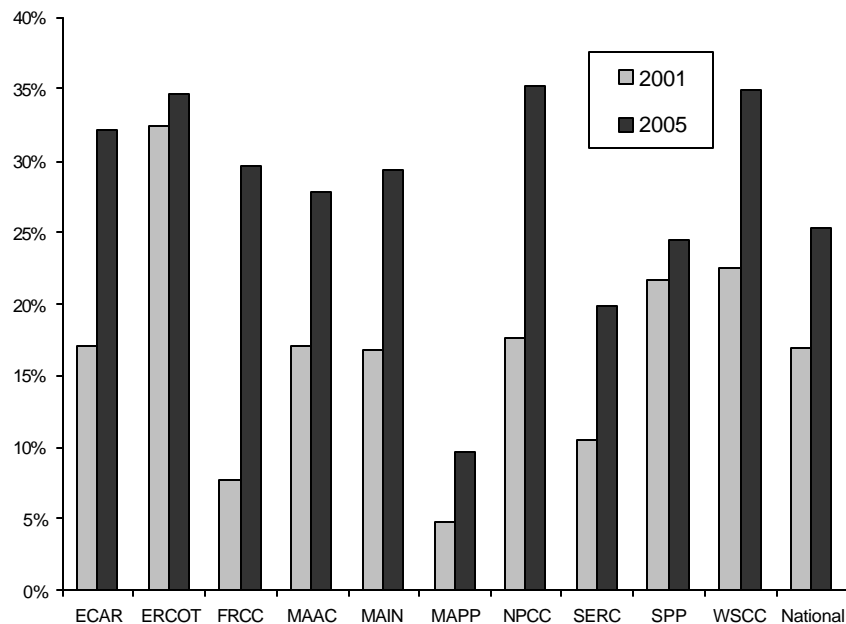
Figure 2 highlights the lack of development activity across the country during the 1990s according to the NERC ES&D database. In fact there were some years, such as 1993 and 1998, when more capacity retired than was added to the system on a national basis. This trend began to reverse in 1999 and substantial capacity was brought on line in the U.S. in 2000. Even more development is expected over the next five years, much of which is already under construction.

<sup>1</sup> According to the NERC ES&D database, peak electrical demand and installed capacity were 523,432 MW and 673,316 MW respectively in 1990, yielding a reserve margin of 25.6 percent. By 1999, peak electrical demand and installed capacity were 681,449 MW and 734,144 MW respectively, yielding a reserve margin of 7.7 percent



**Figure 2 – U.S. Historical and Projected Capacity Additions**

Figure 3 shows the expected increase in reserve margin for each NERC reliability region from current 2001 levels and expected 2005 levels. Every region of the country is expected to see an increase in reserve margin with a number of regions predicted to have considerable surplus.<sup>2</sup>

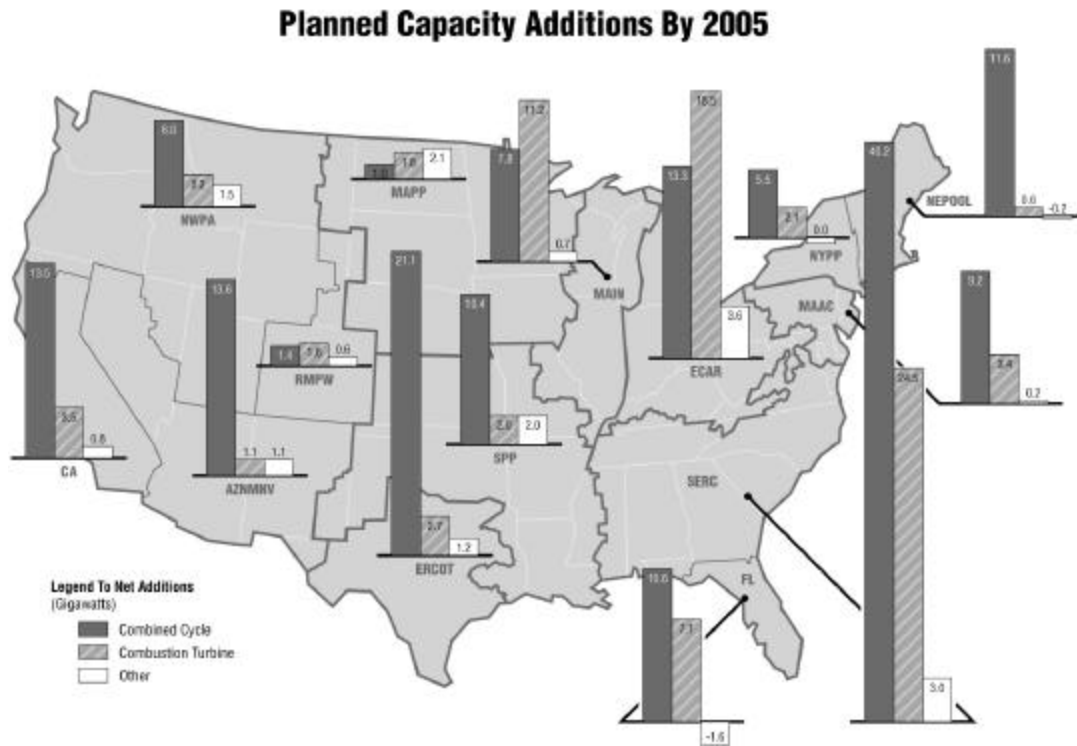


**Figure 3 – Regional Reserve Margin**

<sup>2</sup> This figure reflects aggregate information by NERC region. There may continue to be local shortages or reliability concerns in some areas.



