

MPUC Docket No. E-6472/GS-06-668
OAH Docket No. 12-2500-17512-2

BEFORE THE
MINNESOTA OFFICE OF ADMINISTRATIVE HEARINGS
100 Washington Square, Suite 1700
Minneapolis, Minnesota 55401-2138

FOR THE
MINNESOTA PUBLIC UTILITIES COMMISSION
127 7th Place East, Suite 350
St. Paul, Minnesota 55101-2147

In the Matter of a Joint LEPGP Site Permit,
HVTL Route Permit and Pipeline (Partial Exemption)
Route Permit Application for the Mesaba Energy Project

PREPARED DIRECT TESTIMONY AND EXHIBITS OF
EXCELSIOR ENERGY INC., MEP-I LLC, AND MEP-II LLC

GEORGE E. McVEHIL
JANUARY 16, 2007

1 **EXCELSIOR ENERGY, INC.**

2 **BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION**

3 **PREPARED DIRECT TESTIMONY OF**

4 **GEORGE E. McVEHIL**

5 **Q Please state your name, current employment position and business address.**

6 A Dr. George E. McVehil. I am a Certified Consulting Meteorologist at
7 McVehil-Monnett Associates, Inc. My practice specializes in air pollution modeling,
8 air permitting and regulatory analysis, and the assessment of industrial atmospheric
9 impacts. My business address is 44 Inverness Drive East, Building C, Englewood,
10 Colorado 80112.

11 **Q Would you please describe your educational and professional background.**

12 A I received a Bachelor of Science in Meteorology in 1957, a Bachelor of Arts in
13 Physics and a Masters of Science in Meteorology in 1958, and a Doctorate of
14 Philosophy in Meteorology in 1962.

15 I have over 40 years of professional experience in boundary layer and air
16 pollution meteorology, and the application of atmospheric science to industrial and
17 environmental impact problems. I have been a Certified Consulting Meteorologist
18 since 1972, and have worked either as an independent consultant or for McVehil-
19 Monnett Associates, Inc. since 1974. My primary areas of service include
20 environmental impact assessments, air quality permit applications, analysis of
21 meteorological and pollution data, dispersion modeling, plant siting, and weather
22 effects on industry.

23 Prior to 1974, I worked as a Manager of Technical Services for Ball Aerospace
24 Corporation (1970–1974), and EG&G, Inc. (1969–1970). For the first seven years

1 after completing my Ph.D. (1962–1969), I was a Research Meteorologist and Head of
2 the Dynamic Meteorology Section at Cornell Aeronautical Laboratory, Inc.

3 I am a Fellow of both the American Meteorological Society (AMS) and the
4 Royal Meteorological Society. I have been a member and Chairman of AMS’s Board
5 for Certified Consulting Meteorologists and have served on other committees of the
6 AMS. I am currently Planning Commissioner for the AMS and am a past President
7 and Secretary-Treasurer of the National Council of Industrial Meteorologists. I am
8 also on the editorial review board of “The Air Pollution Consultant.”

9 My resume is appended as Exhibit ____ (GEM-1).

10 **Q On whose behalf are you testifying?**

11 A I am testifying on behalf of MEP-I LLC, MEP-II LLC, and Excelsior Energy
12 Inc. (collectively, “Excelsior”), the developers of the Mesaba Energy Project
13 (the “Project”).

14 Scope and Summary

15 **Q What is the purpose of your testimony in this proceeding?**

16 A The purpose of my testimony is to generally describe the meteorological and
17 air quality characteristics of the East and West Range Sites, the air quality impacts of
18 Phase I and Phase II of the Project (“Mesaba One” and “Mesaba Two,” respectively),
19 and the impacts to air quality related values in Class I areas. I will also describe
20 generally the modeling and analyses to determine the air quality impacts of the
21 project. I will also identify the portions of the Joint Application, Environmental
22 Supplement, and Air Permit Application (attached as Appendix 5 to the Joint
23 Application) (together the “Applications”), which I am sponsoring and on which I will
24 be able to provide testimony.

