

**BEFORE THE  
PUBLIC SERVICE COMMISSION  
OF MARYLAND**

In the Matter of the )  
Application of Catoctin Power, LLC )  
for a Certificate of Public Convenience and ) Case No. 8997  
Necessity To Construct a 600 MW Generating )  
Facility in Frederick County, Maryland )

**DIRECT TESTIMONY OF JULIA B. ROSS**

1 **Q. PLEASE STATE YOUR NAME, OCCUPATION, AND CURRENT**  
2 **POSITION.**

3 A. My name is Julia B. Ross. My business address is Environmental  
4 Resources Management (ERM), 350 Eagleview Boulevard, Suite 200,  
5 Exton, Pennsylvania 19341. I am a senior air quality professional at  
6 ERM and I am a Principal of the firm. A statement of my educational  
7 background, occupational history, and professional qualifications is  
8 appended to this testimony as Appendix A.

9 **Q. WHAT IS ERM’S RELATIONSHIP WITH THE DEPARTMENT OF**  
10 **NATURAL RESOURCES POWER PLANT RESEARCH PROGRAM**  
11 **(PPRP)?**

12 A. ERM is under contract to serve as the Atmospheric Sciences Integrator  
13 (or “Air Integrator”) for PPRP. In this capacity, ERM provides PPRP  
14 with technical expertise in air quality regulatory evaluations and  
15 impact assessments, including pollution control engineering and air  
16 quality dispersion modeling.

17 **Q. PLEASE DESCRIBE YOUR EXPERIENCE WITH THE ATMOSPHERIC**  
18 **SCIENCES INTEGRATOR CONTRACT.**

1 A. I first worked on the Air Integrator contract as a project scientist from  
2 1985 through 1988 while employed by Martin Marietta Environmental  
3 Systems. I joined ERM in 1988.

4 ERM began serving as PPRP's Air Integrator in January 1995. I have  
5 been serving as the Program Manager for ERM's Air Integrator  
6 contract with PPRP since that time. In addition to maintaining  
7 Program Management responsibility, I serve as a senior technical  
8 project team member with a focus on Clean Air Act and Maryland  
9 State air quality regulatory issues, including new power plant source  
10 permitting, pollution control technology evaluations, NO<sub>x</sub> regulatory  
11 and control issues, and power plant air emissions evaluations.

12 **Q. PLEASE EXPLAIN YOUR ROLE WITH RESPECT TO THE**  
13 **CATOCTIN POWER PROJECT.**

14 A. I was responsible for ERM's evaluation of air quality regulatory and  
15 permitting requirements and the control technology assessment  
16 associated with the proposed Catoctin Power Project on behalf of  
17 PPRP. I also directed and participated in the writing of the results of  
18 these evaluations in the PPRP report entitled *Interim Draft*  
19 *Environmental Review of the Proposed Catoctin Power Project* (DNR  
20 Exhibit \_\_ (DHB-2)).

21 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**  
22 **PROCEEDING?**

23 A. The purpose of my testimony is to summarize three areas of air quality  
24 analysis that ERM conducted on behalf of PPRP: (1) review of existing  
25 weather and ambient air quality conditions; (2) investigations of  
26 potential air emissions from the proposed project; and (3) assessments  
27 of the proposed pollution control systems. In addition, I am  
28 sponsoring Section 3.3 (addressing existing weather and ambient air  
29 conditions); Section 4.1 (addressing the air impact assessment  
30 methodology); Section 4.2 (describing the projected air emissions and  
31 related information relevant to evaluating air impacts from the

1 proposed project); portions of Sections 4.3 and 4.4 (regarding  
2 applicability of the Prevention of Significant Deterioration (PSD) and  
3 Nonattainment Area New Source Review (NA-NSR) permitting  
4 programs and related control technology assessments); and Sections  
5 4.9 and 4.10 (summarizing applicable air quality regulatory  
6 requirements) of the PPRP report titled *Interim Draft Environmental*  
7 *Review of the Proposed Catoctin Power Project* (DNR Exhibit \_\_ (DHB-2)).

8 **Q. WHAT SOURCES OF INFORMATION DID YOU USE IN YOUR**  
9 **AIR QUALITY ANALYSES?**

10 A. ERM used information from Catoctin Power’s application for a  
11 Certificate of Public Convenience and Necessity (CPCN) dated  
12 February 25, 2004, and subsequent Responses to Data Requests  
13 prepared by Catoctin Power. In addition, U.S. EPA guidance  
14 documents and information from the air quality engineering and  
15 scientific literature were used in specific analyses, as detailed in DNR  
16 Exhibit \_\_ (DHB-2)).

17 *Existing Ambient Air Conditions*

18 **Q. DID YOU REVIEW THE EXISTING AMBIENT AIR QUALITY**  
19 **CONDITIONS IN THE VICINITY OF THE CATOCTIN PROJECT**  
20 **SITE?**

21 A. Yes. ERM used information data from the U.S. Environmental  
22 Protection Agency and the State of Maryland to characterize the  
23 existing ambient air quality in the vicinity of the plant.

24 **Q. HOW IS THE AIR QUALITY IN ANY PARTICULAR LOCATION**  
25 **DETERMINED?**

26 A. Ambient air quality is generally discussed in terms of whether the air  
27 in any particular area of the county is “attaining” or “not attaining” the  
28 National Ambient Air Quality Standards (the “NAAQS”) that the U.S.  
29 EPA has established as being protective of the public health and  
30 welfare. NAAQS have been established for six so-called “criteria”

1 pollutants: nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), particulate  
2 matter (PM), ozone, carbon monoxide (CO), and lead).

3 The Maryland Department of the Environment (MDE) monitors  
4 concentrations of the criteria pollutants at various locations across the  
5 State near ground level. Other states' agencies do the same at locations  
6 across the United States. If monitoring indicates that the concentration  
7 of a pollutant exceeds a NAAQS in any area of the country, that area is  
8 labeled a "nonattainment area" for that pollutant, meaning that the  
9 area is not meeting the ambient standard. Conversely, any area in  
10 which the concentration of a criteria pollutant is less than the NAAQS  
11 is labeled an "attainment area" indicating that the NAAQS is being  
12 met.

13 The attainment/nonattainment designation is made by states and EPA  
14 on a pollutant-by-pollutant basis. Therefore, the air quality in an area  
15 may be designated attainment for some pollutants and nonattainment  
16 for other pollutants at the same time. For example, many cities are  
17 designated nonattainment for ozone, but are in attainment for the  
18 other criteria pollutants.

19 **Q. ARE THE POLLUTANT MONITORS LOCATED SUCH THAT**  
20 **THEY PROVIDE AMBIENT AIR MEASUREMENTS**  
21 **REPRESENTATIVE OF THE ENTIRE STATE'S AIR QUALITY?**

22 A. Yes. State air quality agencies operate a network of pollutant monitors  
23 across the county meeting requirements of Appendix D of Part 58 of  
24 the Code of Federal Regulations in which EPA established air quality  
25 monitoring network design specifications. The monitors are located  
26 so that the samples they collect are representative of air quality over  
27 the entire area they are intended to cover. The scale of the coverage  
28 area varies for different pollutants and based on local conditions such  
29 as terrain and other factors.