The announced capacity additions are a combination of combined cycle, simple cycle, and other kinds of capacity<sup>3</sup>. Figure 4 shows the type of capacity being added by NERC region. Simple cycle additions are heaviest in the Midwest and Southeast. Combined cycle additions are heaviest in the Southwest, Northeast and Southeast.



**Figure 4 –Additions by Type of Capacity**

Most of the new capacity that became operational in 1999 and 2000 was made up of gas combustion turbine peaking units. However, new base-load combined cycle dominates generation projected to become operational in 2002-2003. Non-gas generation (coal and renewables) comes on line later and in small amounts. The bulk of planned growth takes place by 2004 -- which reflects the far end of the time period needed to develop a new power plant.

<sup>3</sup> "Other" capacity includes coal, hydro, wind, solar, geothermal, and nuclear.

## APPENDICES

**Appendix 1 – Supply Forecast**

The RDI NEWGen database gives detailed information on all of the announced new generating facilities in the country. As mentioned above, there is more than 400,000 MW of capacity that has been announced to become operational between 2000 and 2005. It is likely that not all of this generating capacity will actually be completed. We expect a more realistic estimate for the total capacity added in this time period is approximately 259,000 MW. This capacity can be broken out as follows:

<b>Status</b>	<b>Announced Capacity (GW)</b>	<b>Probability of Completion</b>	<b>Expected Capacity (GW)</b>
Operational	74	100%	74
Under Construction	105	100%	105
Advanced Development Plus	10	75%	7
Advanced Development	37	50%	19
Early Development Plus	11	50%	6
Early Development	192	25%	48
Total	431		259

RDI defines a plant to be in “advanced development” when 3 of the following 6 criteria are met:

- Financing secured
- Signed purchase power agreement
- Obtained federal air permits
- Confirmed turbine order
- Local support for development project
- Transmission interconnection approved

RDI defines a plant to be in “early development” when it has been announced but meets less than three of the above criteria. We added the additional categories of “advanced development plus” and “early development plus”. These categories apply to later stages of projects where the early stages are operational or under construction suggesting a higher likelihood of completion.

**Appendix 2 – Regional Results**

The following table shows the current forecast reserve margin by NERC region.

<b>NERC Region</b>	<b>2001 Peak Demand</b>	<b>2001 Installed Capacity</b>	<b>2001 Reserve Margin</b>	<b>2005 Peak Demand</b>	<b>2005 Installed Capacity</b>	<b>2005 Reserve Margin</b>
ECAR	100	117	17%	107	141	32%
ERCOT	57	75	32%	63	85	35%
FRCC	38	41	8%	42	54	30%
MAAC	52	61	17%	55	70	28%
MAIN	52	61	17%	55	71	29%
MAPP	34	35	5%	35	38	10%
NPCC	54	64	18%	57	77	35%
SERC	157	173	10%	170	218	28%
SPP	40	49	22%	44	57	30%
WSCC	119	146	23%	129	181	40%
National	702	821	17%	756	993	31%



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## APPENDIX B

### **POLLUTION REDUCTION FROM NSR ENFORCEMENT FAR SURPASSES POLLUTION REDUCTION FROM POTENTIAL HEAT RATE IMPROVEMENTS**

An argument has been made that the threat of NSR enforcement is preventing power plant owners from making investments in heat rate improvement that would actually reduce emissions from those power plants. To check this claim we calculated the potential impact of heat rate improvements at coal-fired power plants on emissions and compared that to the potential emission reductions from enforcement of New Source Review standards. The comparison is striking.

The actual potential for heat rate improvement is rather small. The Electric Power Research Institute investigated this a number of years ago and reported its findings in a 1986 report, "Heat-Rate Improvement Guidelines for Existing Fossil Plants." In this report EPRI reported that, if cost were no object, there could be, on average, an improvement in heat rate of about 400 BTUs per kWh (about 4%). Cost, however, is very much an important consideration. Work done by a major northeast utility in the early to mid-1990s found that a fair amount of the heat rate improvement potential at their plants had already been tapped, and that any further improvements were extremely non-cost-effective.

Nevertheless, to give heat rate improvement the benefit of the doubt, we assumed that half of the average heat rate improvement potential could actually be achieved in a cost-effective manner at every major coal-fired generating unit (over 1,000 generating units with a total installed capacity of almost 300,000 MW).

Even under these generous assumptions, heat rate improvement at coal-fired power plants would only reduce SO<sub>2</sub> emissions by about 218,000 tons out of a total of 11.2 million tons (about 2%). NO<sub>x</sub> emission would be reduced by 88,000 tons out of a total of 5.1 million tons (less than 2%).

