TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS

CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CEM	Continuous Emission Monitors
CO_2	Carbon Dioxide
DOE	U.S. Department of Energy
EERE	Energy Efficiency and Renewable Energy
EGU	Electric Generating Units
EPA	U.S. Environmental Protection Agency
kWh	Kilowatt-Hour
ISO	Independent System Operator
ISO-NE	Independent System Operator – New England
MARO	U.S. Department of Energy Mid-Atlantic Regional Office
MWh	Megawatt-Hour
NAAQS	National Ambient Air Quality Standards
NOx	Nitrogen Oxides
NYISO	New York Independent System Operator
NREL	National Renewable Energy Laboratory
OAQPS	EPA Office of Air Quality Planning and Standards
OTC	Ozone Transport Commission
PJM	PJM (Pennsylvania, New Jersey, Maryland) Interconnection
PV	Photovoltaic
SIP	State Implementation Plan
SO_2	Sulfur Dioxide

1.0 INTRODUCTION

This report provides an evaluation of the avoided emissions of selected air pollutants from the operation of the proposed Alabama Ledge Wind Farm to be located in the Town of Alabama, Genesee County, New York, with an installed capacity of 79.8 Megawatts (MW).

This report is a prospective evaluation of the avoided emissions from the operation of the project. The evaluation applies a methodology developed by Resource Systems Group, Inc (RSG). The methodology is based on generally accepted principles and procedures for estimating air emissions reductions from wind and other renewable electric power generation on the electric grid.

The methodology in this report is consistent with the approach used by other experts in the field. It has been used in previous studies of avoided air emissions from wind and other renewable generation in Maryland, New Jersey, Virginia and parts of the ISO New England, NYISO and the PJM Interconnection power market[1]. The New Jersey study, including its methodology, was published in June 2006 and was co-authored by technical experts from both the National Renewable Energy Laboratory (NREL) and the Global Environment and Technology Foundation, a prominent non-profit organization in the energy and environmental field. In addition, the U.S. Environmental Protection Agency, the Department of Energy, and senior NREL officials have reviewed both the Maryland and New Jersey studies.[2] The Environmental Protection Agency accepted the Maryland study to support its first-ever approval of a renewable energy purchase for nitrogen oxide (NOx) emissions reduction credit in a State Implementation Plan (SIP) under the Clean Air Act.[3] The methodology in the Maryland report also was published by NREL as a model for air emissions assessment for other wind energy projects.[4]

2.0 THE ALABAMA LEDGE WIND FARM

Alabama Ledge Wind Farm lies roughly halfway between Buffalo and Rochester, New York. Alabama Ledge Wind Farm draws its name from the Town of Alabama and the Onondaga Escarpment, a limestone ledge, which runs the length of western New York and passes through the Town of Alabama in the northwest corner of Genesee County. The escarpment marks the relative dividing line between the Lake Erie and Lake Ontario basins. Alabama Ledge Wind Farm has a proposed installed capacity of 80 megawatts (MW) - enough to power more than 24,000 average New York homes with clean energy each year. The project area lies roughly halfway between Buffalo and Rochester and agriculture is the dominant land use. The area's wind resource, agricultural land-use pattern and proximity to a transmission line make for an excellent wind farm site. This report is based on the operation of 38 Suzlon S88 2.1 turbines each with a capacity of 2.1 MW for a total capacity of 79.8 MW. The interconnection will be into a 115kV bay directly at a substation located on private land about 900 feet west of Gorton Road and flush with CSX Transportation's railway corridor to the north.

---

[1] *Report on the Clean Energy/ Air Quality Integration Initiative Pilot Project of the U.S. DOE Mid-Atlantic Regional Office, June 2006.* 70 Fed. Reg. 24988 (May 12, 2005). See also, Metropolitan Washington Council of Governments, "Plan to Improve Air Quality in the Washington, DC-MD-VA Region," February 19, 2004 at http://www.mwcog.org/committee/committee/archives.asp?COMMITTEE_ID=14 (Scroll down to February 19, 2004, pp. 7-77 to 7-81 and Appendix J, pp. J-71 to J-76).