30 **Q. CAN YOU CHARACTERIZE THE AMBIENT AIR QUALITY IN**  
31 **THE VICINITY OF THE PROPOSED CATOCTIN PROJECT?**

1 A. As summarized in Section 3.3 of the ERD DNR Exhibit \_\_ (DHB-2), all  
2 of the State of Maryland, including Frederick County, is designated as  
3 being in attainment of the NAAQS for all criteria pollutants (NO<sub>2</sub>, SO<sub>2</sub>,  
4 PM, CO, and lead) with the exception of ozone.

5 Some counties in Maryland are designated ozone attainment areas and  
6 some are nonattainment areas; however, because ozone is a regional  
7 issue, EPA treats the entire northeastern United States, from northern  
8 Virginia to Maine, as an ozone nonattainment area known as the  
9 Northeast Ozone Transport Region. Frederick County is a designated  
10 “severe” ozone nonattainment area (on a scale that ranges from worst-  
11 to-best air quality of: extreme – severe – serious – moderate –  
12 marginal).

13 We reviewed ambient data from air quality monitoring stations in and  
14 around Frederick County, within 100 kilometers of the site. The  
15 monitoring data are collected by state agencies and are available from  
16 EPA’s “AIRS” database.

17 *Potential Air Emissions Investigations*

18 **Q. DID YOU REVIEW CATOCTIN’S EMISSIONS ESTIMATES FOR**  
19 **THE PROPOSED CATOCTIN POWER PROJECT?**

20 A. Yes. ERM reviewed the emission rate and related information  
21 presented in the original CPCN application, and updated emissions  
22 information in Catoctin’s Response to DNR Data Requests Nos. 1, 4,  
23 and 5.

24 **Q. WHAT WAS THE PURPOSE OF YOUR EVALUATION OF**  
25 **PROJECTED EMISSIONS?**

26 A. Projected potential emission rates from a proposed new facility form  
27 the basis for determining which permitting programs and other air  
28 quality requirements apply to a proposed project. To assist PPRP and  
29 the Maryland Department of the Environment Air and Radiation  
30 Management Administration (ARMA) in its evaluation of the

1 proposed Catoctin Power Project, I and ERM staff under my direct  
2 supervision reviewed the information on emission rates, control  
3 technology effectiveness, and operations that will determine potential  
4 emissions from the proposed project.

5 **Q. WHAT, GENERALLY, ARE THE AIR EMISSIONS SOURCES**  
6 **THAT CATOCTIN POWER IS PROPOSING TO CONSTRUCT**  
7 **AND OPERATE AS A PART OF THE CATOCTIN PROJECT?**

8 A. Catoctin Power is proposing to construct and operate two General  
9 Electric Frame 7FA combustion turbines (CTs) to be operated in  
10 combined cycle mode. The CTs will burn only pipeline quality natural  
11 gas. Each CT will be equipped with a heat recovery steam generator  
12 (HRSG) with duct burners. The duct burners will provide additional  
13 steam supply, enabling higher power output when needed. Steam  
14 produced by the HRSGs will be combined and directed to a steam  
15 turbine. Both CTs will be constructed within a turbine building. The  
16 facility will have a nominal electric generating capacity of 600 MW.

17 The CTs will be designed with dry low-NO<sub>x</sub> combustors. The duct  
18 burners will be equipped with low-NO<sub>x</sub> burners. Catoctin will operate  
19 selective catalytic reduction (SCR) systems using 19 percent aqueous  
20 ammonia downstream of the duct burners to control emissions of  
21 nitrogen oxides (NO<sub>x</sub>). The CTs and duct burners will be equipped  
22 with catalytic oxidation systems to control carbon monoxide (CO) and  
23 volatile organic compounds (VOCs).

24 In addition to the combustion turbines, Catoctin Power is proposing to  
25 install one 1,000-kilowatt (kW) emergency diesel generator (EDG), one  
26 370-horsepower (hp) emergency firewater pump, and two electric-  
27 powered fuel gas heaters. The facility will be equipped with a 12-cell  
28 mechanical draft cooling tower with drift eliminators. Catoctin Power  
29 will also install one aqueous ammonia storage tank (approximately  
30 20,000 gallons in size) associated with the SCR system.

1 Q. CAN YOU EXPLAIN, GENERALLY, THE TYPES OF POLLUTANTS  
2 THAT WILL BE EMITTED FROM OPERATION OF THE  
3 CATOCTIN PROJECT?

4 A. Combustion turbines burning natural gas have the potential to emit  
5 "criteria" pollutants, hazardous air pollutants (or "HAPs"), and other  
6 compounds. As mentioned before, criteria pollutants are the six  
7 pollutants for which the U.S. EPA has established NAAQS, which are  
8 set a levels to be protective of public health and welfare.

9 "Particulate matter" is categorized by size (e.g., PM10 represents  
10 particulate matter less than 10 microns in diameter; PM2.5 represents  
11 particulate matter less than 2.5 microns in diameter).

12 Hazardous air pollutants include 188 compounds listed in Section  
13 112(b) of the Clean Air Act. HAPs include metals (e.g., mercury,  
14 arsenic), organic compounds (e.g., toluene, benzene, xylene), and  
15 inorganic compounds (e.g., hydrogen chloride).

16 Other compounds that may be emitted by combustion turbines include  
17 trace amounts of other compounds not regulated as criteria pollutants  
18 or hazardous air pollutants, sometimes referred to as "toxic air  
19 pollutants" or "TAPs," and selected other compounds not presently  
20 regulated by MDE or EPA, including ammonia and greenhouse gases  
21 (GHGs).

22 Each of the small generators, the emergency generator and the  
23 firewater pump engine, will burn diesel fuel and so will also have the  
24 potential to emit criteria pollutants and hazardous air pollutants.

25 The Catoctin Project will use a water-cooled condenser (cooling tower)  
26 system to condense the low-pressure steam released from the steam  
27 turbine generator. The heat absorbed by the circulating water will be  
28 removed by a 12-cell, rectangular, mechanical draft, counterflow  
29 cooling tower and released to the atmosphere. Entrained water  
30 droplets in the air stream are released to the atmosphere as "drift" and  
31 contain particulate matter, PM10 and PM2.5.

1 To minimize the PM emissions and associated visible plume from the  
2 tower, Catocin will utilize a plume abatement system, equipped with  
3 a 0.0005% drift eliminator.

4 Catocin may use wastewater treatment plant effluent from the  
5 Ballenger Creek WWTP or Potomac River water as a source of water  
6 for the cooling systems. Therefore, there is a potential for any toxic air  
7 pollutants (TAPs) in the effluent to be released to the atmosphere in  
8 the cooling drift.

9 The proposed fuel gas heaters will be electrically-fired, not fuel  
10 burning sources, and so will not emit air pollutants.

11 **Q. BEFORE YOU CONTINUE, PLEASE EXPLAIN THE DISTINCTION**  
12 **BETWEEN PM2.5 AND PM10, AND WHICH STANDARD APPLIES**  
13 **TO CATOCTIN?**

14 A. Since the late 1980s, the NAAQS for particulate matter covered  
15 "PM10," which represents particulate matter less than 10 microns in  
16 diameter. In 1997, EPA revised the NAAQS for PM and added a  
17 standard for a new form of particulate matter known as PM2.5,  
18 particulate matter less than 2.5 microns in diameter. PM2.5, or "fine  
19 particulates" are of concern because the small size of the particles  
20 allows them to be inhaled deeply into the lungs. There was litigation  
21 over the PM2.5 NAAQS that delayed the official identification and  
22 designation of PM2.5 nonattainment areas until 2004. EPA published  
23 its preliminary PM2.5 nonattainment area designations in June 2004;  
24 final determinations are expected in late 2004-early 2005.