In contrast, NSR enforcement at the 51 plants currently subject to enforcement actions under federal law would reduce SO<sub>2</sub> by 2.8 million tons – over 12 times as much as the heat rate improvements, and NO<sub>x</sub> by 1 million tons – over 11 times as much as the heat rate improvements. NSR enforcement at all coal-fired power plants would reduce SO<sub>2</sub> by 8.8 million tons and NO<sub>x</sub> by 3.3 million tons.

Heat rate improvements would reduce CO<sub>2</sub> emissions by about 38 million tons out of 2,454 million tons (1.5%). It is more difficult to compare this to CO<sub>2</sub> reductions from NSR enforcement, because those would be a byproduct of other actions taken.

However, we have estimated that NSR enforcement at all coal-fired power plants would reduce CO<sub>2</sub> by 95 million tons, and NSR enforcement at the 32 plants initially charged with violations would reduce CO<sub>2</sub> by 40 million tons. The reductions from enforcement at the 51 plants currently cited would be between those figures. Details of these calculations are provided in an appendix.

## Appendix – Heat Rate Improvement

An argument has been made that the threat of NSR enforcement is preventing power plant owners from making investments in heat rate improvement which would actually reduce emissions from those power plants. To check this claim we calculated the potential impact of heat rate improvements at coal-fired power plants on emissions and compared that to the potential emission reductions from enforcement of New Source Review standards. The comparison is striking.

The main source of information on heat rate improvement is a 1986 report by EPRI.<sup>1</sup> EPRI surveyed 129 plants to identify the potential for heat rate improvement. The EPRI project identified key areas where improvements could be obtained and methods for achieving those improvements. The overall conclusion of the EPRI work was that, without consideration of cost, approximately 400 BTUs per kWh of heat rate improvement could be achieved on average.

While we have identified 400 BTUs per kWh as the heat rate improvement potential, it is clear that we cannot assume the power plant owners would actually improve their heat rates by that much. For one thing, in the fifteen years since this work was done, it is likely that many of the most cost-effective improvements have already been adopted. It is also clear that, contrary to the assumptions in the EPRI analysis, cost is a serious consideration. If the heat rate improvement costs more than the resulting fuel savings, it is unlikely to be adopted. Work done for a northeastern utility in the early to mid-1990s suggested that, even at that time, very little additional heat rate improvement was cost-effective.

Nevertheless, we chose to give heat rate improvement the benefit of the doubt by assuming that half of the identified improvement – 200 BTUs per kWh – could be achieved at each major fossil-fueled power plant. We assumed this improvement at 1,059 fossil-fueled generating unit which together are responsible for about 95% of power plant SO<sub>2</sub> and NO<sub>x</sub> emissions. Emission rates and heat inputs were based on the EPA Acid Rain Scorecard (CEMS database), while level of generation was based on FERC Forms 767 and 759. Current heat rates were actual heat rates calculated by dividing the heat input by the power generated. A heat rate improvement of 200 BTUs per kWh was applied to each generating unit independently, and the resulting emission reductions were calculated unit by unit. The reductions were then totaled over all 1,059 generating units. The total emission reductions produced by the assumed heat rate improvements were 218,000 tons of SO<sub>2</sub>, 88,000 tons of NO<sub>x</sub>, and 38 million tons of CO<sub>2</sub>.

These reductions are compared in the attached graphs to the current emissions and the emission reductions which would be obtained if BACT were applied at both the 51 plants currently cited and at all coal-fired power plants. The calculation of these values is straightforward for SO<sub>2</sub> and NO<sub>x</sub>, but less so for CO<sub>2</sub>. For SO<sub>2</sub> and NO<sub>x</sub>, the

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<sup>1</sup> "Heat-Rate Improvement Guidelines for Existing Fossil Plants," Electric Power Research Institute, Report CS-4554, May 1986.

reductions are calculated by using an assumed BACT average emission rate of 0.30 pounds per MMBTU for SO<sub>2</sub> and 0.15 pounds per MMBTU for NO<sub>x</sub>. When this emission rate is applied to the currently cited plants, the resultant reduction is 2.8 million tons of SO<sub>2</sub> and 1 million tons of NO<sub>x</sub>.<sup>2</sup> When the BACT emission rate is applied to all coal-fired generation, the reduction is 8.8 million tons of SO<sub>2</sub> and 3.3 million tons of NO<sub>x</sub>.<sup>3</sup>

Calculating the CO<sub>2</sub> impacts of NSR enforcement is more complicated because it is a byproduct of enforcement rather than a direct target. CO<sub>2</sub> reductions occur because there will be some plants to which it is not economically justifiable to add emission control equipment. These plants would be retired instead, and replaced with new generating units. We based our analysis on work done by the Energy Information Administration in its report, "Analysis of Strategies for Reducing Multiple Emissions from Power Plants: Sulfur Dioxide, Nitrogen Oxides, and Carbon Dioxide" (December 2000). One chapter of this report looks specifically at the impact of NSR enforcement on the power generating system. This chapter looks at two cases. One includes NSR enforcement at the 32 plants which were identified in the initial November 1999 litigation. This is the NSR/32 Case. The other included NSR enforcement at all coal-fired power plants greater than 25 MW. This is the NSR/All Case. There is no case which matches the current situation, with 51 plants under litigation (NSR/51). However, the NSR/51 impacts would fall between those of NSR/32 and NSR/All.

