**STATE OF MINNESOTA**
**BEFORE THE**
**MINNESOTA PUBLIC UTILITIES COMMISSION**

| | |
|---|---|
| IN THE MATTER OF THE APPLICATION OF NORTHERN STATES POWER COMPANY AND ITC MIDWEST LLC FOR A CERTIFICATE OF NEED FOR THE HUNTLEY-WILMARTH 345 KV TRANSMISSION LINE PROJECT | Docket No. E002, ET6675/CN-17-184<br>OAH Docket No. 82-2500-35157 |
| IN THE MATTER OF THE APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION FOR A ROUTE PERMIT FOR THE HUNTLEY-WILMARTH 345 KV TRANSMISSION LINE PROJECT | Docket No. E002, ET6675/RP-17-185<br>OAH Docket No. 82-2500-35157 |

DIRECT TESTIMONY OF

BENJAMIN T. ABING

on Behalf of

NORTHERN STATES POWER COMPANY,
A MINNESOTA CORPORATION

and

ITC MIDWEST LLC

September 6, 2018

Exhibit ___(BTA-1)

## Table of Contents



## Schedules

# I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Benjamin Abing, and my business address is 27175 Energy Way, Novi, Michigan 48377.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed as a Senior Engineer with ITC Holdings Corp., the sole member of ITC Midwest LLC (ITC Midwest), one of the co-applicants in this proceeding.

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I am a transmission planning engineer with approximately seven years of experience in power system analysis with ITC Holdings Corp. I have extensive experience using production cost simulation software to evaluate transmission development and other market-based opportunities. I have a Bachelor of Science in Electrical Engineering, with an emphasis in Power & Energy and Controls, from the University of Wisconsin–Platteville. My resume is attached as Exhibit___(BTA-1), Schedule 1.

Q. FOR WHOM ARE YOU TESTIFYING?

A. I am testifying on behalf of Xcel Energy and ITC Midwest (collectively, Applicants) for a Certificate of Need and Route Permit for the Huntley – Wilmarth Project (Project).

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

A. The purpose of my testimony is to discuss Appendix I to the Certificate of Need Application, titled "ITC Midwest's Cost of Alternatives, Including Commission Externalities Values."

Q WHAT PORTIONS OF THE CERTIFICATE OF NEED APPLICATION ARE YOU SPONSORING?

A. I am sponsoring Appendix I and those portions of the Application where Appendix I is summarized.

Q. WHAT SCHEDULES ARE ATTACHED TO YOUR TESTIMONY?

A. Schedule 1: Resume of Benjamin Abing.

Schedule 2: Applicants' Response to Minnesota Department of Commerce Information Request No. 20 (DOC-IR 20).

## II. APPENDIX I

Q. WERE YOU RESPONSIBLE FOR PREPARING APPENDIX I TO THE CERTIFICATE OF NEED APPLICATION?

A. Yes.

Q. WHY DID THE APPLICANTS INCLUDE APPENDIX I WITH THE CERTIFICATE OF NEED APPLICATION?

A. ITC Midwest developed Appendix I to evaluate environmental externalities of different transmission line alternatives in Certificate of Need proceedings as required by the Minnesota Public Utilities Commission's (Commission)

November 25, 2014, Order Granting Certificate of Need with Conditions in Docket No. ET6675/CN-12-1053. ITC Midwest developed the initial template and submitted it to the Commission as a compliance filing on October 7, 2015, to be applied to future Certificate of Need proceedings. This is the first docket where ITC Midwest has populated the template.

Q. WHAT METHODOLOGY DID YOU USE TO PREPARE APPENDIX I?

A. As discussed in more detail in Schedule 2, Appendix I evaluated two system configurations, the Huntley – Wilmarth 345 kilovolt (kV) Project (345 kV Project) and a Huntley – Wilmarth 161 kV line (161 kV alternative). The first step was to identify capital cost estimates. For the 345 kV Project, I identified the high, medium, and low cost estimates for the 345 kV Project based on different routing and design options contained in the Route Permit Application (Docket No. E002, ET6675/RP-17-185). For the 161 kV alternative, I used a mid-range cost estimate. This resulted in four different capital cost estimates for evaluation. These costs are shown in the column of the Summary Table on page 2 of Appendix I labeled "Total Capital Cost."