25 **Q. WOULD YOU ALSO EXPECT AIR EMISSIONS FROM**  
26 **CONSTRUCTION ACTIVITIES ASSOCIATED WITH THE**  
27 **PROJECT?**

28 A. Yes. Construction of a project of this size will result emissions from  
29 two types of activities: 1) land clearing, site preparation, and other  
30 construction activities; and 2) exhaust from construction vehicles. The  
31 construction activities can result in fugitive emissions of particulate

1 matter; operation of construction vehicles results in combustion  
2 emissions (particulate matter, sulfur dioxide, carbon monoxide,  
3 volatile organic compounds, and nitrogen oxides).

4 **Q. WHAT POLLUTANTS DID CATOCTIN POWER ADDRESS IN ITS**  
5 **APPLICATION AND RESPONSES TO DATA REQUESTS?**

6 A. As required by State and federal air regulations, Catoctin Power  
7 addressed potential criteria pollutants and hazardous air pollutants  
8 from the combustion turbines, small generators, and the cooling tower  
9 system. Catoctin Power also presented information on potential  
10 emissions of ammonia from its use in the SCR pollution control  
11 system, and characterized potential emissions from construction  
12 activities.

13 **Q. IS CATOCTIN POWER PROPOSING ANY OPERATING**  
14 **RESTRICTIONS ON THE COMBUSTION TURBINES OR OTHER**  
15 **EMISSIONS SOURCES FOR THE CATOCTIN PROJECT THAT**  
16 **WILL AFFECT POTENTIAL AIR EMISSIONS?**

17 A. Yes, Catoctin Power is proposing several operating restrictions that  
18 will limit air emissions from the project; each of these restrictions is  
19 factored into our estimates of potential emissions from the project.

20 **Q. WHAT OPERATING RESTRICTIONS IS CATOCTIN POWER**  
21 **PROPOSING THAT WILL AFFECT AIR EMISSIONS FROM THE**  
22 **CATOCTIN PROJECT?**

23 A. There are a number of operating restrictions that Catoctin Power is  
24 proposing that will serve to limit air emissions.

25 First, the combustion turbines will burn only pipeline quality natural  
26 gas with a maximum sulfur content of 1 grain per 100 standard cubic  
27 feet (gr/100 scf).

28 Second, each combustion turbine will be equipped with dry low-NO<sub>x</sub>  
29 combustors to minimize the production of NO<sub>x</sub>, and will have the

1 capability of operating 24 hours per day, 365 days per year (8,760  
2 hours per year).

3 Third, although Catoctin Power is requesting the ability to operate the  
4 combustion turbines continuously over the year, the duct burners will  
5 each be limited to a heat input rate of 577 million British thermal units  
6 (MMBtu) per hour per unit at 90°F (or 561 MMBtu/hr at 54°F). Duct  
7 firing will be limited to a maximum of 4,000 hours per year per unit,  
8 which equates to a maximum of 2,308,000 MMBtu per year at 90°F.

9 Fourth, each combustion turbine will operate in startup or shutdown  
10 mode for no more than 680 hours per year and there will be no duct  
11 firing during startups and shutdowns.

12 Fifth, Catoctin Power will operate selective catalytic reduction (SCR)  
13 control systems within the heat recovery steam generators (HRSGs),  
14 which will reduce NO<sub>x</sub> emissions by approximately 81.5%; and  
15 oxidation catalyst systems within the HRSGs that will reduce CO  
16 emissions by 82% and VOC emissions by 50%.

17 **Q. BASED ON YOUR REVIEW OF EMISSIONS AND OTHER**  
18 **INFORMATION PRESENTED BY THE APPLICANT, DO YOU**  
19 **ACCEPT CATOCTIN POWER'S PROJECTED EMISSION RATES**  
20 **AS REPRESENTATIVE OF THE PROPOSED PROJECT?**

21 A. Yes. With clarifications and additions to the CPCN application that  
22 Catoctin Power provided in responses to data requests, we believe that  
23 Catoctin Power's emissions projections are representative of the  
24 proposed Catoctin project.

25 **Q. DID YOU ALSO LOOK AT EMISSIONS FROM POLLUTANTS**  
26 **OTHER THAN THOSE REQUIRED BY REGULATION?**

27 A. Yes, in addition to potential criteria pollutant and HAP emissions, on  
28 behalf of PPRP, we estimated potential emissions of toxic air pollutants  
29 that could be released from the cooling tower, assuming Catoctin  
30 Power uses Ballenger Creek effluent. We also estimated potential

1 emissions of the greenhouse gas carbon dioxide (CO<sub>2</sub>) from the  
2 combustions turbines.

3 *Air Pollution Control Systems*

4 **Q. DID YOU ALSO REVIEW CATOCTIN POWER'S CONTROL**  
5 **TECHNOLOGY PROPOSALS AS PART OF YOUR REVIEW OF**  
6 **THE APPLICATION?**

7 A. Yes. On behalf of PPRP and ARMA, I and engineers under my direct  
8 supervision reviewed Catoctin's control technology proposals, referred  
9 to as the Best Available Control Technology (BACT) and Lowest  
10 Achievable Emission Rate (LAER) proposals, and conducted an  
11 independent evaluation of potentially applicable control technologies.

12 As discussed in Section 4.3 of the *Interim Draft Environmental Review of*  
13 *the Proposed Catoctin Power Project* (DNR Exhibit \_\_ (DHB-2)), potential  
14 emissions of NO<sub>2</sub>, CO, SO<sub>2</sub>, and PM<sub>10</sub> from the Catoctin Power project  
15 will exceed significance thresholds and are therefore subject to  
16 Prevention of Significant Determination (PSD) review. Potential  
17 emissions of NO<sub>x</sub> and VOCs will also be above applicable thresholds  
18 and so trigger NA-NSR Nonattainment Area New Source Review  
19 (PSD) requirements.

20 Being subject to PSD, Catoctin Power must demonstrate the project  
21 will employ a level of pollution control known as Best Available  
22 Control Technology (BACT) for emissions of PM<sub>10</sub>, CO, SO<sub>2</sub> and NO<sub>2</sub>.  
23 BACT must be demonstrated for the affected pollutants from all new  
24 sources that are part of the project. In this case, this means that  
25 Catoctin Power must demonstrate application of BACT separately for  
26 PM<sub>10</sub>, CO, SO<sub>2</sub>, and NO<sub>2</sub> from the combustion turbines, the emergency  
27 diesel generator, and the firewater pump engine; and for PM<sub>10</sub> from  
28 the cooling towers.

29 Triggering NA-NSR requires Catoctin Power to demonstrate Lowest  
30 Achievable Emission Rate (LAER) level of pollution control for NO<sub>x</sub>  
31 and VOCs. Again, once triggered, LAER must be demonstrated for all

1 sources that emit the pollutants of concern. For the Catoctin Power  
2 case, this means that the combustion turbines and small generators are  
3 subject to LAER for NO<sub>x</sub> and VOCs.

