

Surrebuttal Testimony
Roger A. Clarke

State of Minnesota
Before the Office of Administrative Hearings
For the Minnesota Public Utilities Commission

*In the Matter of a Petition by Excelsior Energy Inc. for Approval of a Power
Purchase Agreement Under Minn. Stat. § 216B.1694, Determination of Least
Cost Technology, and Establishment of a Clean Energy Technology Minimum
Under Minn. Stat. § 216B.1693*

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Environmental Impacts

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1 **I. INTRODUCTION**

2
3 Q. PLEASE STATE YOUR NAME.

4 A. My name is Roger A. Clarke.

5
6 Q. HAVE YOU PROVIDED DIRECT TESTIMONY IN THIS CASE?

7 A. Yes. I provided Direct Testimony regarding the modeling utilized by ICF to
8 calculate the relative health benefits of the Mesaba Unit 1 compared to the
9 hypothetical SCPC alternative provided by Mesaba 1 LLC in this proceeding.

10
11 **II. PURPOSE**

12
13 Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY IN THIS
14 PROCEEDING?

15 A. My Surrebuttal Testimony responds to the Rebuttal Testimony of Robert S.
16 Evans II, Baxter Jones, Edward N. Steadman, and Richard Stone regarding
17 the environmental impacts of Mesaba Unit 1, issues related to the
18 assumptions used in the ICF modeling, and carbon capture and sequestration.
19 With respect to the modeling assumptions, the testimony provides some
20 clarification of the issues that I raised previously. However, I continue to
21 believe that when the remaining issues are taken in aggregate, there is still
22 some uncertainty regarding whether the conclusions from the ICF Final
23 Report entitled Air Quality and Health Benefits Modeling: Relative Benefits
24 Derived from Operation of the MEP I/II IGCC (“ICF Report”) are valid.
25 With respect to carbon capture and sequestration, I believe that there are
26 infrastructure, regulatory, financial, and liability issues that must first be

1 resolved before the sequestration of a significant percentage of the CO₂
2 emissions from a large energy project becomes a viable option.

3

4 Q. PLEASE OUTLINE THE ISSUES YOU ADDRESS IN YOUR SURREBUTTAL
5 TESTIMONY.

6 A. I address the information presented in Mesaba 1 LLC's Rebuttal Testimony
7 regarding the modeling assumptions used by ICF in its health benefits report.
8 Specifically, I discuss my concerns regarding:

- 9 • discrepancies in emissions rates,
- 10 • the location used to model the hypothetical SCPC plant,
- 11 • the comparison of the modeled SCPC plant to other proposed solid
12 fuel fired traditional technologies,
- 13 • mercury speciation assumptions, and
- 14 • the externality value assigned to fine particulate matter.

15

16 I also address Rebuttal Testimony related to carbon capture and
17 sequestration.

18

19 Q. DID THE REBUTTAL TESTIMONY YOU REVIEWED RESOLVE YOUR CONCERNS
20 ABOUT THESE ISSUES?

21 A. Not entirely. While Mesaba 1 LLC addresses each of these issues separately,
22 they have not addressed my concern that when considered in aggregate, the
23 results of the modeling may not be as significant as the ICF Report indicates.
24 Consequently, while the potential benefits of IGCC technology are clear,
25 absent further modeling, there is insufficient information to determine
26 whether reduced emissions from Mesaba Unit 1 compared to other traditional

1 technologies is sufficient to result in the health benefits reported in the ICF
2 Report.

3 4 III. ASSESSMENT

5
6 Q. DID THE REBUTTAL TESTIMONY YOU REVIEWED RESOLVE YOUR CONCERNS
7 ABOUT THE DISCREPANCIES IN THE EMISSIONS RATES USED AS THE BASIS FOR
8 THE ICF REPORT AND THE EMISSIONS DATA REFLECTED IN EXCELSIOR'S
9 APPLICATION FOR A NEW-SOURCE REVIEW CONSTRUCTION AUTHORIZATION
10 PERMIT ("PSD PERMIT APPLICATION")?

11 A. Not entirely. While Mr. Evans' explanation of the differences appears
12 plausible, it is oversimplified and does not address my primary concern.

13
14 Q. PLEASE DESCRIBE MR. EVANS' ANALYSIS.