The EIA calculates that 31 GW of coal-fired capacity would become uneconomic and would be retired under the NSR/All Case, and 13 GW under the NSR/32 Case. EIA assumes that most of that capacity would be replaced with new coal generation, and under that assumption, there is no decrease in CO<sub>2</sub> emissions. In fact, there is a very slight increase. We do not believe replacement with coal is a likely scenario. Looking at the current activity in developing new generation facilities, the planned additions are overwhelmingly natural gas-fired. We believe this is likely to continue, and we used that assumption in calculating the CO<sub>2</sub> impact of NSR enforcement.

The typical coal-fired power plant produces about 2240 pounds of CO<sub>2</sub> for every MWH generated. A new gas-fired combined cycle power plant with a heat rate of 7000 BTUs per kWh will produce only 840 pounds of CO<sub>2</sub> for every MWH, a saving of 1400 pounds per MWH. We assumed that each of the retired coal-fired power plants would otherwise have run at a capacity factor of 50%. This is below the average capacity factor for coal-fired plants of 70%. We expect that it will be those coal plants which run less than average which are most likely to be retired.

With these assumptions, the 31 GW of retirements in the NSR/All Case lead to a reduction of 95 million tons of CO<sub>2</sub>. The 13 GW of retirements in the NSR/All Case lead

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<sup>2</sup> These 51 plants currently have a heat input of 4.1 billion MMBTUs, with emission rates on average of 1.66 pounds per MMBTU of SO<sub>2</sub> and 0.64 pounds per MMBTU of NO<sub>x</sub>. Heat input and emissions data come from the EPA CEMS database.

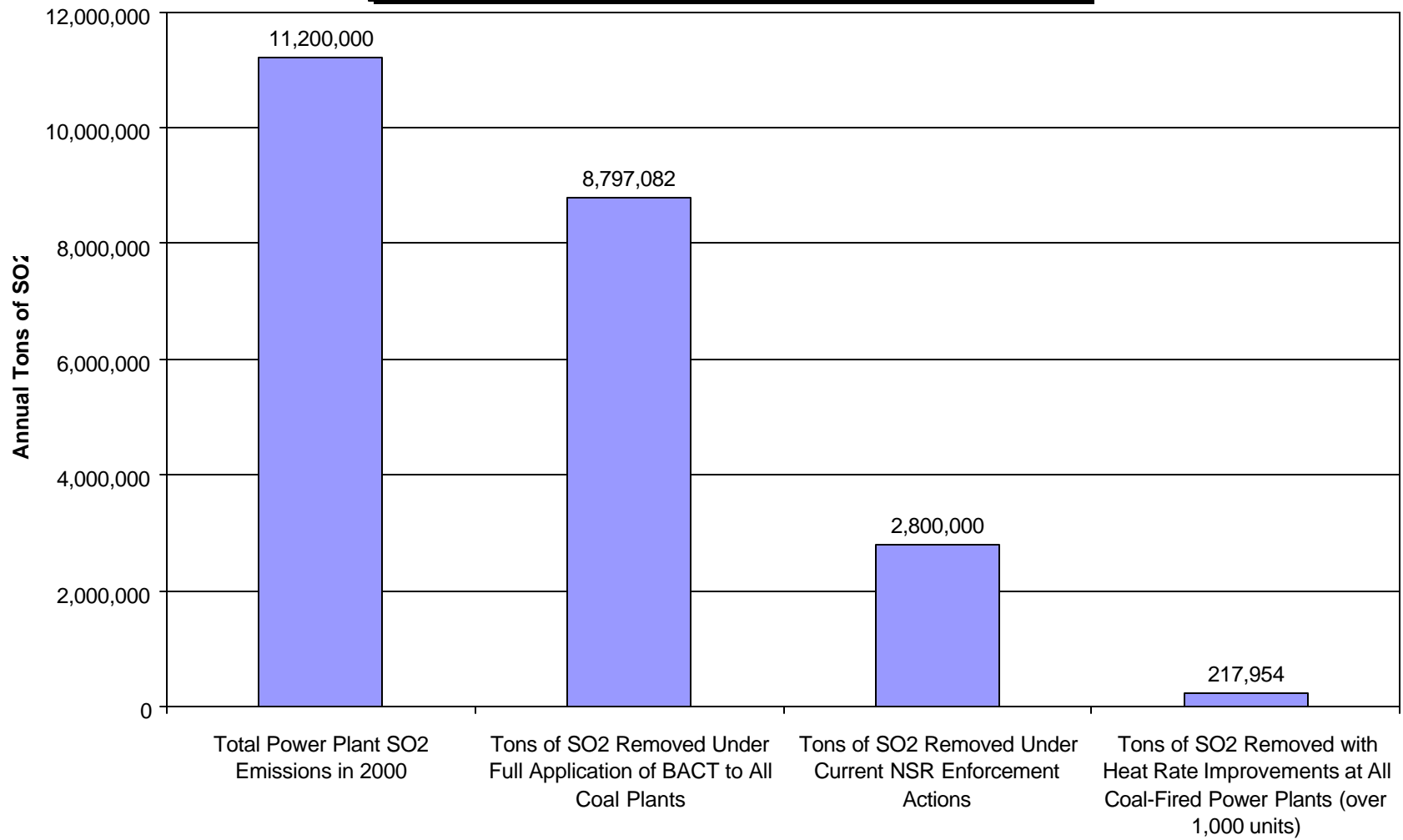
<sup>3</sup> These plants currently have a heat input of about 20.3 billion MMBTUs, with emission rates on average of 1.17 pounds per MMBTU of SO<sub>2</sub> and 0.47 pounds per MMBTU of NO<sub>x</sub>. Heat input and emissions data come from the EPA CEMS database.