4 **Q. PLEASE DESCRIBE THE TERMS “BEST AVAILABLE CONTROL**  
5 **TECHNOLOGY” (BACT) AND “LOWEST ACHIEVABLE**  
6 **EMISSION RATE” (LAER) IN MORE DETAIL.**

7 **A.** Best Available Control Technology, or BACT, applies to new or  
8 modified sources considered to be “major” under the Prevention of  
9 Significant Deterioration (PSD) program, such as the proposed  
10 Catoctin project. Although BACT is often discussed in terms of a  
11 particular type of control technology, BACT is defined as an emissions  
12 limitation, determined on a case-by-case basis, which provides for the  
13 maximum degree of reduction of a pollutant, taking into account  
14 energy, environmental, and economic impacts and other costs. At a  
15 minimum, BACT must be at least as stringent as any applicable,  
16 established New Source Performance Standards (NSPS) found in 40  
17 CFR Part 60, nor may BACT allow a violation of a NAAQS or PSD  
18 increment.

19 Lowest Achievable Emission Rate, or LAER, is defined as the more  
20 stringent of either: (1) the most stringent emissions limitation which is  
21 contained in the implementation plan of any state for a class or  
22 category of stationary sources, unless the owner or operator of the  
23 proposed stationary source demonstrates that these limitations are not  
24 achievable; or (2) the most stringent emissions limitation which is  
25 achieved in practice by a class or category of stationary sources. LAER  
26 is always at least as stringent as BACT.

27 *Lowest Achievable Control Technology (LAER) Review*

28 **Q. WHAT ARE THE POLLUTANTS OF CONCERN FOR THE**  
29 **STATE’S ANALYSIS OF LAER FOR THE CATOCTIN PROJECT?**

1 A. Based on projected potential emissions from the project, the Catoctin  
2 project is subject to LAER requirements for emissions of NO<sub>x</sub> and  
3 VOCs.

4 **Q. WHAT PROPOSED CATOCTIN POWER SOURCES HAVE THE**  
5 **POTENTIAL TO EMIT NO<sub>x</sub> OR VOCs?**

6 A. The three combustion sources (the combustion turbines and their  
7 associated duct burners, the emergency diesel generator, and the  
8 firewater pump engine) have the potential to emit NO<sub>x</sub> and VOCs and  
9 so must demonstrate LAER.

10 **Q. DID YOU REVIEW THE APPLICANT'S LAER ASSESSMENTS**  
11 **FOR NO<sub>x</sub> FROM AFFECTED SOURCES?**

12 A. Yes. Table 4-22 of the *Interim Draft Environmental Review of the Proposed*  
13 *Catoctin Power Project* (DNR Exhibit \_\_ (DHB-2)) summarizes LAER for  
14 the project.

15 **Q. PLEASE DESCRIBE THE APPLICANT'S LAER PROPOSAL FOR**  
16 **NO<sub>x</sub> FROM THE COMBUSTION TURBINES.**

17 A. Catoctin Power initially proposed in its CPCN application to use GE  
18 combustion turbines that incorporate advanced dry low-NO<sub>x</sub> (DLN)  
19 combustor technology, dry low-NO<sub>x</sub> burners on the duct burners, and  
20 operation of a selective catalytic reduction (SCR) system to be located  
21 within the heat recovery steam generator (HRSGs) to achieve a NO<sub>x</sub>  
22 emission rate of 2.5 parts per million by volume on a dry weight basis  
23 (ppmvd) corrected to 15% oxygen.

24 **Q. DID YOU CONCUR WITH THE APPLICANT'S FINDINGS**  
25 **REGARDING LAER FOR NO<sub>x</sub> FROM THE CATOCTIN POWER**  
26 **PROJECT COMBUSTION TURBINES?**

27 A. No, we did not. We reviewed available literature, EPA databases, and  
28 information on recent combustion turbine projects and determined

1 that a rate of 2.0 ppmvd corrected 15% oxygen, rather than 2.5 ppmvd  
2 as proposed by Catoctin Power, would be achievable on this units.

3 In response to DNR Data Request #4, Catoctin Power revised its  
4 emissions estimates, and now indicates that the maximum NO<sub>x</sub>  
5 emission rate will be 2.0 ppmvd corrected to 15% oxygen, based on a 1-  
6 hour average during steady-state operations (periods other than  
7 startup and shutdown when the SCR system is not operating at steady  
8 state conditions).

9 **Q. PLEASE DESCRIBE THE APPLICANT'S LAER PROPOSAL FOR**  
10 **NO<sub>x</sub> FROM THE EMERGENCY DIESEL GENERATOR.**

11 A. Catoctin Power initially proposed in its CPCN application that LAER  
12 for NO<sub>x</sub> for the emergency diesel generator would be 41.6 pounds per  
13 hour (lb/hr), on 3-hour average basis.

14 **Q. DID YOU CONCUR WITH THE APPLICANT'S FINDINGS**  
15 **REGARDING LAER FOR NO<sub>x</sub> FROM THE CATOCTIN POWER**  
16 **PROJECT EMERGENCY DIESEL GENERATOR?**

17 A. No, we did not. We reviewed various source of information and  
18 determined that a lower NO<sub>x</sub> would be achievable for this type of  
19 source.

20 The applicant revised its LAER determination at the request of the  
21 State and clarified in Response to DNR Data Request #4 of 23 July 2004  
22 that maximum NO<sub>x</sub> emissions from the unit would not exceed 20.4  
23 lb/hr (or 6.9 grams per brake-horsepower-hour, g/bhp-hr) on a 3-hour  
24 average basis, to be achieved by use of a EPA Tier 1-rated engine,  
25 application of good combustion practices, and limiting operations to  
26 no more than 200 hr/year.

27 **Q. PLEASE DESCRIBE THE APPLICANT'S LAER PROPOSAL FOR**  
28 **NO<sub>x</sub> FROM THE FIREWATER PUMP ENGINE.**

1 A. Catoctin Power has proposed LAER for the firewater pump engine as a  
2 NO<sub>x</sub> emission rate not to exceed 11.5 lb/hr on a 3-hour average basis to  
3 be achieved by limiting operations to no more than 100 hr/yr and  
4 application of good combustion practices.

5 **Q. DID YOUR EVALUATION SHOW THAT THIS PROPOSED**  
6 **EMISSION RATE IS WITHIN THE RANGE OF THE LOWEST**  
7 **EMISSIONS RATES ACHIEVED BY SIMILAR SOURCES?**

8 A. Yes, the proposed NO<sub>x</sub> emission rate from the firewater pump engine  
9 is within the range of similarly sized units reported for other similar  
10 sources; there are some units with somewhat lower projected NO<sub>x</sub>  
11 rates, although none appear to have add-on controls in place, or  
12 systems other than good operating practices and limits on hours of  
13 operation.

14 **Q. DID YOU ALSO REVIEW THE APPLICANT'S LAER**  
15 **ASSESSMENTS FOR VOLATILE ORGANIC COMPOUNDS**  
16 **(VOCs) FROM AFFECTED SOURCES?**

17 A. Yes.

18 **Q. PLEASE DESCRIBE THE APPLICANT'S LAER PROPOSALS FOR**  
19 **VOCs FROM THE AFFECTED CATOCTIN POWER SOURCES.**

20 A. For the combustion turbines, Catoctin Power proposes to use good  
21 combustion practices and operation of oxidation catalyst systems to be  
22 located within the HRSGs to achieve a VOC emission rate not to  
23 exceed 0.7 ppmvd corrected 15% oxygen on 3-hr average basis without  
24 duct firing, and 1.3 ppmvd corrected 15% oxygen on 3-hr average basis  
25 with duct firing.

