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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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME.

A. My name is Roger A. Clarke.

Q. HAVE YOU PROVIDED DIRECT TESTIMONY IN THIS CASE?

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

II. PURPOSE

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

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

resolved before the sequestration of a significant percentage of the CO_2 emissions from a large energy project becomes a viable option.

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

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

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

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

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

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

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

III. ASSESSMENT

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

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

Q. PLEASE DESCRIBE MR. EVANS' ANALYSIS.

A. Mr. Evans discussed the differences in SO_2 and NO_x emission rates between the ICF Report and the PSD Permit Application. He notes that because both emissions are precursors to fine particulate matter, the 35 pound per hour deficit in the SO_2 emissions used in the ICF Report is partially offset by the 18 pounds per hour increase in NO_x emissions. He notes that this results in a 5 percent difference in these emissions totals and concludes that this is not sufficient to warrant concerns over the ICF modeling.

Q. DO YOU AGREE WITH THIS ANALYSIS?

A. No. The extent that decreases in NO_x emission rates can offset increases in SO_2 emission rates are not always one-for-one and cannot be combined through simple addition. Consequently, as indicated on page 4 of Mr. Jones

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A. Mr. Evans' Rebuttal Testimony appears to have been in the context of supporting Mesaba 1 LLC's initial plan to capture and sequester 30% of the CO_2 emissions from Mesaba Unit 1. At this capture rate, based upon what I have read, I agree that Mesaba 1 LLC's sequestration plan for enhanced oil recovery is technically plausible. However, one of the primary benefits from the IGCC technology is its potential to sequester a large percentage of the CO_2 emissions, which Mesaba 1 LLC is not currently planning to do. Under this scenario, I continue to believe – and it appears that Mr. Steadman agrees with this conclusion (pages 58-59 of his Rebuttal Testimony) – carbon capture and sequestration must first overcome many infrastructure,

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

IV. CONCLUSION

Q. PLEASE SUMMARIZE YOUR SURREBUTTAL TESTIMONY.

A. In its Rebuttal Testimony Mesaba 1 LLC attempted to individually address the concerns that I previously identified. While this additional information is helpful, I continue to believe that when these concerns are considered in aggregate, there is insufficient information to determine whether the health benefits identified in the ICF Report are as significant as purported. Thus, although clean-coal technologies offer potential environmental benefits, there is still uncertainty regarding whether the conclusions from the ICF Report are valid. In addition, while IGCC technology's ability to support carbon sequestration is clear, carbon capture and sequestration of high percentages of the total CO_2 emissions from the Mesaba Unit 1 will not be a viable option until the infrastructure, regulatory, financial, and liability issues are resolved.

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A. Yes, it does.