15 A. Mr. Evans discussed the differences in SO₂ and NO_x emission rates between
16 the ICF Report and the PSD Permit Application. He notes that because both
17 emissions are precursors to fine particulate matter, the 35 pound per hour
18 deficit in the SO₂ emissions used in the ICF Report is partially offset by the
19 18 pounds per hour increase in NO_x emissions. He notes that this results in a
20 5 percent difference in these emissions totals and concludes that this is not
21 sufficient to warrant concerns over the ICF modeling.

22
23 Q. DO YOU AGREE WITH THIS ANALYSIS?

24 A. No. The extent that decreases in NO_x emission rates can offset increases in
25 SO₂ emission rates are not always one-for-one and cannot be combined
26 through simple addition. Consequently, as indicated on page 4 of Mr. Jones

1 Rebuttal Testimony, “without additional detailed modeling, it is difficult to
2 predict the precise degree to which the offset would occur.”

3
4 Q. DID ANY OF THE REBUTTAL TESTIMONY YOU REVIEWED RESOLVE YOUR
5 CONCERNS ABOUT THE LOCATION USED TO MODEL THE HYPOTHETICAL SCPC
6 PLANT?

7 A. No. Mr. Evans indicates in his Rebuttal Testimony that the ICF Report did
8 not make a side-by-side comparison of technologies at the same location, but
9 instead modeled emissions levels and their corresponding health effects of
10 Mesaba Unit 1 on the Iron Range while modeling a hypothetical SCPC plant
11 in central Minnesota. He justifies this position by indicating that they
12 considered an expansion of Xcel Energy’s Sherburne County Generating
13 Plant the Company’s most likely base load addition.

14
15 Q. WHAT IS YOUR REACTION TO MR. EVANS’ STATEMENT THAT IT WAS MESABA 1
16 LLC’S INTENTION TO COMPARE THE IMPACTS OF MESABA UNIT 1 TO XCEL
17 ENERGY’S MOST LIKELY SOLID-FUEL BASE LOAD ALTERNATIVE?

18 A. As I have previously testified, I believe that to obtain data that allows a more
19 precise comparison of the environmental and health benefits between the
20 proposed Mesaba Unit 1 and an alternative technology, the modeling should
21 have used the same location for both technologies. Further, to model a
22 hypothetical alternative SCPC plant at a location that Mesaba 1 LLC believed
23 was Xcel Energy’s most likely expansion site does not facilitate a useful
24 comparison. To illustrate this point, if Xcel Energy intended to expand its
25 base load capacity in Wisconsin, South Dakota, or North Dakota, then the
26 use of the Minnesota externality calculations by Mesaba 1 LLC in this
27 proceeding would not have been a useful mechanism to quantify the costs

1 impact associated with the relative health and environmental benefits between
2 the proposed project and alternative traditional technologies. If the purpose
3 of this effort is to compare the benefits of one technology over another, then
4 the modeling of the two alternatives should have used the identical location to
5 facilitate an apples-to-apples comparison.

6
7 Q. DO YOU BELIEVE THE COMPARISON OF MESABA UNIT 1 TO A HYPOTHETICAL
8 SCPC PLANT IN CENTRAL MINNESOTA RENDERS THE RESULTS OF THE
9 COMPARISON QUESTIONABLE?

10 A. Yes. Because Xcel Energy has not proposed the development of an
11 additional base load unit at the Sherburne County Generating Plant in this
12 proceeding, the selection of this site as a likely alternative to Mesaba Unit 1 is
13 based upon an incorrect assumption. Further, as identified in the ICF Report,
14 and as confirmed on page 6 of Mr. Evans' Rebuttal Testimony, the
15 differences in the demographic composition of the two locations have the
16 potential to affect the assessment of health benefits.

17
18 Q. WHAT IS YOUR REACTION TO MR. EVANS' ASSERTION THAT DESERT ROCK
19 AND CALAVERAS ARE NOT RELEVANT COMPARISONS BECAUSE OF THE THEIR
20 LOCATIONS AND THE CIRCUMSTANCES NECESSITATING THE LOWER EMISSION
21 RATES?

22 A. I believe examples such as the Desert Rock and Calaveras Station facilities are
23 important comparisons because they are both traditional technologies and
24 demonstrate that emission rates that are lower than those modeled for the
25 hypothetical SCPC facility can be achieved. The fact that these lower
26 emission rates are being driven by the special circumstances identified in Mr.
27 Evans testimony reaffirms my assertion that same drivers that prompted the

1 development and enhancement of IGCC technologies are also driving
2 vendors to continue to reduce the emission profiles of other coal-fired
3 technologies.