[2] *Op cit.*.

[3] 70 Fed. Reg. 24988 (May 12, 2006).

[4] National Renewable Energy Laboratory, Model State Implementation Plan (SIP) Documentation for Wind Energy Purchase in State with Renewable Energy Set-Aside, May 2005, Subcontract Report NREL/SR-500-44075. See http://www.windpoweringamerica.gov/sips.asp

3.0 The New York Power Market

Electric power generated from wind energy at the Alabama Ledge wind farm will be sold into the New York ISO power market. The plants used in this analysis are shown in Figure 1. For practical purposes, this analysis focuses on the New York upstate power market area. Most if not all of the displaced generation by wind is expected to occur primarily in the upstate power market area shown and at the plants listed in Table 1. The analysis does not include the avoided emissions associated with changes in generation outside the New York upstate power market. If there are out of market area effects, the wind farm will typically displace generation on the margin at the same type of variably-dispatched fossil fuel units that are included in this analysis. As a result, there will be little difference in average avoided emission rates. As there is currently transmission capacity for the project, any potential future transmission constraints are not considered in this analysis. These simplifying assumptions are unlikely to significantly affect the results at this level and for the purposes of the report.

4.0 Avoided Emissions in Power Markets

Wind power has zero direct air emissions and will create reduced air emissions from other electrical generators. Wind creates these reductions because of the way the electric power system works. Wind power is nearly always dispatched when it is available because wind generation has zero fuel costs and very low total operating costs. When wind energy is available, it will displace generation at facilities with higher operating costs and which can be variably dispatched. These are typically fossil-fueled units, as they are in Western New York. The emissions from those fossil-fuel generating units are then avoided. In the absence of transmission constraints, wind almost never displaces nuclear power, hydroelectric power, or other renewable energy sources, because, like wind, these units have low operating costs. Nuclear power is normally fully dispatched and is therefore rarely able to respond to rapidly-changing loads.

Under some limited circumstances, where there are transmission constraints and at times when hydropower is a large part of the total generation, wind power may curtail or time shift hydro-electric power generation. This situation is rare and will not likely occur in western New York. If hydro-electric power were displaced, it could result in higher or lower emissions in any short time period but it will have very little effect on annual average avoided emissions from the wind farm.

The electrical generation that is displaced by wind power varies by time of day and season and with the mix of fossil-fueled generation. In the New York power market area, this mix includes coal, oil, and natural gas. The avoided emissions from all the major pollutants tend to be higher in areas with more coal-fired generation and lower where natural gas is the dominant fuel. Efficiency and the pollution control system performance of fossil-fueled units are also important.

5.0 Analytical Methodology

This analysis evaluates the average avoided emissions that will occur when electric generation from the Alabama Ledge Wind Farm is sold into the power grid. This avoided emissions analysis is based on projected generation from the Alabama Ledge Wind Farm and on EPA emissions data for the fossil-fueled power plants for the year 2005. [1]

The methodology used in this report is the time-matched marginal avoided emissions analysis using an incremental generation-weighted average of the emissions of plants that are variably dispatched to meet

[1] The most recent year for which complete and consistent validated data are available from the EPA is 2005. Changes since 2005 are not expected to have a significant effect on this avoided emissions analysis.

changing demand. The analysis matches the projected hour-by-hour generation of the Alabama Ledge Wind Farm with the actual hourly generation of fossil-fueled units in the ISO New York power market area shown in Figure 1.

Figure 1: Location of the Alabama Ledge Wind Farm and the Fossil Fueled Units Included in the Analysis