The next step was to update financial assumptions for the present value analysis. The levelized fixed charge rate of 12.9% is an average of the ITC Midwest and Xcel Energy levelized fixed charge rates detailed in Appendix J and response to DOC-IR 20, attached as Exhibit___(BTA-1), Schedule 2. The present value period of 63 years was based on the assumed life of the Project. The inflation rate of 2.50% and discount rate of 7.10% replicate the Midcontinent Independent System Operator, Inc. (MISO) assumptions

applied in the Applicants' 2017 MISO Transmission Expansion Plan (MTEP17) analysis.

For each of the four cost estimates, I then calculated an annual revenue requirement for each year of the evaluation period. The formula multiplies the capital cost of the transmission alternative by the levelized fixed charge rate. The cumulative present value of the annual revenue requirements is shown in the Summary Table in the column labeled "Revenue Requirement."

I then modeled each configuration, the 345 kV Project and the 161 kV alternative, in PROMOD IV to simulate the system performance.[1] The benefits are measured as the differences between each change case and corresponding base case. The Economic Benefit was calculated as the modified Adjusted Production Cost (APC) savings for each of three MTEP17 study years (2021, 2026, and 2031).

The Public Policy Benefit was calculated by first identifying the change in the avoided tons of emissions for $CO_2$, $NO_x$, and $SO_2$. These reductions in values for MISO Local Resource Zones 1, 2, and 3 were then multiplied by the Commission-approved externality values for each study year. The Commission-approved externality values for $CO_2$ , $NO_x$, and $SO_2$ were taken

[1] PROMOD is the generally-accepted means for evaluating the impact of a new facility on the production cost of energy. PROMOD is a security-constrained production cost simulation tool used to evaluate transmission projects and perform other market analyses. A nodal system topology allows for detailed, hourly chronological unit commitment and dispatch optimization while recognizing generator and transmission constraints to forecast hourly energy prices, congestion, unit generation, revenues, fuel consumption, unit emissions(including $CO_2$, $NO_x$ and $SO_2$), and transmission flows for selected future years.

from the Commission's January 3, 2018, Order Updating Environmental Cost Values in Docket No. E999/CI-14-642.[2]

Benefits for each non-simulated year in the study period were interpolated between, or extrapolated from, benefits calculated in simulated years. Finally, a present value of the benefits for each year was calculated. The cumulative present values of benefits are shown in the Economic Benefit and Public Policy Benefit columns on the Summary Table.

The "Total Benefit" is the sum of the "Economic Benefit" and the "Public Policy Benefit." The "Net Benefits" for each of the four alternatives is provided in the far right-hand column of the Summary Table. The Net Benefits represents the present value of the "Total Benefit" minus the present value of the Revenue Requirement.

Q. IN CALCULATING THE BENEFITS, DID YOU MAKE ANY ADJUSTMENTS TO THE PROMOD RESULTS?

A. Yes. As described in detail in response to DOC-IR 20, to calculate the Public Policy Benefit using the values in the Externalities Order, the emission cost values that the PROMOD program assigns were removed from the APC benefit for all MISO North/Central resources. This was done to prevent double counting the benefit. This reduced APC is identified as the "modified APC."

[2] *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B.2422, Subd. 3*, Docket No. E999/CI-14-642, ORDER UPDATING ENVIRONMENTAL COST VALUES (Jan. 3, 2018) [hereinafter Externalities Order].

Q. PLEASE DISCUSS THE RESULTS OF THE ANALYSIS PROVIDED IN APPENDIX I.

A. The 345 kV Project was identified to have higher Economic Benefit and Public Policy Benefit than the 161 kV alternative. The Public Policy Benefit was calculated for the three 345 kV Project route/design options and the 161 kV alternative by applying the Commission-approved externality values for $SO_2$, $NO_x$, and $CO_2$. The range of Public Policy Benefits is due to application of high and low externality values for $CO_2$. Each of the evaluated combinations of projects or routing estimates is evaluated by benefits and Net Benefits in the Summary Table on page two of Appendix I, inserted below. The range of Net Benefits for the 345 kV Project is $368 million to $770 million. The Net Benefits for the 161 kV alternative are lower—$295 million to $552 million (2016$).