1 Preparation of the Joint Permit Application and Environmental Supplement

2 **Q Upon which sections of the Applications are you available to act as sponsor?**

3 A. I am sponsoring the following sections:

4 **Joint Application**

5 West Range Site

6 Section 7.4.2 (NAAQS and PSD Increment Impact Analysis)

7 Section 7.4.3 (Significant Impact Analysis)

8 Section 7.4.4 (PSD Increment)

9 Section 7.4.5 (Class II NAAQS Evaluation)

10 Section 7.4.7 (Class I Impacts and Increment Consumption)

11 Section 7.4.8 (Visibility)

12 Section 7.4.10 (Soil and Vegetation)

13 East Range Site

14 Section 8.4.1 (East Range Site Dispersion Modeling)

15 Section 8.4.3 (Cooling Tower Emissions)

16 Section 8.4.4 (East Range Visibility)

17 Section 8.4.6 (Soil and Vegetation)

18 **Environmental Supplement**

19 Section 2.3 (Air Quality and Meteorology)

20 Section 3.2.1 (Permitting Status)

21 Section 3.2.2 (NAAQS and PSD Increment Impact Analysis)

22 Section 3.2.3 (Nonattainment Area Impact Analysis)

23 Section 3.2.4 (Good Engineering Practice Height Analysis)

24 Section 3.2.6 (Emissions from Cooling Towers)

1 Section 3.2.7 (Visibility (Air Quality Related Impact))

2 Section 3.2.8 (Construction Impacts)

3 Section 3.2.10 (Soil and Vegetation)

4 **Air Permit Application** (attached as Appendix 5 to the Joint Application)

5 Section 6.2 (Climatology and Meteorology)

6 Section 6.3 (Background Air Quality)

7 Section 7 (Air Quality Impact Assessment)

8 Section 8 (Impacts to Air Quality Related Values (AQRVs) in Class I Areas)

9 Appendix C (Air Modeling Protocol)

10 Appendix D (Air Dispersion Modeling Analysis)

11 For these sections, I supervised all of the air quality modeling analyses and
12 prepared draft reports and applications sections describing the analyses and presenting
13 the results.

14 Considerations in Determining Whether to Issue a Site Permit for the Project

15 **Q What modeling was performed to determine if any adverse effects would result**
16 **from air emissions?**

17 A The AERMOD air dispersion model, which is the Minnesota Pollution Control
18 Agency's ("MPCA") and U.S. Environmental Protection Agency's ("EPA") preferred
19 model, was used to demonstrate compliance with State and National Ambient Air
20 Quality Standards, and to establish that emissions would not exceed Prevention of
21 Significant Deterioration ("PSD") increments for "near field" areas, *i.e.*, the area
22 within fifty (50) kilometers of the IGCC Power Station. Further modeling was
23 required when the results of the AERMOD modeling confirmed that facility emissions
24 from Mesaba One and Mesaba Two would exceed Significant Impact Levels ("SILs").

1 PSD increment analyses were performed for sulfur dioxide (“SO₂”), particulate matter,
2 and nitrogen oxides using an inventory of increment-consuming sources, as provided
3 by the MPCA. The data demonstrate that Mesaba One and Mesaba Two, in
4 combination with all other regional PSD sources, will be in full compliance with all
5 state and federal increment limits.

6 Regional sources were included to demonstrate compliance with ambient air
7 quality standards by following the recommendations of MPCA modeling staff and
8 utilizing a two-step procedure. First, nearby sources were included for which
9 emission parameters were provided by the MPCA. Then the full regional inventory,
10 or FAR data, was provided by the MPCA. Application of the FAR data provided an
11 approximation of the combined impacts of all sources. The highest predicted impacts
12 for Mesaba One and Mesaba Two are far below applicable standards, and compliance
13 with all ambient air quality standards is assured.

14 The CALPUFF model, described in detail in Section 8 of the Air Permit
15 Application, was used to calculate impacts to air quality related values in Class I areas,
16 both within and beyond fifty (50) kilometers of the plant site.