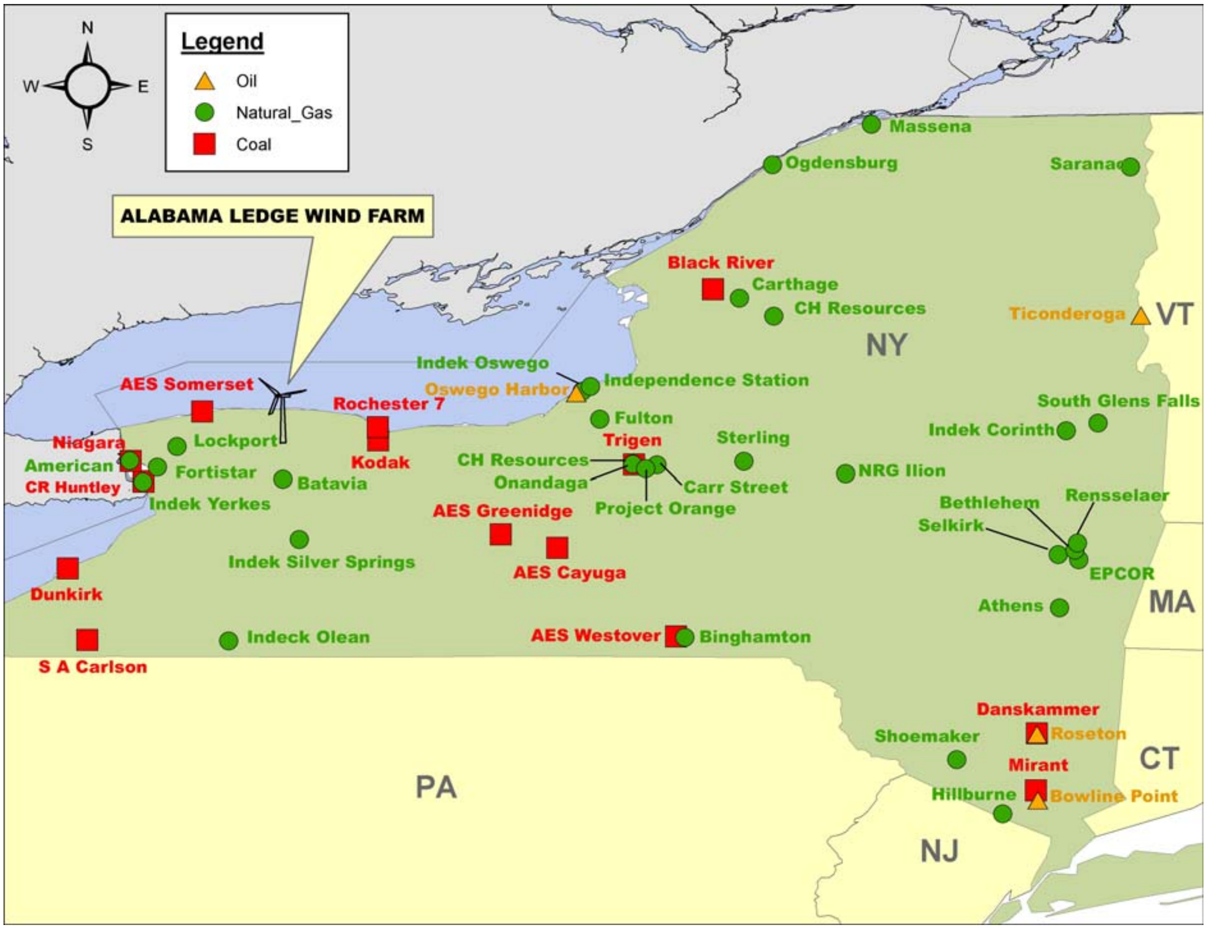


Table 1: List of Major Variably Dispatched Fossil-Fueled Plants in the Analysis[1,2]

Name	Name
AES Cayuga	Indeck Silver Springs Energy Center
AES Greenidge LLC	Indeck Yerkes Energy Center
AES Somerset LLC	Independence Station
AES Westover	Kodak Park Site
American Ref-Fuel of Niagara	Lockport Energy Associates LP
Athens Generating Plant	Lovett
Batavia Power Plant	Massena Power Plant
Bethlehem Energy Center	Niagara Generating Facility
Binghamton Cogen	North East Cogeneration Plant
Black River Generation	NRG Ilion LP
Bowline Point	Ogdensburg Power
C R Huntley Generating Station	Onondaga Cogeneration
Carr Street Generating Station	Oswego Harbor Power
Carthage Energy LLC	Project Orange Associates LP
CH Resources Beaver Falls	Rensselaer Cogen
CH Resources Syracuse	Rochester 7
Danskammer Generating Station	Roseton Generating Station
Dunkirk Generating Station	S A Carlson
EPCOR, Castleton Facility	Saranac Facility
Fortistar North Tonawanda	Selkirk Cogen
Fulton Cogeneration Associates	Shoemaker
Hillburn	South Glens Falls Energy LLC
Indeck Corinth Energy Center	Sterling Power Plant
Indeck Olean Energy Center	Ticonderoga Mill
Indeck Oswego Energy Center	Trigen Syracuse Energy