to a reduction of 40 million tons. While there is no basis for estimating the CO<sub>2</sub> impact of an NSR/51 Case, we can assume it will fall between the NSR/32 and the NSR/All Cases.

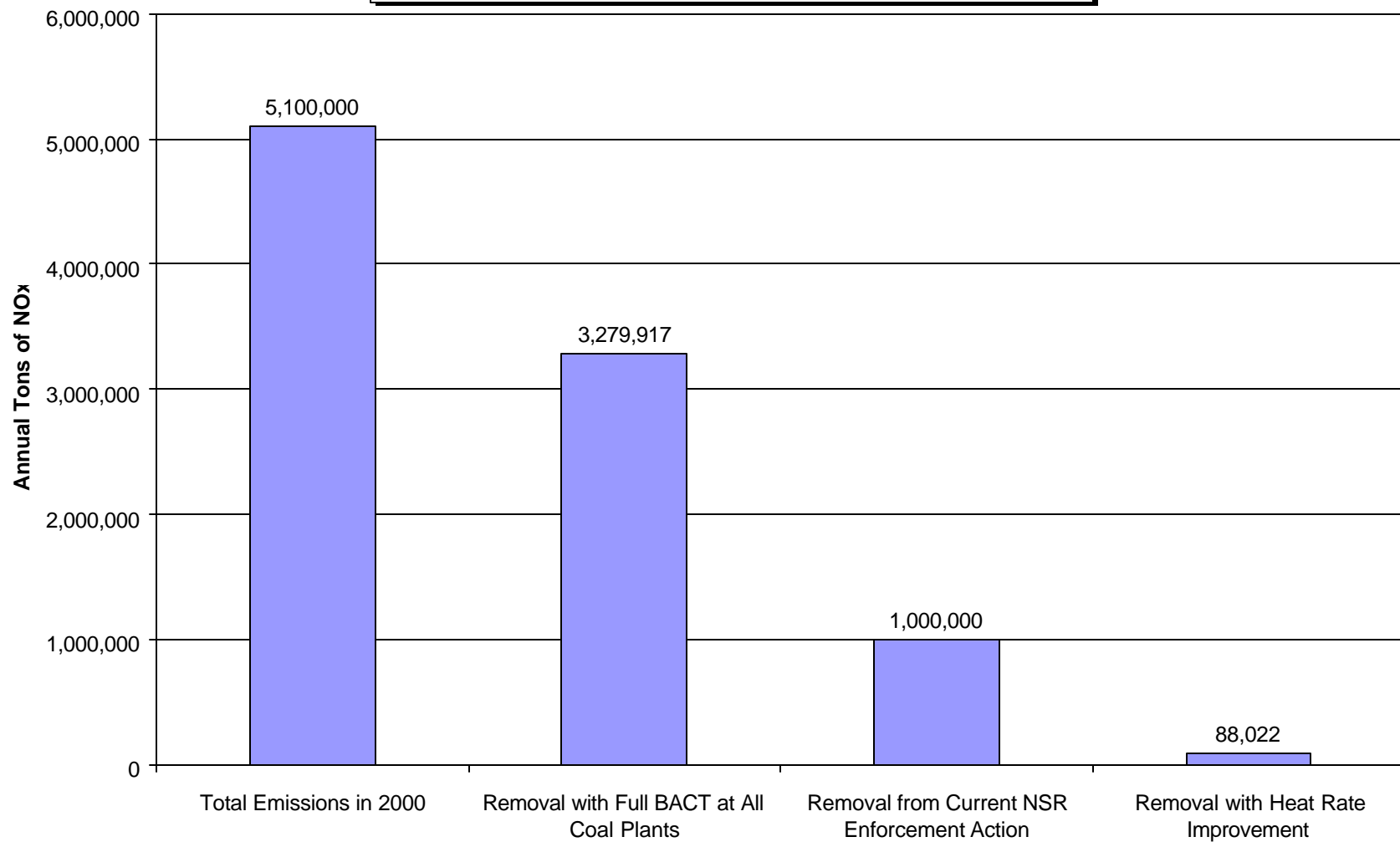
As the figure shows, the difference between CO<sub>2</sub> reductions for the heat rate improvement case and the NSR enforcement cases is not as dramatic as for SO<sub>2</sub> and NO<sub>x</sub>. Nevertheless, under our assumptions, NSR enforcement still removes more CO<sub>2</sub> than heat rate improvements.