17 **Q Were background pollution levels included in these analyses?**

18 **A** Yes. The state of Minnesota uses pollutant monitoring stations to determine
19 the air quality of a particular region, and use of the FAR data provided information on
20 the impacts of all regional sources. Existing conditions at the two sites are described
21 in detail in section 6 of the Air Permit Application. The West Range and East Range
22 Sites are similar regarding air quality and meteorology. The most significant
23 difference is that the East Range Site is closer to the nearest Class I area (the
24 Boundary Waters Canoe Area Wilderness) than the West Range Site.

1 **Q Please describe the effects on the natural environment, including effects on air**
2 **and water quality resources and flora and fauna.**

3 A PSD regulations require analysis of air quality impacts on sensitive vegetation
4 and soil types. Most of the designated vegetation screening levels are equivalent to or
5 exceed PSD standards, and the impacts of Mesaba One and Mesaba Two will be
6 below NAAQS and PSD thresholds. However, the 3-hour and 1-hour SO₂ sensitive
7 vegetation screening levels are more stringent than comparable NAAQS and State
8 Ambient Air Quality Standards. Modeling shows, however, that maximum impacts
9 from the IGCC Power Station for the 1-hour and 3-hour averaging periods are less
10 than 15% of vegetation screening levels.

11 **Q Please describe any effects on rare and unique natural resources from the**
12 **estimated air emissions.**

13 A The CALPUFF modeling analysis was conducted to estimate impacts of
14 Mesaba One and Mesaba Two on air quality in the following Class I areas: the
15 Boundary Waters Canoe Area Wilderness (“BWCA”), Voyageurs National Park
16 (“VNP”), and the Rainbow Lakes Wilderness (“RLW”) in Wisconsin. The data
17 indicated that maximum impacts of Mesaba One and Mesaba Two are far below
18 allowable increments for all pollutants and Class I areas. Impacts are also below the
19 Significant Impact Level (“SIL”) in most cases. However, for short-term SO₂
20 concentrations, impacts are indicated to exceed the SIL in the BWCA and VNP. A
21 cumulative PSD increment analysis for these pollutants was therefore conducted. The
22 maximum predicted increment consumption in each of the Class I areas from this
23 analysis was shown to be well within the PSD Class I limits with the conclusion being

1 that Mesaba One and Mesaba Two will not cause or contribute to any violation of
2 Class I PSD increments.

3 **Q Please describe any effects on human settlement, including recreation.**

4 A A visibility impact analysis was carried out for the BWCA and VNP for
5 Mesaba One and Mesaba Two at the East and West Range IGCC Power Station sites.
6 The West Range data for Mesaba One and Two indicated that calculated visibility
7 impacts greater than 5% or 10% could occur at some locations within the BWCA and
8 VNP on a small number of days per year. In EPA's BART guidance for regional
9 haze, an average of seven days per year or more exceeding a 5% increase indicates a
10 significant impact. Using this criterion, accounting for the conservatism inherent in
11 the model used, and considering the meteorological circumstances attending the
12 remaining events, my judgment is that operation of Mesaba One and Mesaba Two at
13 the West Range site location will not cause a significant visibility impact at the
14 BWCA or VNP.

15 The East Range modeling data indicated that Mesaba One and Mesaba Two
16 would cause increased visibility impacts in the BWCA relative to the impacts of
17 Mesaba One and Mesaba Two operating on the West Range site location. However, if
18 necessary, such incremental impacts could be mitigated in any one of numerous
19 alternatives, including the purchase of offsetting emissions, or the addition of further
20 controls.

21 **Q Have you conducted other studies on the West Range Site that lead you to the**
22 **conclusion that the operation of Mesaba One and Two at the West Range site**
23 **location will not cause a significant visibility impact at the BWCA or VNP?**

1 A Yes, I have conducted such studies. Since submission of the Applications,
2 considerable further analysis of the visibility impacts of the West Range IGCC Power
3 Station has been performed. A cumulative analysis was carried out to assess
4 combined visibility impacts of the Project and all existing and proposed sources in
5 northern Minnesota. The analysis confirmed significant visibility impacts from all
6 sources combined at the BWCA and VNP. However, it demonstrated that planned
7 emission reductions at Minnesota Power's generating stations will more than offset
8 any visibility impacts of Mesaba One and Mesaba Two. Emission controls at other
9 sources, to be achieved by Minnesota BART regulations (but not included in the
10 analysis), will provide additional mitigation of existing visibility impacts.