Note: The names in Table 1 are those in the EPA CEM database. These plants may also be known by other names.

The projected hourly wind generation data used in the analysis were provided by Alabama Ledge Wind Farm based on meteorological data that were scaled to reflect generation from 38 wind turbines. The data are for the hourly electric generation for a recent one-year period based on the wind data collected near the Alabama Ledge. Missing data (about one weeks' worth in total) from that record were supplemented with a correlation model using wind data from other sites.

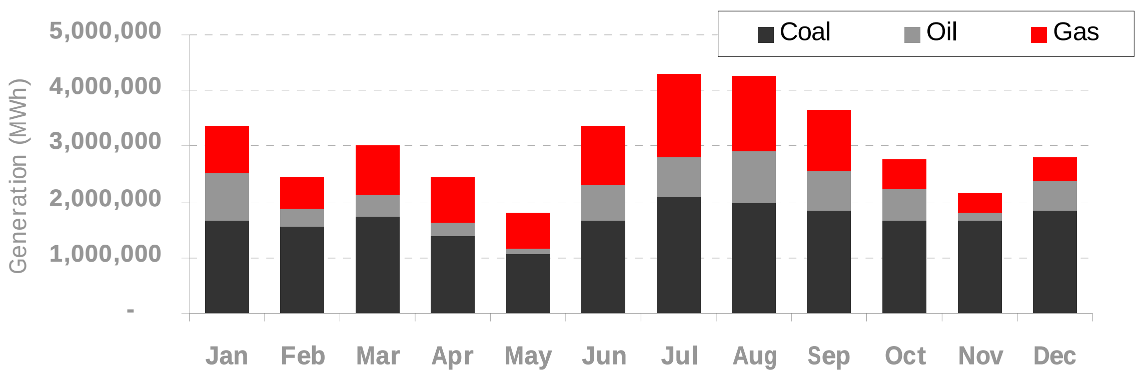
The expected hourly generation for the wind farm was matched by RSG's database model against the hourly generation of the variably dispatched fossil fuel units at plants shown in Figure 1 and Table 1. This information forms the basis for matching and creating the set of generation units in each hour which can be displaced. This analysis identifies the marginal generation units which are dispatched to follow the changing load on the system in this part of the grid. The hourly generation records for the fossil fuel plants have been calculated by using the hourly carbon dioxide (CO_2) emissions from the continuous emissions monitors (CEMs) and the generation average CO_2 emission rates per MWh for each facility as reported to the U.S. Environmental Protection Agency (EPA).[2] The hourly emission rates for nitrogen oxides (NOx), sulfur dioxide (SO_2) and carbon dioxide (CO_2) are taken from the CEM data reported to EPA by the owners and operators of the fossil-fueled power plants. The average NOx, SO_2 and CO_2 avoided emission rates are then based on a weighted average of the emissions at fossil-fueled units, which are matched at each hour when wind generation occurs. The weighting is based on each generation unit's

[1] Currently, plans are under way to upgrade the Dunkirk NRG coal-generating facility and other coal facilities, but, since these projects have not yet been completed, no actual data is available on the new emissions

[2] U.S. Environmental Protection Agency, Continuous Emission Monitoring Database, Office of Air and Radiation, "Acid Rain Hourly Emissions Data 2004," CD 2 disks 02/07/06 Distributed by National Technical Information Service, Springfield VA.

contribution to the changing load. The variably-dispatched fossil-fueled generation in New York is dominated by gas and coal. This can be seen in Figure 2, which shows the monthly generation of fossil fueled units in Upstate New York by fuel type from the dataset.