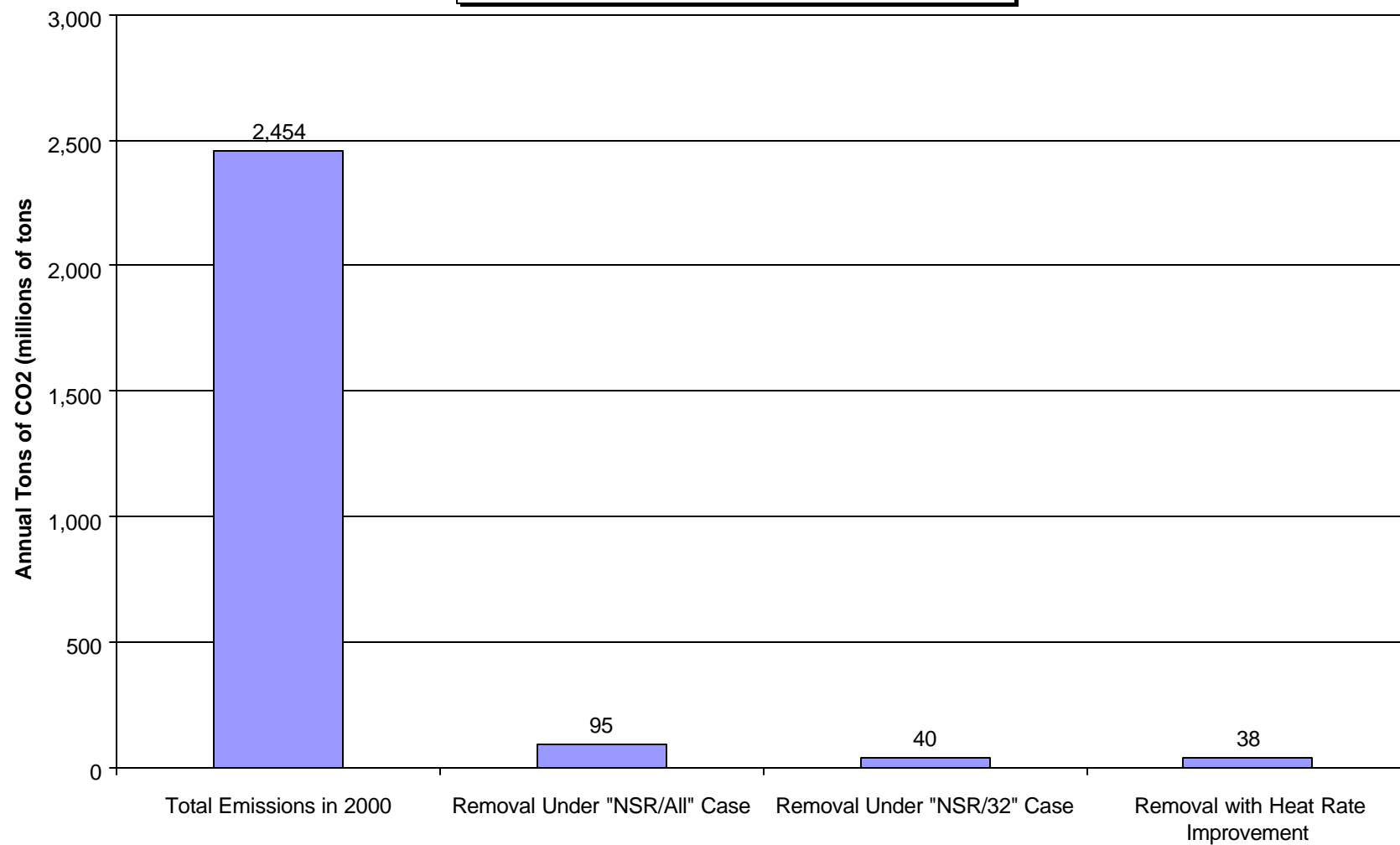
**SO<sub>2</sub> Reductions from NSR Enforcement  
Far Outweigh Those from Heat Rate Improvements**



NOx Reductions from NSR Enforcement  
Far Outweigh Those from Heat Rate Improvements



NSR Enforcement Removes More CO2  
than Heat Rate Improvements





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## Appendix C

### **Potential for Increased Capability and Emissions from Existing Plants – a Critical Review of the National Coal Council Report, “Increasing Electricity Availability from Coal-Fired Generation in the Near-Term”**

David Schoengold  
MSB Energy Associates

November 2, 2001

MSB Energy Associates reviewed in detail the National Coal Council report in order to determine the methods used by the NCC and whether its conclusions are reasonable. In order to make a reasonable judgement on the NCC conclusions we performed our own analysis of the potential for bringing on near-term increases in coal-fired capacity.

#### Summary of Conclusions

- The NCC report is skimpy in terms of the details it provides and seriously flawed in terms of the methods it does describe.
- NCC estimated 40,000 MW of recoverable coal capacity, while the MSB analysis estimated 35,000 MW.
- The MSB analysis determined that actually recovering most of that coal capacity will be difficult and expensive, since it comes in small amounts from a large number of power plants, and may well depend on the availability of parts and equipment which are no longer made.
- If the coal-fired capacity could be recovered, the expected emissions would not be large, but they would be significantly greater than from the gas-fired power plants which make up the likely alternative.