11 The cumulative modeling analyses also demonstrated that future air quality at
12 BWCA, VNP, and RLW will comply with all PSD increment and NAAQs limits when
13 all existing and proposed sources (including Mesaba One and Mesaba Two) are in
14 operation.

15 Conclusion

16 **Q Does this conclude your testimony?**

17 A Yes.

EXHIBITS

EXHIBIT ____ (GEM-1)

GEORGE E. McVEHIL, Ph.D.
Certified Consulting Meteorologist
McVehil-Monnett Associates, Inc.

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Englewood, Colorado 80112
(303) 790-1332

Dr. McVehil has more than 40 years of professional experience in boundary layer and air pollution meteorology, and the application of atmospheric science to industrial and environmental impact problems. His consulting practice specializes in air pollution modeling, air permitting and regulatory analysis, assessment of industrial atmospheric impacts, and litigation support services.

Dr. McVehil has authored several hundred papers, technical reports, impact assessments, and permit application documents. Recent reports prepared by Dr. McVehil have involved analyses of new source impacts on air quality related value in Class I areas, regional haze, air quality impacts of power generation facilities and mining operations, PSD permit applications, and deposition of heavy metals and hazardous materials from industrial sources and remediation activities.

Dr. McVehil's responsibilities at MMA include supervision of complex air modeling analyses, preparation of PSD/NSR air permit applications, and consultation on air permitting/regulatory compliance issues. A significant portion of his time is devoted to litigation support activities, including analyses, consultation to law firms, and expert testimony. Litigation subjects include air dispersion modeling, deposition of hazardous pollutants, and meteorological factors in accident cases.

Dr. McVehil is a Fellow of the American Meteorological Society, and a Certified Consulting Meteorologist. He has been a Certified Consulting Meteorologist since 1972, and was elected a Fellow of the Society in 1984. He served as a member of the AMS Council from 1997 to 2000. Dr. McVehil has also been a member and Chairman of the Society's Board for Certified Consulting Meteorologists, and has served on other committees of the Society. He is currently Planning Commissioner for the Society. He is a past President and Secretary-Treasurer of the National Council of Industrial Meteorologists and is on the editorial review board of "The Air Pollution Consultant".

SPECIAL AWARDS

1998 Award for Outstanding Contribution to the Advance of Applied Meteorology,
American Meteorological Society, Boston, MA, January 1998

EDUCATION

B.A. Physics, 1958, WASHINGTON AND JEFFERSON COLLEGE
 B.S. Meteorology, 1957, MASSACHUSETTS INSTITUTE OF TECHNOLOGY
 M.S. Meteorology, 1958, MASSACHUSETTS INSTITUTE OF TECHNOLOGY
 Ph.D. Meteorology, 1962, PENNSYLVANIA STATE UNIVERSITY

EXPERIENCE

1987- Present	Principal, McVEHIL-MONNETT ASSOCIATES, INC.
1984 - 1987	Partner, McVEHIL-MONNETT ASSOCIATES
1974 – 1984	<p><u>Independent Meteorological Consultant</u> Consultation, analysis, reports and testimony for industrial clients and governmental agencies. Primary areas of service included environmental impact assessments, air quality permit applications, analysis of meteorological and pollution data, dispersion modeling, plant siting, and weather effects on industry.</p>
1970 - 1974	<p>BALL AEROSPACE CORPORATION, Environmental Systems Group (Formerly Sierra Research Corporation, Environmental Systems Division) <u>Manager, Technical Services</u> Responsible for technical management of BALL's meteorological / air quality monitoring and consulting services activities. Provided technical oversight for consulting service contracts and air quality impact analyses, specialized consultation to power industry and industrial clients, testimony, and consulting reports.</p>
1969 - 1970	<p>EG&G, Inc. Environmental Services Operation <u>Manager Technical Services</u> Responsible for management and technical direction of field services and research contracts in air pollution, weather modification, and applied meteorology. Provided direct research, report and proposal preparation, and technical supervision of service contracts.</p>