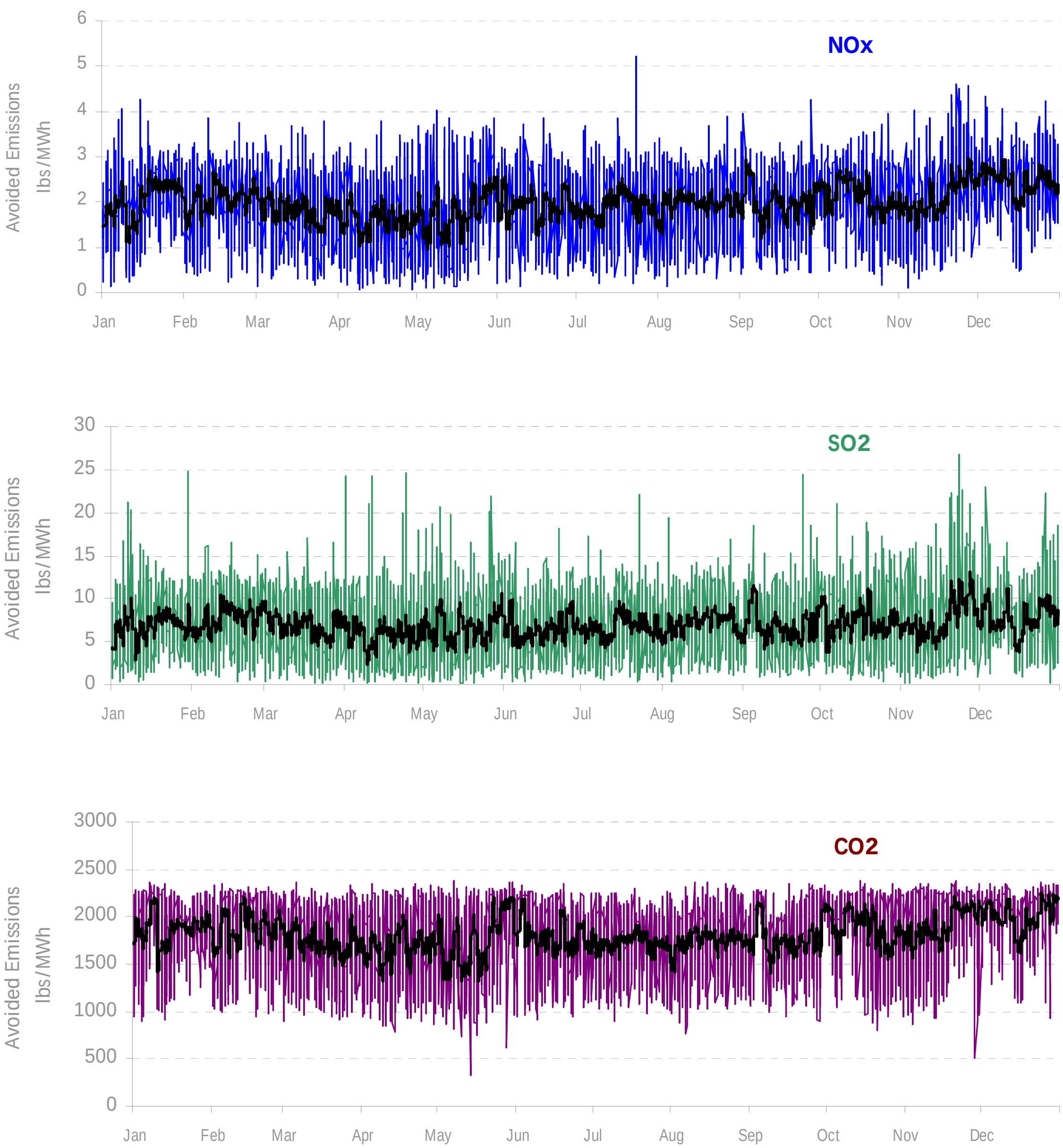
Figure 2: Monthly Generation by Fossil-Fuel Type in Upstate New York (2005 Data)



6.0 RESULTS

The annual avoided emissions can be expressed in terms of the average rate in lb/MWh and as total annual emissions for the plant. Table 2 shows the average annual avoided emission rates for NOx, SO_2 and CO_2 in lb/MWh resulting from the wind power generation at the Alabama Ledge Wind Farm. Figure 3 shows the hourly average avoided emission rates for NOx, SO_2 and CO_2 for one year.