26 For the emergency diesel generator, the applicant originally proposed  
27 LAER for VOCs from the unit as a rate not to exceed 11.5 lb/hr.

28 Catoctin Power proposed that LAER for the firewater pump for VOCs  
29 is a limit of 0.91 lb/hr on a 3-hour average basis to be achieved by

1 application of good combustion practices and limiting operations to no  
2 more than 100 hr/year.

3 **Q. DID YOUR EVALUATION SHOW THAT THESE PROPOSED**  
4 **EMISSION RATES ARE WITHIN THE RANGE OF THE LOWEST**  
5 **EMISSIONS RATES ACHIEVED BY SIMILAR SOURCES?**

6 A. Catoctin Power's LAER proposals for VOC emissions for the  
7 combustion turbines and firewater pump engine are within the range  
8 of the best performing similar source; however, a review of relevant  
9 literature indicated that lower VOC emissions could be achieved by  
10 the emergency diesel generator. As explained previously for NO<sub>x</sub>,  
11 Catoctin Power agreed to revise its LAER proposal for the unit, and  
12 indicates in its Response to DNR Data Request #4 of 23 July 2004, that  
13 the emergency diesel generator will meet Tier 1 emissions standards,  
14 and therefore LAER for the units for VOCs will be a limit of 1.5 lb/hr  
15 on a 3-hr average basis to be achieved by application of good  
16 combustion practices and limiting operations to no more than 200  
17 hr/year. This rate is within the range of known emissions limits for  
18 VOCs from similar sources having undergone LAER or BACT review.

19 *BACT Review*

20 **Q. DID YOU REVIEW THE APPLICANT'S BACT ASSESSMENTS**  
21 **FOR PARTICULATE MATTER FROM AFFECTED SOURCES?**

22 A. Yes.

23 **Q. PLEASE DESCRIBE THE APPLICANT'S PROPOSED BACT FOR**  
24 **PARTICULATE MATTER FROM THE COMBUSTION TURBINES,**  
25 **SMALL GENERATORS, AND THE COOLING TOWERS.**

26 A. The Applicant proposes specific emission rates, summarized in Table  
27 4-10 of the *Interim Draft Environmental Review of the Proposed Catoctin*  
28 *Power Project* (DNR Exhibit \_\_ (DHB-2)) document.

1 For the combustion turbines, BACT for PM will be achieved by the  
2 exclusive use of pipeline quality natural gas with typical heat content  
3 of approximately 20,500 Btu/lb (lower heating value) and a maximum  
4 sulfur content of 1 grain per 100 standard cubic foot. There are no  
5 known applications of add-on pollution control systems to reduce PM  
6 emissions from combustion turbines; it is accepted that use of cleaner  
7 fuels such as low sulfur content natural gas is BACT for this type of  
8 source.

9 For the diesel-fired emergency generator, BACT for PM will be  
10 achieved by use of an EPA Tier 1-rated 1,000-kilowatt generator  
11 burning low sulfur (0.05% sulfur by weight) diesel fuel. Catoctin  
12 Power will maintain the unit according to manufacturer's  
13 specifications to minimize emissions of PM, and will limit operations  
14 to no more than 200 hours per year. BACT for this type of source is  
15 generally achieved by use of low-sulfur fuels and limits on hours of  
16 operation, as proposed by Catoctin Power.

17 For the firewater pump engine, BACT for PM will be achieved by  
18 using low sulfur (0.05% sulfur by weight) diesel fuel in the 370-hp  
19 engine and operating the unit for no more than 100 hours per year.  
20 BACT for this type of source is generally achieved by use of low-sulfur  
21 fuels and limits on hours of operation, as proposed by Catoctin Power.

22 For the cooling tower, Catoctin Power will install and operate high  
23 efficiency mist or "drift" eliminators to achieve a drift loss rate of  
24 0.0005 percent of recirculating water flow, which removes a percentage  
25 of the drift droplets (PM) prior to release from the cooling tower stack.  
26 Drift eliminators are the only known feasible method to reduce PM  
27 emissions from cooling towers.

28 **Q. DO YOU CONCUR WITH THE APPLICANT'S TECHNICAL**  
29 **FINDINGS REGARDING BACT FOR PARTICULATE MATTER**  
30 **FROM THE PROPOSED PROJECT?**

1 A. We agree with the Applicant's technical conclusions regarding BACT  
2 for particulate matter from all proposed sources.

3 **Q. DID YOU REVIEW THE APPLICANT'S BACT ASSESSMENTS**  
4 **FOR CARBON MONOXIDE?**

5 Y. Yes.

6 **Q. PLEASE DESCRIBE THE APPLICANT'S PROPOSED BACT FOR**  
7 **CARBON MONOXIDE FROM THE COMBUSTION TURBINES**  
8 **AND SMALL GENERATORS.**

9 The Applicant proposes specific emission rates, summarized in Table  
10 4-10 of the *Interim Draft Environmental Review of the Proposed Catoctin*  
11 *Power Project* (DNR Exhibit \_\_ (DHB-2)) document, as BACT for CO  
12 emissions from the combustion sources.

13 For the combustion turbines, Catoctin Power is proposing to limit CO  
14 emissions through use of the dry low-NO<sub>x</sub> combustor design, good  
15 combustion practices, and application of an oxidation catalyst system  
16 to achieve an emission rate of 2.0 parts per million by volume on a dry  
17 weight basis (ppmvd) corrected to 15% oxygen over a 3-hour  
18 averaging period without duct firing, and 3.0 ppmvd at 15% oxygen  
19 on a 3-hour average basis with duct firing. This represents a CO  
20 reduction of approximately 82% and so is at the higher end of the  
21 range of expected CO reduction efficiencies.

22 For the diesel-fired emergency generator, BACT for CO will be  
23 achieved by use of an EPA Tier 1-rated 1,000-kilowatt generator  
24 burning low sulfur (0.05% sulfur by weight) diesel fuel. Catoctin  
25 Power will maintain the unit according to manufacturer's  
26 specifications to minimize emissions of CO, and will limit operations  
27 to no more than 200 hours per year. BACT for this type of source is  
28 generally achieved by use of good combustion practices and limits on  
29 hours of operation, as proposed by Catoctin Power.

1 For the firewater pump engine, BACT for CO will be achieved by  
2 using low sulfur (0.05% sulfur by weight) diesel fuel in the 370-hp  
3 engine and operating the unit for no more than 100 hours per year.  
4 BACT for this type of source is generally achieved by use of good  
5 combustion practices and limits on hours of operation, as proposed by  
6 Catoctin Power.

7 **Q. DO YOU CONCUR WITH THE APPLICANT'S TECHNICAL**  
8 **FINDINGS REGARDING BACT FOR CARBON MONOXIDE**  
9 **FROM THE CATOCTIN POWER PROJECT?**

10 A. Yes, we agree with the Applicant's technical conclusions regarding  
11 BACT for CO from the proposed combustion sources.