| Alternative | Route | Total Capital Cost (2016$) | Present Value (base year 2016) | | | | | | Net Benefits[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Revenue Requirement ($) | Economic Benefit ($) | Public Policy Benefit ($)[2] | | | | | | |
| Preferred Project: Huntley - Wilmarth 345 kV | Low Cost: Purple Route (West | $105,820,000 | $156,130,593 | $470,716,689 | $100,677,763 | to | $455,788,663 | $415,263,859 | to | $770,374,759 |
| | High Cost: Blue Route (East Route), Double-Circuit Monopole | $138,020,000 | $203,639,619 | | | | | $367,754,834 | to | $722,865,735 |
| | Midrange Cost: Green Route (Middle Route), Single Circuit | $121,320,000 | $178,999,845 | | | | | $392,394,608 | to | $747,505,509 |
| Alternative: Huntley - Wilmarth 161 kV | Midrange Cost: Green Route (Middle Route), Single Circuit Monopole Design | $ 80,900,000 | $119,362,738 | $339,693,909 | $ 75,134,571 | to | $331,485,787 | $295,465,743 | to | $551,816,959 |

Q. ARE THERE OTHER CONCLUSIONS YOU CAN DRAW FROM APPENDIX I?

A. Yes. The key takeaway is the 345 kV Project provides greater estimated avoided emissions reductions for $SO_2$, NOx, and $CO_2$ than the 161 kV alternative. The net avoided emissions are shown in the table below from Appendix I.

| Annual Emissions Benefit (short tons) for MISO LRZ's 1,2,3 | | | |
|---|---|---|---|
| **Preferred Option: Huntley-Wilmarth 345 kV** | | | |
| | ***SO2*** | ***NOx*** | ***CO2*** |
| **2021** | 105 | 85 | 159,048 |
| **2026** | 57 | 131 | 339,622 |
| **2031** | 22 | 33 | 442,764 |
| | | | |
| **Alternative: Huntley-Wilmarth 161 kV** | | | |
| | ***SO2*** | ***NOx*** | ***CO2*** |
| **2021** | 60 | 54 | 76,280 |
| **2026** | 52 | 90 | 210,511 |
| **2031** | 20 | 33 | 316,323 |

As a result, after multiplying the estimated total annual avoided emissions tonnages (noted above) by the Commission-approved externality values for $SO_2$, $NO_x$, and $CO_2$, the 345 kV Project was identified to have more Public Policy Benefit than the 161 kV alternative.

On the whole, the results of the analysis show that the 345 kV Project better supports Minnesota's policy objectives of minimizing overall emissions of $SO_2$, $NO_x$, and $CO_2$.

Q. ON AUGUST 13, 2018, APPLICANTS PROVIDED INFORMATION IN RESPONSE TO MINNESOTA DEPARTMENT OF COMMERCE INFORMATION REQUEST NO. 23 (DOC-23) REGARDING ADDITIONAL ROUTE SEGMENT AND ALIGNMENT ALTERNATIVES THAT WILL BE EVALUATED IN THE ENVIRONMENTAL IMPACT STATEMENT. DO THE COST ESTIMATES PROVIDED IN THAT RESPONSE CHANGE YOUR ANALYSIS?

A. The costs provided in Applicants' response to DOC-23[3] indicate that the highest cost route would be the Purple-E-Red Route at $160.7 million (2016$). This higher cost impacts the Net Benefits of the Project, but does not affect the sum of the Public Policy Benefits. This is because the Public Policy Benefits are calculated based on avoided emissions which is in turn driven by the voltage of the Project rather than route. In other words, the specific 345 kV route for the Project does not affect the Public Policy Benefits. The 345 kV Project outperforms and provides greater Public Policy Benefits than the 161 kV alternative. Using the estimate for the Purple-E-Red Route, the Net Benefits would be $334.3 to $689.4 million dollars (2016$).

Q. DOES YOUR ANALYSIS IN APPENDIX I EVALUATE ANY OTHER IMPACTS OF THE PROJECT?

A. No. For example, my analysis does not evaluate other costs and benefits of the Project, such as impacts on existing land uses. My analysis focused on how the 345 kV Project and the 161 kV alternative affected emissions. The dollar value of the Public Policy Benefit would vary if different values were assigned to each of the pollutants, but the key takeaway would remain the

[3] A copy of this response is provided as Schedule 6 to the Direct Testimony of Mr. Andrew Siebenaler.

same—the 345 kV Project provides greater estimated avoided emissions of $SO_2$, $NO_x$, and $CO_2$ than the 161 kV alternative.