#### NCC Report

The NCC report on its face appears to be a fairly detailed analysis of the potential for increasing available capacity at existing coal-fired power plants, but upon further examination it turns out that there is very little real information in the report. There are also several key methodological flaws. In addition, NCC leaves out an entire category of potential for increasing available capacity.

NCC begins by examining reduced availability of existing plants due to aging. The report claims that improved maintenance could increase the equivalent availability of older plants by about 5% (by decreasing outages from 10% to 5%). NCC appears to claim that this is equivalent to recovering 5% of the coal-fired capacity because it converts this 5% improvement to a 10,000 MW gain (5% of 200,000 MW). However, utilities are most intent on keeping plants available at times of peak, and NCC does nothing to check whether the outages of the plants in question are likely to occur at peak. Thus we cannot rely on the NCC estimate of 10,000 MW from improved reliability of older plants.

NCC then compares the maximum demonstrated generating capacity (nameplate) for coal plants with the currently existing operating capacity and comes up with a difference of about 20,000 MW (200,000 MW versus 220,000 MW). While this difference would appear to be 20,000 MW, NCC turns it into 40,000 MW by assuming that there is the potential to increase the nameplate capacity by an additional 20,000 MW. The report provides no support for this estimate, other than pointing out that plant owners have the potential for repowering and turbine upgrades. Thus the second 20,000 MW in this category is not based on any real analysis.

In total, the NCC report comes up with approximately 20,000 MW of potentially recoverable capacity from deratings and approximately 20,000 MW of not very well defined or supported improvements in plant performance. The NCC report also states, with no material to support the statement, that these increases could occur over a 36 month period.

### MSB Analysis

The MSB analysis asked four questions. These questions are similar to those asked in the NCC report, but not exactly the same.

- How much existing capacity is currently in deferred or cold shutdown mode? (this is a category of potential capacity recovery which NCC ignored)
- How much capacity is lost in deratings of existing power plants?
- What is the likelihood of this capacity being recovered?
- What are the potential increases in emissions if the derated and/or shutdown capacity were to be brought back into service?

The basis for this analysis comes from two major sources. One is the US EPA's acid rain database which classifies units as to whether they are operational, retired, or in a deferred/shutdown mode. Our analysis assumed that retired units will remain retired, since in the process of retiring the units the owners generally end up making them inoperable. We assumed, however, that units in a deferred/shutdown mode can be brought back into service.

The second major source is the FERC Form 767 which gives the nameplate, summer, and winter capacity of each generating unit. The summer rating is often lower than both

the winter and nameplate rating; however, this does not represent recoverable capacity because it is generally caused by high temperatures in the cooling water which reduce the available capacity. There are, however, cases in which the winter capacity is lower than the nameplate capacity. As a very rough approximation we assumed that all of these reductions represent capacity lost to plant aging which could be recovered. In fact, this is not likely to be the case. In many cases the differential may be as a result of a mismatch in available steam from the boiler compared to the generating capacity of the generator. By assuming that all of these differences could be recovered, we have most likely overestimated (possibly by a significant amount) the potential for capacity increases.

- How Much Capacity is in Deferred/Shutdown Mode

According to the EPA acid rain database there are a total of 102 generating units in deferred mode, with a total capacity of 6,487 MW. This deferred capacity equals approximately 1.4% of the currently operable capacity in fossil-fueled generating facilities. These are divided among the NERC regions as follows:

Table 1. Capacity in Deferred Units

Region	MW of Deferred Units	Number of Deferred Units
ECAR	1,748	36
ERCOT	38	1
MAAC	180	1
MAIN	31	1
MAPP	20	1
NPCC	422	9
SERC	1,171	21
SPP	945	16
WSCC	1,932	16
Total	6,487	102

This is based on 1999 data. It may well be that some, or many of these units have already been put back into service – especially in the Western States Coordinating Council region where the power shortages have been the greatest.

- How Much Capacity is Lost in Deratings of Existing Power Plants

We calculated the amount of derating by comparing the winter capacity to the nameplate, and assuming that any difference reflects a recoverable derating. This is then adjusted to reflect summer deratings compared to winter capacity, since the critical season is the summer. The total amount of derating calculated in this manner is not insignificant. The total is 28,474 MW in 1,211 units. This represents approximately 6.1% of the currently operable fossil-fueled capacity. The 1,211 units represents

approximately 65% of the operating units – that is, almost 2/3 of the operating units have capacity deratings. The average amount of capacity derating is 24 MW per unit. Thus, the capacity potentially available from recovering deratings tends to come in fairly small packages, and recovering the capacity would require actions at the majority of generating units.

It is important to reiterate that the estimates here are likely to be overestimates because they include as potential capacity recoveries capacity lost because of mismatches between the boiler and the generator. These mismatches would be expensive and difficult to capture.

The deratings are divided among the NERC regions as follows:

Table 2. Capacity in Derated Units

Region	MW of Derating	Number of Derated Units	Average MW Derating per Unit
ECAR	6,322	244	26
ERCOT	1,434	85	17
MAAC	1,913	89	21
MAIN	2,531	80	32
MAPP	988	66	15
NPCC	1,339	80	17
SERC	6,985	262	27
SPP	4,106	161	26
WSCC	2,866	144	20
Total	28,484	1,211	24

- What Is The Likelihood Of Recovery of Derated Capacity?