12 **Q. DID YOU REVIEW THE APPLICANT'S BACT ASSESSMENT FOR**  
13 **SULFUR DIOXIDE (SO<sub>2</sub>) FROM THE COMBUSTION TURBINES?**

14 Y. Yes.

15 **Q. PLEASE DESCRIBE THE APPLICANT'S PROPOSED BACT FOR**  
16 **SULFUR DIOXIDE FROM THE COMBUSTION TURBINES AND**  
17 **SMALL GENERATORS.**

18 A. The Applicant proposes specific SO<sub>2</sub> emission rates identified in Table  
19 4-10 of the *Interim Draft Environmental Review of the Proposed Catoctin*  
20 *Power Project* (DNR Exhibit \_\_ (DHB-2)) document.

21 For the combustion turbines, Catoctin Power is proposing to use  
22 pipeline quality natural gas with a maximum sulfur content of 1 grain  
23 per 100 standard cubic feet to minimize SO<sub>2</sub> emissions. There are no  
24 known applications of add-on controls to remove SO<sub>2</sub> from exhaust  
25 gases from combustion turbines firing natural gas. BACT for SO<sub>2</sub> is  
26 generally found to be achieved by the as use of low sulfur fuel,  
27 including pipeline quality natural gas, which is consistent with  
28 Catoctin Power's proposal.

29 For the diesel-fired emergency generator, the Applicant is proposing  
30 that BACT for SO<sub>2</sub> will be achieved by use of an EPA Tier 1-rated

1 generator burning low sulfur (0.05% sulfur by weight) diesel fuel.  
2 Catoctin Power will maintain the unit according to manufacturer's  
3 specifications and will limit operations to no more than 200 hours per  
4 year. BACT for this type of source is generally achieved by use of low-  
5 sulfur fuels and limits on hours of operation, as proposed by Catoctin  
6 Power.

7 For the firewater pump engine, the Applicant is proposing that BACT  
8 for SO<sub>2</sub> will be achieved by using low sulfur (0.05% sulfur by weight)  
9 diesel fuel in the engine and limiting operations of the unit to no more  
10 than 100 hours per year. BACT for this type of source is generally  
11 achieved by use of low-sulfur fuels and limits on hours of operation, as  
12 proposed by Catoctin Power.

13 **Q. DO YOU CONCUR WITH THE APPLICANT'S TECHNICAL**  
14 **FINDINGS REGARDING BACT FOR SULFUR DIOXIDE AND**  
15 **FROM THE CATOCTIN POWER PROJECT?**

16 A. Yes.

17 **Q. DID YOU REVIEW THE APPLICANT'S BACT ASSESSMENTS**  
18 **FOR NITROGEN OXIDES (NO<sub>x</sub>)?**

19 Y. Yes.

20 **Q. DO YOU CONCUR WITH THE APPLICANT'S TECHNICAL**  
21 **FINDINGS REGARDING BACT FOR NO<sub>x</sub> AND FROM THE**  
22 **CATOCTIN POWER PROJECT?**

23 A. Yes. In fact, the project is also subject to NA-NSR review, which  
24 requires LAER. By definition, LAER must be at least as stringent as  
25 BACT; therefore, by meeting LAER, the project is assumed to meet  
26 BACT requirements also.

27 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

28 A. Yes it does.

**APPENDIX A**  
**STATEMENT OF QUALIFICATIONS**  
**for Julia B. Ross**

*Experience and Employment*

Ms. Ross is a senior Air Quality professional at Environmental Resources Management, Inc. (ERM). She has more than 18 years of experience in environmental consulting with an emphasis in air quality management and electric utility environmental issues. She is a Principal of ERM, and provides senior quality assurance/quality control on air quality regulatory project work for the company.

Ms. Ross has extensive experience in preparing air quality permit applications, including complex Prevention of Significant Deterioration (PSD) and nonattainment New Source Review (NSR) permits; conducting criteria and hazardous air pollutant emissions inventories; evaluating air pollution control technologies; conducting Clean Air Act assessments and training; and preparing and reviewing Title V operating permits.

Ms. Ross serves as Program Manager for ERM's contract with the Maryland Department of Natural Resources Power Plant Research Program (PPRP) in which ERM is serving as the Atmospheric Sciences Integrator (Air Integrator). In this role, Ms. Ross manages the range of air quality regulatory and engineering tasks that PPRP must address to ensure management and licensing of utility and non-utility power plants in Maryland. As part of the Air Integrator program, Ms. Ross directs ERM's detailed air quality analyses for PPRP in all Certificate of Public Convenience and Necessity (CPCN) licensing cases before the Public Service Commission (PSC).

Among the CPCN cases in which Ms. Ross has directed and conducted the air quality and related technical evaluations, including regulatory, control technology and impact assessment evaluations; prepared discovery materials; and prepared direct testimony on behalf of PPRP on issues related to emissions and pollution control are:

- ODEC/Reliant Rock Springs (Case No. 8821)
- Trigen/UMCP (Case No. 8840)
- Trigen/Sweetheart Cup (Case No. 8858)
- Trigen/Inner Harbor East (Case No. 8856)
- Bentech/Oaks Landfill (Case No. 8782)

- Town of Berlin Power Plant Replacement Project (Case No. 8175)
- Brown Station Road Landfill Project (Case No. 8838)
- Baltimore Gas & Electric Perryman Power Plant CPCN Modification
- Mirant Mid-Atlantic Dickerson Expansion (Case No. 8888)
- Mirant Mid-Atlantic Chalk Point Expansion Project (8912)
- Mirant Mid-Atlantic Morgantown Auxiliary Boiler Project (8949)

In addition to directing CPCN work, Ms. Ross directs and conducts studies for PPRP on new and proposed emissions limitations and pollution control requirements affecting stationary sources, such as RACT and MACT regulations; and proposed revisions to the National Ambient Air Quality Standards for ozone, particulate matter, and SO<sub>2</sub>.

Brief summaries of Ms. Ross' additional related air quality project experience include:

- Directed PPRP's review of distributed generation (DG) issues in Maryland and surrounding states.
- Managed the review and summary of recently promulgated Federal hazardous air pollutant (HAP) regulations affecting combustion sources, including the Boiler and Combustion Turbine Maximum Achievable Control Technology (MACT) standards.
- Coordinated PPRP's environmental review of PEPCO's Station H project located on the site of the Dickerson power plant, including evaluation of the Montgomery County Resource Recovery facility (municipal waste incinerator) adjacent to the existing Dickerson site. Evaluations included human health and ecological risk assessment, extensive atmospheric deposition, PSD review, and toxic air pollutant evaluations. Ms. Ross coordinated the discovery, testimony, and rebuttal testimony for PRPP in the case.
- Managed and prepared Title V permit applications and conducted Title V applicable requirements reviews for clients in PA, DE, GA, SC, MD, NE, and NJ.
- Managed and conducted VOC and NO<sub>x</sub> RACT assessments for various clients including a pharmaceutical manufacturer, two aluminum rolling mills, and a printing firm.