## III. CONCLUSION

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

# Benjamin Abing

27175 Energy Way Novi,
Michigan 48377
ITC Holdings Corp.

## Education

**University of Wisconsin-Platteville, Platteville, WI**

Bachelor of Science
Major: Electrical Engineering (ABET accredited)
Emphasis: Power & Energy and Controls

## Professional Experience

**International Transmission Company- Novi, MI** February 7, 2011 – Present

*Sr. Engineer | Regional Planning*

- Utilize power systems analysis tools to study transmission system performance including production cost simulations and voltage & thermal reliability assessments
- Support development of PROMOD models to facilitate system studies
- Build contingency files for economic and reliability assessments
- Perform analysis to develop Order 1000 project proposals in in regional and interregional planning processes of SPP, MISO, PJM, SPP-MISO Seams, MISO-PJM Seams, NYISO
- Lead ITC's economic planning participation efforts in MISO's Market Congestion Planning Studies which includes model review, needs list research, solution development & analysis, solution prioritization, and preparation of proposal documentation
- Develop geographic heat maps or displays of opportunities or study results using Velocity Suite software
- Perform steady-state power flow analysis for annual Michigan Reliability Assessments (Near Term and Long Term) necessary for NERC compliance
- Perform analysis of prospective projects; develops, tests and proposes new system capital expansion projects
- Develop project engineering information sketches for internal project review and cost estimation
- Monitor and research industry trends and policy impacting electric grid and energy markets
- Prepare written reports on various facets of the transmission system's condition and performance
- Develop presentations and present study results to both internal and external audiences

- Support or monitor various committees, panels and working groups at the RTO level; predominantly in MISO, SPP, and PJM
- Provide technical support to internal and external groups
- Provide training and work direction to technical team members
- Create and present educational material on energy markets and economic planning concepts for internal departments

**American Transmission Company-Madison, WI** May 2010 – December 2010

*Co-Op Transmission Planning*

- Performed steady-state power flow studies for T-D interconnections
- Performed dynamic stability simulations
- Created common right of way contingency file for ATC system

## Technical Skills

PROMOD IV
PROMOD Analysis Tool (PAT)
Velocity Suite
Transmission Adequacy & Reliability Assessment (TARA)
PSSE
MUST
Python
Excel PivotTables

☐ **Not Public Document – Not For Public Disclosure**
☐ **Public Document – Not Public Data Has Been Excised**
☒ **Public Document**

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|---|---|---|---|
| Xcel Energy | | | |
| Docket No.: | E002,ET6675/CN-17-184 | | |
| Response To: | MN Department of Commerce | Information Request No. | 20 |
| Requestor: | Matthew Landi / Steve Rakow | | |
| Date Received: | May 29, 2018 | | |

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Question:

Topic: Economic Analysis of the Project and Alternatives
Reference(s): Chapters 4 & 5; Appendixes G, I, & K

Please explain the data and assumptions used in Appendix I, including the sources, methodology, and justification for each of the components.

Response:

Appendix I was developed by ITC Midwest to evaluate externalities of different transmission line alternatives in Certificate of Need proceedings as required by the Minnesota Public Utilities Commission's November 25, 2014 Order Granting Certificate of Need with Conditions in Docket No. ET6675/CN-12-1053. The initial template was developed and submitted by ITC Midwest on October 7, 2015 to be applied to future Certificate of Need proceedings. This is the first docket where ITC Midwest has populated the template. The data applied in this evaluation included the routing cost estimates in the Certificate of Need Application for the Huntley-Wilmarth 345 kV Project (Project), financial assumptions, and externality values. The purpose of this analysis is to compare the benefits and net benefits, considering externalities, of the Project and a comparable 161 kV alternative. The variables, data sources, and methodology are described below.

**Route/Design Cost Estimates**

High, medium, and low cost route estimates for the Huntley – Wilmarth 345 kV Project were applied in this externalities analysis to provide a range of benefits for potential routes. Specifically, ITC Midwest utilized the cost estimates for Purple

Route (single-circuit, H-Frame design), the Blue Route (double-circuit and single-circuit, monopole design), and the Green Route (single-circuit, monopole design). The same externalities value were applied regardless of the route/design of the 345 kV Project. Only one cost estimate was developed for the 161 kV Huntley – Wilmarth alternative, that being the mid-range cost estimate along the Green Route.

**Financial Assumptions**

The Levelized Fixed Charge Rate of 12.9% is an average of ITC Midwest and Xcel Energy levelized fixed charge rates derived analogous to MISO's Schedule 26 - Indicative Annual Charge Rates. MISO's assumptions for the Indicative Annual Charge Rates except using a 63-year life include:

1) Annual Charge Rate calculated in accordance with Attachment GG of the Tariff using Attachment O data as of March 2017. It does not take into account changes to Attachment O that would result from tax reform legislation; and

2) Components of Annual Charge Rate based on Attachment O data assumed to remain constant in future years.