Recovery of much derated capacity is not very likely, even if plant owners are relieved of concern for being hit with New Source Review violation suits. There are several reasons for this. The most important reason is that the derated capacity generally occurs in a large number of small increments, so that recovery would require taking action at the majority of power plants. There is not a pool of a few plants with a large amount of derated capacity at them waiting to be recovered. Recovery of this capacity would likely be expensive, and would require coordinating repair outages among a large percentage of the currently operating capacity. Another important reason why we should not expect a great deal of the derated capacity to be recovered is that it tends to be expensive to recover. In most cases the deratings have occurred because old power plants have deteriorated with age and use. Recovery of derated capacity will require major repair and replacement of equipment – much of which is not likely to be available

anymore. Finally, until about two to three years ago, power plant operators paid little or no attention to the possibility of NSR violation suits. The fact that, even with little worry about these suits, the plant operators had not already taken steps to recover capacity derates suggests that they viewed the cost-effectiveness of these actions as fairly poor.

Recovery of capacity from plants in deferred/shutdown mode has more potential. The capacity comes in larger chunks, and scheduling outages in order to work on these units is not an issue. However, as Table 1 shows, there is not very much capacity in deferred mode. Only about 6,500 MW nationally falls into this category.

- What Are the Potential Increases In Emissions if the Derated and/or Shutdown Capacity Were to Be Brought Back Into Service?

The amount of increased emissions from recovered capacity is a function of how much that newly recovered capacity is likely to operate. For the purposes of this analysis we assumed that the newly recovered capacity will be called on for 100 hours per year. The emissions are a linear function of the time, so doubling the assumed operating time would double the new emissions. Our choice of 100 hours is not random. Most electric power systems face very sharp needle peaks. Typically, the highest 10% of load (one of the traditional definitions of peak) occurs for no more than about 100 hours per year. Given the tremendous amount of new, low-cost, efficient, natural gas-fired combined cycle capacity currently under construction and expected to be in-service by 2005 (see the attached material on new capacity prepared by Erin O'Neill of NorthBridge), it is unlikely that the marginal new capacity that might be added to older existing coal-fired power plants would be called on much more than the bare minimum of peak hours. The 2005 timeframe focused on in the NorthBridge material matches the expected timeframe for the capacity recovery suggested by the National Coal Council.<sup>1</sup>

For units with capacity deratings we assumed that the emission rate for the recovered capacity would be equal to the current emission rate. For deferred units for which current emission rates are not available, we assumed that the emission rate would be the same as for the recovered deratings. The following table shows the potential new emissions by region.

Table 3. Potential New Emissions from recovered Capacity  
(tons of new emissions at 100 hours of operation)

Region	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>
ECAR	6,538	2,627	942,961
ERCOT	370	239	136,806
MAAC	1,568	426	243,781
MAIN	1,677	897	298,490

<sup>1</sup> The NCC report estimates a 36 month period to recover the capacity. That would put the capacity availability at the beginning of 2005.



MAPP	392	272	120,226
NPCC	752	226	157,571
SERC	6,783	2,490	925,266
SPP	1,017	1,265	461,968
WSCC	883	861	488,672
Total	19,980	9,303	3,775,740

Table 4. Potential New Emissions from recovered Capacity  
(percentage increase over current emissions)

Region	SO2	NOx	CO2
ECAR	0.17%	0.18%	0.17%
ERCOT	0.07%	0.07%	0.07%
MAAC	0.15%	0.16%	0.19%
MAIN	0.16%	0.20%	0.17%
MAPP	0.07%	0.08%	0.08%
NPCC	0.15%	0.16%	0.16%
SERC	0.20%	0.18%	0.17%
SPP	0.14%	0.22%	0.18%
WSCC	0.17%	0.17%	0.17%
Total	0.16 %	0.17%	0.16%

As these tables show, the likely increase in emissions from recovery of derated or deferred capacity is small. However, it is not zero. For comparison purposes, if this generation came from the new gas-fired plants currently being planned and constructed, the SO2 emissions would be zero rather than 20,000 tons, and the NOx emissions would be only a fraction of the coal plant emissions – less than 3,000 tons rather than 9,000. CO2 emissions would be about 1.3 million tons rather than 3.8 million. See figure 1 below.

#### Comparison Between NCC Report and MSB Energy Associates Analysis

As we pointed out in our discussion of the NCC report, the report is vague, makes a number of unsubstantiated claims, and also leaves out a major category of potentially recoverable capacity. Nevertheless, the results of the NCC analysis are not that different from the results in my analysis – 35,000 MW in my analysis compared to 40,000 MW in the NCC report.

The NCC report ignores two other very important pieces of information – the location of recoverable capacity and the probability of recovering that capacity. As the MSB

analysis shows, the probability of recovering much of the lost capacity is very small, even if the EPA were to relax all of its standards.

Figure 1. Comparative Emissions from Coal and Natural Gas