- Managed and conducted numerous criteria and hazardous air pollutant emissions inventories for large and small facilities, for such clients as AlliedSignal, Westinghouse, Hercules Aerospace, Reynolds Metals, Aqualon, ICI Fluoropolymers, and Elf Atochem.
- Managed Nonattainment NSR and PSD air quality permitting of a proposed onsite hazardous waste incinerator and three coal-fired boilers at a manufacturing facility.
- Managed and conducted a project to register and permit over 200 individual air pollution sources at a large manufacturing facility in Maryland, including permitting of 40 toxic air pollutant sources.
- Managed the development of customized Title V Operating Permit Manuals and training courses for a major multinational chemical manufacturer, and the American Association of Automobile Manufacturers. Trained company's environmental managers in Title V regulatory compliance.
- Conducted a Clean Air Act strategic planning project, including nationwide Clean Air Act training, for the General Electric Company. The strategic planning project included preparation of a customized Clean Air Act Compliance Manual.
- Managed the preparation of air quality permits, which included toxics and control technology assessments, for a new sludge drying facility at a municipal wastewater treatment plant.
- Managed the review and validation of an electric utility's strategy for complying with the Acid Rain provisions (Title IV) of the Clean Air Act Amendments of 1990.
- Prepared a review of air toxics regulations proposed by the State of Delaware for a group of chemical industry clients as compared to the Clean Air Act Amendments of 1990.
- Assisted in the design and implementation of toxic chemical release reporting strategies for several large industrial clients under the Community Right to Know Act.
- Conducted regulatory compliance audits at numerous industrial facilities and hazardous waste treatment, storage, and disposal facilities in the United States. Assessed compliance with CAA, SARA, OSHA. Conducted compliance assessments in Canada and England for U.S.-based companies.

Prior to her employment with ERM, Ms. Ross was a Scientist, and then Associate Scientist in the Atmospheric Sciences Department of Martin Marietta Environmental Systems. In this role, she tracked U.S. EPA and state and local air pollution regulatory changes; prepared permit applications for new and existing air pollutant sources; compiled, collected, and analyzed environmental field data for air quality and acid precipitation studies; maintained field air quality and meteorological monitoring stations; wrote and reviewed reports, technical memoranda, and proposals; supervised field and laboratory personnel; and programmed in SAS, FORTRAN, and BASIC on mainframe and a variety of personal computers and data loggers.

While in graduate school at McGill University, Ms. Ross served as a Climate Research/Teaching Assistant and Field Technician for the Department of Geography. In this capacity, she compiled climate data sets; created and interpreted computer maps of sea ice types; performed statistical analyses; and researched and prepared literature reviews. She created, administered, and graded weekly exercises and examinations, and tutored students and lead student group study sessions. Ms. Ross installed and maintained an 18-station rain gauge network in the Canadian Subarctic for an acid precipitation monitoring program.

### *Education*

M.Sc., McGill University, Montreal, Quebec, Canada, 1988  
Program in Physical Geography-Climatology.

B.A., University of Delaware, Newark, Delaware, 1982  
Program in Geography, with emphases in Climatology and Cartographic Studies. Graduated cum laude with a 3.6/4.0 G.P.A.

### *Academic Awards*

- 1984 1st Runner-up in the Student Paper Contest at the 41st International Eastern Snow Conference
- 1982 Delaware Valley Geographical Association Award for Distinguished Academic Achievement in Geography
- 1982 Phi Beta Kappa

### ***Professional Affiliations and Participation***

Ms. Ross is a member of the Air and Waste Management Association (AWMA), and is former Chair of the Board of the Delaware Valley Chapter of AWMA. She is also a member of the Association of American Geographers.

### ***Selected Publications – Julia B. Ross (formerly Julia Bartoshesky)***

- Bartoshesky, J. 1984. *Comparison of Linear and Log-linear Extrapolation Techniques for Snow Surface Temperature Prediction at Schefferville, Quebec.* Paper prepared for the 41st International Eastern Snow Conference, Washington, D.C., June 1984.
- Granberg, H., J. Bartoshesky, G. Crocker, and R. VanWyngaarden. 1984. "Research on Snow and Ice of Schefferville, Quebec." *McGill Subarctic Research Report for 1983-84.* Centre for Northern Studies and Research, McGill University, Montreal, Quebec.
- Bartoshesky, J., L. Corio, C. Maxwell, N. Pfeffer, K. Pickering, and R. Roig. 1986. *Patterns of Transport and Wet Deposition of Acidic Matter in Maryland During Spring 1984.* Report prepared by Martin Marietta Environmental Systems for Maryland Power Plant Siting Program.
- Bartoshesky, J., S. Campbell, T. Janicki, C. Maxwell, J. Miller, N. Pfeffer, and K. Zankel. 1986. *Coastal Streams Data Analysis: Phase I Report.* Technical Memorandum prepared by Martin Marietta Environmental Systems for Maryland Power Plant Siting Program.
- Bartoshesky, J., C. Maxwell, N. Pfeffer, and R. Roig. 1986. *Transport of Acidic Matter in Maryland: June - December 1984.* Technical Memorandum prepared by Martin Marietta Environmental Systems for Maryland Power Plant Siting Program.
- McGirr, R.R., and J. Bartoshesky. 1986. *Quality Assurance/Standard Operating Procedures Program Plan: Meteorological Monitoring Montgomery County, Maryland.* Prepared by Martin Marietta Environmental Systems for Montgomery County Government, Department of Environmental Protection, Division of Environmental Planning and Monitoring.

- Maxwell, C., J. Bartoshesky, N. Pfeffer, and S. Campbell. 1986. *Patterns of Wet Deposition of Acidic Matter in Maryland: January - June 1984*. Report prepared by Martin Marietta Environmental Systems for Maryland Power Plant Siting Program.
- Kumar, S., K. Timbre, S. Mahn, and J. Bartoshesky. 1986. *Air Quality Impact Study of Brandon Shores Power Plant Modeled at GEP Stack Height*. Report prepared by Martin Marietta Environmental Systems for Maryland Power Plant Research Program.
- Maxwell, C. J. Bartoshesky, and S. Campbell. 1987. *Concentration and Deposition Patterns of Ions Measured in Precipitation Over the Central Mid-Atlantic Region of the United States*. Paper presented at the 80th Annual Meeting of the Air Pollution Control Association, June 21-26, 1987, New York, New York.
- Campbell, S., J. Bartoshesky, D. Heimbuch, and T. Janicki. 1987. *Coastal Streams Study: Relationships Between Acid Deposition, Watershed Characteristics, and Stream Chemistry in Maryland's Coastal Plain*. Report prepared by Versar, Inc., ESM Operations for Maryland Power Plant Research Program.
- Bartoshesky, J., K. Zankel, R. McGirr, J. Ondov, N. Hrdlick, and K. Thaug. 1987. *Apportionment of TSP and PM10 Among Morgantown SES Sources Using an Optical Particle Counter*. Report prepared by Martin Marietta Environmental Systems for Maryland Power Plant Research Program.
- Bartoshesky, J. 1988. *Observation and Characterization of Low-level Air Temperatures Above a Subarctic Snowpack*. Master of Science thesis, Department of Geography, McGill University, Montreal, Quebec.
- Maryland Department of Natural Resources Power Plant Research Program . 1991. Ross, J. and E. Bauman, eds. *Power Plant Cumulative Environmental Impact Report for Maryland*. Report prepared by the Maryland Power Plant Research Program, Annapolis, Maryland. PPER-CEIR-7.
- Maryland Department of Natural Resources Power Plant Research Program . 1993. Ross, J. and R. McLean, eds. *Maryland Power Plants and the Environment*. Report prepared by the Maryland Power Plant Research Program, Annapolis, Maryland. PPER-CEIR-8/1 and 8/2.