- 1962 - 1969 CORNELL AERONAUTICAL LABORATORY, INC.
Research Meteorologist and Head, Dynamic Meteorology Section
Conducted basic and applied research in atmospheric diffusion and turbulence, air-sea interactions, weather phenomena related to the Great Lakes, weather modification, wind tunnel modeling of meteorological flows, radar meteorology, and meteorological influences on military weapons and operations. Principal Investigator on more than ten research contracts.
- 1958 - 1962 PENNSYLVANIA STATE UNIVERSITY
Graduate Assistant, 1958 - 1960, Instructor, 1960 - 1961, Research Assistant, 1961 - 1962
As Graduate and Research Assistant, performed research on wind structure and turbulence in the planetary boundary layer. As full-time instructor in Meteorology, taught under-graduate courses in dynamic meteorology, thermodynamics of the atmosphere, applications of statistics to meteorology, and synoptic meteorology.

ORGANIZATIONS/HONORS

AMERICAN METEOROLOGICAL SOCIETY - Fellow, Certified Consulting Meteorologist
ROYAL METEOROLOGICAL SOCIETY, Fellow
AIR & WASTE MANAGEMENT ASSOCIATION (formerly APCA)
NATIONAL COUNCIL OF INDUSTRIAL METEOROLOGISTS - President, 1976-1977, Secretary-Treasurer, 2002-2004
AMERICAN METEOROLOGICAL SOCIETY - 1998 Award for Outstanding Contribution to the Advance of Applied Meteorology, Councilor 1998 – 2001, Planning Commissioner, 2004-2007

PUBLICATIONS

- Panofsky, H.A., Blackadar, A.K., and McVehil, G.E., 1960: "The Diabatic Wind Profile." Quarterly Journal of the Royal Meteorological Society, 86, 390-398.
- McVehil, G.E., 1964: "Wind and Temperature Profiles Near the Ground in Stable Stratification." Quarterly Journal of the Royal Meteorological Society, 90, 136-146.
- McVehil, G.E., Pilie, R.J., and Zigrossi, G.A., 1965: "Some Measurements of Balloon Motions with Doppler Radar." Journal of Applied Meteorology, 4, 146.

Fichtl, G.H., and McVehil, G.E., 1970: "Longitudinal and Lateral Spectra of Turbulence in the Atmospheric Boundary Layer at the Kennedy Space Center." *Journal of Applied Meteorology*, 9, 51.

American Society of Mechanical Engineers, 1975: "Cooling Tower Plume Modeling and Drift Measurement. A Review of the State-of-the-Art." (Authored by G.E. McVehil and K.E. Heikes) ASME, New York, New York, 170 pages.

McVehil, G.E. and Umenhofer, T.A., 1981: "Assessment of Coal Dust Emissions from Power Plants for PSD Permit Applications." *Proceedings of the American Power Conference*, Vol. 43. Illinois Institute of Technology, Chicago, Illinois.

McVehil, G.E., 1990: "Model Estimates of Provincial Scale Atmospheric Sulphur Dioxide and Oxides of Nitrogen in Alberta." In "Acidic Deposition: Sulphur and Nitrogen Oxides", A.H. Legge and S.V. Krupa, Editors, Lewis Publishers, Chelsea, Michigan, 48118.

McVehil, G.E., and Dickey, J.W., 2004: "Approaches to Refining Regional Haze Impact Assessments at Class I Areas – Case Study: Roundup Power Project." *Electric Utilities Environmental Conference*, Tucson, Arizona, January 19-22, 2004.

McVehil, G.E., Hensel, J.S., and Hoefs, E.A., 2004: "Regulatory Hurdles for PSD Permitting of Modifications to an Urban Coal-Fired Power Plant." *Electric Utilities Environmental Conference*, Tucson, Arizona, January 19-22, 2004.

McVehil, G.E., Hormel, T.R., and Addison, E., 2005: "Sensitivity of CALPUFF Visibility Impacts to Meteorological Data, Emissions, and Model Inputs." *Electric Utilities Environmental Conference*, Tucson, Arizona, January 24-26, 2005.