Figure 3: Average Hourly Avoided Emission Rates from Alabama Ledge Wind Farm (2005 emissions data)[1]



In addition to the avoided emissions of NOx, SO_2 and CO_2 shown in Table 2 and Figure 3, the Alabama Ledge Wind Farm will also result in significant avoided emissions of fine particulate matter, mercury, volatile organic compounds, carbon monoxide and other toxic air pollutants. All of these pollutants can have adverse environmental and public health impacts. The avoided emissions of these pollutants cannot be quantified as accurately as NOx, SO_2 and CO_2 because they are not subject to continuous monitoring requirements. However, these additional avoided emissions will in general follow the same pattern as the avoided emissions of CO_2.

[1] The daily moving average rate is shown by a black line.

The results of the analysis in terms of average avoided emissions rates are provided in Table 2. These rates are likely representative of the situation in 2006 through 2010. In future years, the magnitude and pattern of avoided emission rates will be similar, but will be affected by future changes in the distribution of fossil-fueled generation in New York and adjoining power market areas.[1]

Table 2: Average Annual Avoided Emission Rates from Alabama Ledge Wind Farm (lbs/MWh)

	NOx	SO2	CO2
Annual	2.0	7.0	1,830

The total annual avoided emissions from the operation of the Alabama Ledge Wind Farm are shown in Table 3 and the monthly avoided emissions are shown in Figure 4. This figure highlights the fact that wind creates the greatest amount of avoided emissions in the fall, winter, and spring. This is because wind potential is strongest in those seasons. In addition, NOx emissions are limited in the summer months due to the NOx allowance cap during the ozone season. This divergence between the ozone season and annual NOx emissions may change somewhat because annual NOx emissions reductions are required under the Clean Air Interstate Rule (CAIR) starting in 2009.[2]