4
5 Q. DOES MR. EVANS' EXPLANATION OF THE MERCURY SPECIATION ASSUMPTIONS
6 RESOLVE YOUR CONCERNS THAT MESABA 1 LLC'S MODELING WAS FLAWED?

7 A. Not entirely. While I agree with Mr. Evans' explanation related to how the
8 lower chlorine content within the sub-bituminous coal is less likely to form
9 oxidized forms of mercury than that from bituminous coal containing a
10 higher chlorine content, the fact remains that Mesaba 1 LCC is relying upon a
11 single test report from a single facility to assert that 100% of the mercury
12 emissions from Mesaba Unit 1 will be elemental.

13
14 This is an important assumption as the presence of any mercury in a non-
15 elemental form affects the deposition and thus the modeling results. A review
16 of EPA's ICR mercury testing database demonstrates that there is a certain
17 amount of inherent error associated with the methodology used to monitor
18 mercury emissions. This error manifests itself between test runs within a
19 single testing episode at a facility. For instance, a review of the Polk Stack 1
20 mercury test indicates that the percent of mercury emitted in the elemental
21 form from this facility during the first run was 89.89%, 91.83% during the
22 second run, and 96.28% during the third run, resulting in an average of
23 92.67%. With respect to the Wabash IGCC project, a review of the mercury
24 test report that Mesaba 1 LLC is relying upon indicates that two of the three
25 runs showed that 100% of the mercury was speciated as elemental and on the
26 third run 99.7% was speciated as elemental. The report states the average
27 speciation of mercury as elemental mercury is 99.7%.

1

2 However, Mesaba 1 LLC has assumed in its modeling that 100% of the
3 mercury emitted is in the elemental form. My understanding, as discussed in
4 the ICF Report, is that the model treats elemental and other forms of mercury
5 differently. Consequently, if the inputs to the model indicate that there are no
6 non-elemental mercury emissions, then there will be a corresponding impact.
7 If, however, the non-elemental mercury emissions are something other than
8 zero, then there is some modeled impact, even if it is small.

9

10 Q. WHAT IS YOUR REACTION TO MR. EVANS' TESTIMONY REGARDING MESABA 1
11 LLC'S ASSIGNING A QUANTITATIVE EXTERNALITY VALUE TO PM_{2.5}?

12 A. It appears that Mr. Evans responded with a legal argument, which I am not
13 qualified to provide a response. However, I do note that in my experience, I
14 cannot recall a party unilaterally assigning an externality value to PM_{2.5}.

15

16 Q. DOES MESABA 1 LLC'S CARBON CAPTURE AND SEQUESTRATION PLAN
17 ALLEVIATE YOUR EARLIER CONCERNS?

18 A. Mr. Evans' Rebuttal Testimony appears to have been in the context of
19 supporting Mesaba 1 LLC's initial plan to capture and sequester 30% of the
20 CO₂ emissions from Mesaba Unit 1. At this capture rate, based upon what I
21 have read, I agree that Mesaba 1 LLC's sequestration plan for enhanced oil
22 recovery is technically plausible. However, one of the primary benefits from
23 the IGCC technology is its potential to sequester a large percentage of the
24 CO₂ emissions, which Mesaba 1 LLC is not currently planning to do. Under
25 this scenario, I continue to believe – and it appears that Mr. Steadman agrees
26 with this conclusion (pages 58-59 of his Rebuttal Testimony) – carbon
27 capture and sequestration must first overcome many infrastructure,

1 regulatory, financial and liability issues before it becomes viable at Mesaba
2 Unit 1.

3 4 **IV. CONCLUSION**

5
6 Q. PLEASE SUMMARIZE YOUR SURREBUTTAL TESTIMONY.

7 A. In its Rebuttal Testimony Mesaba 1 LLC attempted to individually address the
8 concerns that I previously identified. While this additional information is
9 helpful, I continue to believe that when these concerns are considered in
10 aggregate, there is insufficient information to determine whether the health
11 benefits identified in the ICF Report are as significant as purported. Thus,
12 although clean-coal technologies offer potential environmental benefits, there
13 is still uncertainty regarding whether the conclusions from the ICF Report are
14 valid. In addition, while IGCC technology's ability to support carbon
15 sequestration is clear, carbon capture and sequestration of high percentages of
16 the total CO₂ emissions from the Mesaba Unit 1 will not be a viable option
17 until the infrastructure, regulatory, financial, and liability issues are resolved.

18
19 Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

20 A. Yes, it does.