- Maryland Department of Natural Resources Power Plant Research Program .  
1995. Ross, J. and J. Sherwell, eds. *Cumulative Environmental Impact Report-9: Maryland Power Plants and the Environment*. Volumes 1 and 2. Report prepared by the Maryland Power Plant Research Program, Annapolis, Maryland. PPRP-CEIR-9/1 and PPRP-CEIR-9/2.
- Klaber, K., A. Earley, and J. Ross. 1995. *Review of Title V Programs in States Proximate to Maryland*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- Collins, S., K. Egers, and J. Ross. 1996. *Review of the History of Atmospheric Deposition Research by the Power Plant Research Program*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- Harkov, R. and J. Ross. 1996. *Air Pollution Control Technologies for PM<sub>2.5</sub> Emissions from Utility Boilers*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- DiPrinzio, M., K. Hume, and J. Ross. 1997. *Study of Hazardous Air Pollutant Emissions from Electric Steam Generating Units--Final Interim Report*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- Ross, J., S. Myers, and D. Mountain. 1997. *Preliminary Review of Environmental Issues Associated with a New Boiler at the Eastern Correctional Institute*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- Brown, D., J. Ross, D. Mountain, and K. Hardy. 1997. *PPRP Smart Siting Project*. Paper presented at Power-Gen '97, Houston, TX, December 1997.
- Goldstein, D., J. Ross, and M. Garrison. 1998. *Environmental and Basis of Need Review Report for the Town of Berlin Power Plant Expansion Project*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.

- Goldstein, D. and J. Ross. 1998. *Environmental Review of the Bentech Group/Oaks Landfill Project*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- D. Mountain, K. Hardy, L. Banting, and J. Spollen. 1999. *Maryland Smart Siting Project Phase II Report*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD. PPSA-6.
- Goldstein, D., M. Garrison, J. Ross, and M. Kahal. 1998. *Environmental and Basis of Need Review Report for the Town of Berlin Power Plant Expansion Project*. Prepared by Environmental Resources Management, Annapolis, MD; Exeter Associates, Inc., Silver Spring, MD; and Versar, Inc., Columbia, MD for the Maryland Power Plant Research Program, Annapolis, MD.
- Brown, D., M. Kahal, K. Palmer, J. Ross, and M. Garrison. 1998. *Assessing the Impact of Electricity Restructuring on the Environment in Maryland*. In Proceedings 91<sup>st</sup> Annual Meeting of the Air and Waste Management Association, 98-MP21.02, Air and Waste Management Association, Pittsburgh, PA.
- Brown, D., J. Ross, D. Mountain, and K. Hardy. 1998. *Maryland Smart Siting: Using GIS in Siting Power Plants*. In Proceedings 91<sup>st</sup> Annual Meeting of the Air and Waste Management Association, 98-TP49.08, Air and Waste Management Association, Pittsburgh, PA.
- Dunbar, P, D. Brown, M. Kahal, K Palmer, D. Burtraw, A. Paul, J. Ross, and M. Garrison. 1998. *Assessing the Impact of Electricity Restructuring on CO<sub>2</sub> Emissions from the Electricity Sector*. Poster at AWMA/DOE December 1998.
- Mountain, P., D. Goldstein, D. Brown, J. Sherwell, J. Ross. 1999. *Consolidated, Multimedia Environmental Review and Licensing of Electric Generating Facility Projects in Maryland*. Paper presented at the AWMA/EPA Environmental Permitting Symposium, February 17-19, 1999.
- R. Harkov and J. Ross. 1999. *Evaluation of Hydrogen Chloride (HCl) Emissions from Maryland Utility Boilers*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD. PPRP-118.

- Mountain, P., D. Goldstein, D. Brown, J. Sherwell, J. Ross. 1999. *Consolidated, Multimedia Environmental Review and Licensing of Electric Generating Facility Projects in Maryland*. Paper presented at the AWMA/EPA Environmental Permitting Symposium, February 17-19, 1999.
- Ross, J., M. Garrison, D. Brown, D. Burtraw, K. Palmer, and A. Paul. 1999. *The Impact of Electricity Restructuring on NO<sub>x</sub> Emissions and Effects on Nitrogen Deposition and Ozone Formation in the Chesapeake Bay Watershed Region*. Paper to be presented at the AWMA 92<sup>nd</sup> Annual Meeting & Exhibition, June 20-24, 1999, St. Louis, MO.
- Goldstein, D., D. Brown, and J. Ross. 1999. *Consolidated, Multimedia Environmental Review and Licensing of a Landfill Gas Combustion/Electrical Generation System in Maryland*. Paper to be presented at the AWMA 92<sup>nd</sup> Annual Meeting & Exhibition, June 20-24, 1999, St. Louis, MO.
- Sherwell, J., M. Garrison, S. Gill, and J. Ross. 1999. *Further Applications of the CALMET/CALPUFF Modeling System to the Estimation of Nitrogen Deposition in the Chesapeake Bay Watershed*. Paper to be presented at the AWMA 92<sup>nd</sup> Annual Meeting & Exhibition, June 20-24, 1999, St. Louis, MO.
- Garrison, M., J. Ross, D. Brown, and J. Sherwell. 1999. *Transport, Deposition, and Effects of NO<sub>x</sub> Emissions from the U.S. Electricity Sector Undergoing Restructuring: Nitrogen Deposition and Ozone Formation in the Chesapeake Bay Watershed Region*. Paper to be presented at the North Carolina Department of Environment and Natural Resources Workshop on Atmospheric Nitrogen Compounds II: Emissions, Transport, Transformation, Deposition, and Assessment, Chapel Hill, North Carolina.
- Ross, J., K. Weiss, J. Trought (contributing authors). 1999. *Environmental Science Deskbook*. Contributing author Chapter 8 "Air." J.W. Conrad, ed. West Group, St. Paul, MN.
- Ross, J., M. DiPrinzio, and G. Walls. 1999. *Review of NO<sub>x</sub> Control Technologies Potentially Feasible for Installation on Large Utility Boilers in Maryland*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD. PPRP-119.

- H. Wattenbach, J. Ross, D. Mountain, M. Kahal. 2001. *Environmental Review Report for the Proposed Central Steam Plant Upgrade at the University of Maryland College Park Campus*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD. PPSE-UMCP-1.
- S. Peterson, J. Ross, and D. Mountain. 2001. *Environmental Review Report for the Proposed Central Energy Plant at the Inner Harbor East Complex*. Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD. PPSE-IHE-1.
- J. Wheeler, J. Ross, and D. Mountain. 2001. *Environmental Review Report for the Proposed Boiler Operations Upgrade at Sweetheart Holdings, Inc.* Prepared by Environmental Resources Management, Annapolis, MD for the Maryland Power Plant Research Program, Annapolis, MD. PPSE-SC-1.
- Avendt, L, M. Garrison, J. Ross, D. Brown. 2002. *Air Impacts of Distributed Generation Power Sources in Maryland*. In Proceedings 95<sup>th</sup> Annual Meeting of the Air and Waste Management Association, 02-42920. Air and Waste Management Association, Pittsburgh, PA.
- Avendt, L., D. Brown, M. Garrison, J. Ross. 2003. *Air Impacts of Distributed Generation Power Sources in Maryland*. In Proceedings 96<sup>th</sup> Annual Meeting of the Air and Waste Management Association, 03-69844 Air and Waste Management Association, Pittsburgh, PA.
- L. Avendt, M. Garrison, J. Ross, A. Yegnan. 2004. *Air Impacts of Distributed Generation Power Sources in Maryland*, Reported prepared by ERM for Maryland Department of Natural Resources Power Plant Research Program, PPRP-131, August 2004.