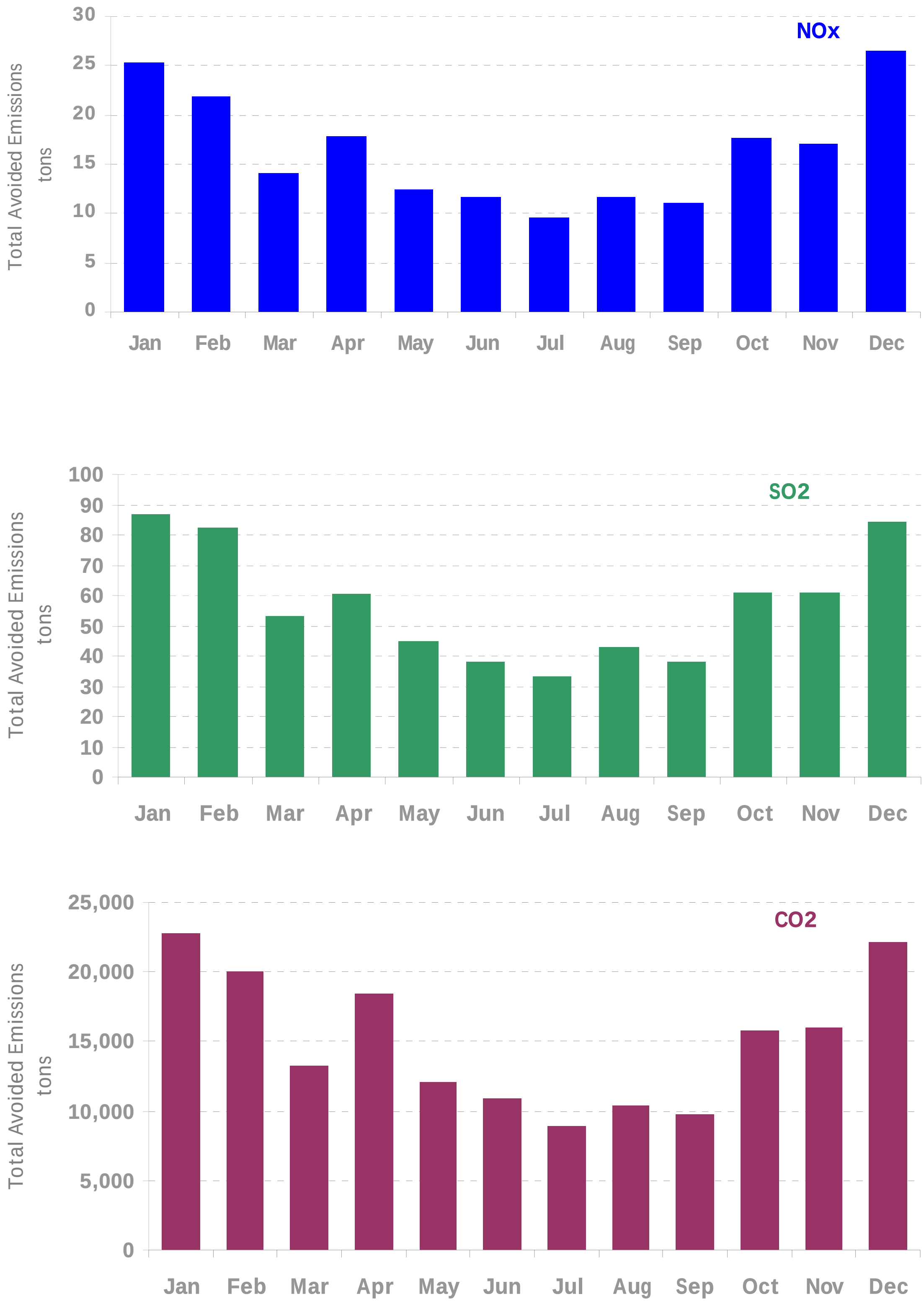
Table 3: Total Annual Avoided Emissions from Alabama Ledge Wind Farm (Tons per year)

	NOx	SO2	CO2
Annual	197	686	180,463

[1] 70 Fed. Reg. 25162 (May 12, 2005).

[2] 70 Fed. Reg. 25162 (May 12, 2005).

Figure 4: Average Monthly Total Avoided Emission from Alabama Ledge Wind Farm



7.0 COMPARISONS

The average avoided emission rates for SO_2, NOx, and CO_2 shown in Table 2 can be compared with emission rates for the entire NYISO power market area derived from EPA eGRID non base-load emission rates. The eGRID annual 2005 non base-load emission rates for ISO New York are 0.54 lb/MWh for NOx, 2.03 lb/MWh for SO_2 and 1,102 lb/MWh for CO_2.[1] The eGRID non base-load emission rates for upstate New York are generally comparable, although lower than in this analysis. The reason for the different avoided emission rates is primarily due to differences in methodology. The eGrid database simply averages the emission rates of all non base-load plants. It does not identify the marginal plants, nor does it calculate the marginal emission rates. It does not take into consideration the time matching of wind generation. The eGRID database approach is much less accurate than the methodology used in this report. However, there is some broad agreement on emission rates.

8.0 EFFECT OF CAP AND TRADE PROGRAMS

The avoided emissions estimates from the operation of the Alabama Ledge Wind Farm are those that may reasonably be expected to take place through the operation of the Upstate New York power grid. Although it is clear that wind energy reduces the energy production of fossil fuel-fired generation at individual power plants or units and reduces actual emissions at those plants, the impact of wind generation on total overall emissions is more complicated for pollutants that are subject to regulation under emissions caps and trading programs.

With or without a cap and trade program, the effect of wind power generation is to avoid emissions from displaced generation at fossil fueled plants. In the case of cap and traded pollutants, the emissions allowances that are not used as a result of the wind generation may be banked for future use, or traded to another generator within the program. Therefore, the emissions avoided may be replaced by the fossil-fueled generator at another time, or through surplus allowance trading, to another plant at another place. However, the overall emissions rate throughout the regional grid will be reduced, even if the cap on fossil-fueled generators is not reduced. An additional benefit is that as the avoided emissions from wind or other renewable energy technologies increase on the grid, the overall cost of reducing the emissions cap decreases.

In the case of NOx and SO_2, which are subject to cap and trade regulatory programs, the actual emissions reductions can only be credited for air quality regulatory purposes by the allocation and retirement of allowances in accordance with guidelines issued by the EPA.[2] In the case of CO_2, New York and other northeastern states that are part of the Regional Greenhouse Gas Initiative (RGGI) have implemented a limited CO_2 emissions cap regulation. EPA's Clean Air Mercury Rule, providing cap and trade requirements for mercury emissions from electric generating units, was struck down by the D.C. Circuit Court of Appeals.[3] Therefore, avoided mercury emissions are unaffected by cap and trade regulation. In the future, allowance allocation and retirement for NOx will depend on how EPA and New York implement regulations concerning the EPA's Clean Air Interstate Rule or replacement regulations.[4] For CO_2, this will depend on how the states and the federal government manage greenhouse gases.

[1] US EPA eGRID Summary Data http://www.epa.gov

[2] *U.S. Environmental Protection Agency, "Guidance on State Implementation Plan (SIP) Credits for Emission Reduction Measures from Electric-sector Energy Efficiency and Renewable Energy Measures," August 2004.*

[3] State of New Jersey, et al., v. Environmental Protection Agency, No. 05-1097, slip op. (D.C. Cir. Feb. 8, 2008). The court found that EPA had violated the requirements of the Clean Air Act by removing electric generating units from the list of sources regulated under Section 112 of the Act without making the required findings. As a result, the court also struck down EPA's Clean Air Mercury Rule.

[4] 70 Fed. Reg. 25162 (May 12, 2005). The Clean Air Interstate Rule is in abeyance as the result of a US court case. New York has provision for 10% of the total NOx allowance allocation to be set-aside for renewable energy.

9.0 CONCLUSIONS

Significant avoided air emissions may be expected to result from electric power generation by the Alabama Ledge Wind Farm. The avoided emissions will include NOx, SO_2 and CO_2, which have been quantified. In addition, there will be significant avoided emissions of fine particulate matter, mercury, volatile organic compounds, carbon monoxide, and other toxic air pollutants. The avoidance of emissions of all these pollutants has public health benefits and contributes to the mitigation of global warming. The avoided emissions from the wind farm will also reduce the overall cost of lowering the cap on NOx and SO_2, and in the future the cost of limiting greenhouse gas emissions in the US.

The avoided emissions will also have specific environmental benefits. The avoidance of NOx emissions will contribute to reducing the occurrence of high ozone days in New York, New England and Eastern Canada. This, coupled with reductions in SO_2, will reduce the impacts of acid precipitation on regional forests and lakes. The avoidance of fine particulate matter, NOx, and SO_2 will contribute to reducing regional haze and respiratory health risks. Lastly, avoided mercury emissions will contribute to efforts to reduce human exposure to environmental mercury, a compound that is both directly dangerous to human health and indirectly dangerous through the consumption of fish.

Most significantly, the reduction in CO_2 emissions will contribute to the mitigation of the potentially severe impact of global warming on the climate of New York and the world. To put the impacts in perspective, the greenhouse gas avoided emissions benefits of the Alabama Ledge Wind Farm are equivalent to taking approximately 33,606 cars off the road.[1] At the present time, the development of commercial wind power is one of the more cost-effective means of reducing carbon dioxide emissions and therefore of mitigating the pending climate crisis. This important environmental benefit of avoided emissions should be considered in balancing other impacts of the Alabama Ledge Wind Farm.

[1] Based on an average consumption of 554 gal/year for passenger cars and 19.4 pounds of CO_2 per gallon. Source: http://www.bts.gov/publications/national_transportation_statistics/csv/table_04_11.csv