The inflation and discount rates replicate MISO's assumptions applied in the MTEP17 analysis:

1) Inflation Rate 2.50%;

2) Discount Rate 7.10%

**Benefits**

Total proposed project benefits are calculated as the sum of the public policy benefits and the economic benefits. The public policy benefit reflect the weighted PROMOD Emissions Cost Savings as derived by the change in tons of emissions for resources within MISO LRZ's 1, 2, and 3 reported by PROMOD multiplied by the Minnesota Public Utilities Commission approved externality values. The economic benefit reflects the weighted PROMOD APC savings as derived from traditional MISO North/Central APC savings methodology discussed in Applicants' response to DOC-DER IR No. 17 minus the change in emissions costs.

Benefits are derived from simulations of study years 2021, 2026, and 2031. For a 63-year evaluation period, the remaining years are interpolated between study years and

extrapolated beyond the final study year. The weighted data and formulae are included in the live spreadsheet provided in response to DOC-DER IR No. 19.

The MISO MTEP17 models capture emission rates of SO2, NOx, and CO2 that were developed by Asea Brown Bovari (ABB) and are applied in the MTEP17 models by fuel type. Emissions of NOx and CO2 have prices applied in the unit commitment and dispatch process. Increased CO2 prices are necessary to create higher dispatch costs necessary to achieve the carbon reduction assumptions developed in the futures building process. These resulting emission costs become part of the unit production costs captured in the APC metric but do not match the Minnesota Public Utilities Commission's approved externality values *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3*, Docket No. E-999/CI-14-642, Order Updating Environmental Cost Values (Jan. 3, 2018) ("Externalities Order"). To avoid double counting of emissions reductions when considering externalities, the change in emission costs from PROMOD are removed from the APC benefit for all MISO North/Central resources. This reduced APC is identified as the 'modified APC'.

The public policy benefits are measured as the change in weighted tons of emissions multiplied by the externality costs contained in the Externalities Order for MISO LRZ's 1, 2, and 3. These LRZ's reasonably capture the range of resource locations identified in the Externalities Order as Urban, Metropolitan Fringe, Rural, and Within 200 Miles of Minnesota. The majority of the emission changes occurred with CO2. Therefore, high and low CO2 values were applied to provide a range of impacts. SO2 and NOx emission changes were relatively insignificant so these effluents, regardless of resource location, were valued at their median value for the rural location as a proxy. Higher or lower values can be incorporated into the calculations upon request but are assumed to be inconsequential. Appendix I contains the externality values applied, the weighted tons of emissions for each simulation, the emissions reduction for each alternative and the resulting change in externality costs.

The non-weighted simulation results for APC benefits, emissions cost benefits, and modified APC benefits for Huntley – Wilmarth 345 kV Project and the Huntley – Wilmarth 161 kV are shown in Table 1 below. Only the weighted values (i.e., the MISO MTEP17 Futures weightings) are applied in Appendix I. It was identified during the preparation of the response to this IR request that the emission prices between the Base Cases and Change Cases are different by fractions of a cent. As a result, this small price change multiplied by a large emissions tonnage may equate to a small increase in cost. These costs are reported by the ReportAgent tool in

PROMOD and do not require any user computations. Emission cost increases of $805 to $111,301, as seen in Table 1 below, are assumed to be a reflection of this minor variation in emissions prices applied by PROMOD.

**Table 1**

| | Economic Benefit Data ($) | | Future | 2021 | 2026 | 2031 | |
|---|---|---|---|---|---|---|---|
| 1 | Huntley - Wilmarth 345 kV | Traditional MISO APC Benefits | EF | 1,546,109 | 946,852 | 1,941,249 | |
| 2 | | | PR | 3,022,323 | 9,141,354 | 21,708,039 | |
| 3 | | | AAT | 2,891,317 | 58,045,943 | 131,912,380 | |
| 4 | | | **Weighted** | **2,530,635** | **19,316,251** | **44,233,463** | |
| 5 | | Emissions Cost Portion of APC Benefits | EF | (805) | (47,284) | (34,493) | |
| 6 | | | PR | (17,192) | (111,301) | 205,204 | |
| 7 | | | AAT | (15,692) | 4,882,121 | 38,497,928 | |
| 8 | | | **Weighted** | **(11,722)** | **1,206,834** | **10,087,006** | |
| 9 | | Modified APC Benefits | EF | 1,546,914 | 994,135 | 1,975,742 | |
| 10 | | | PR | 3,039,515 | 9,252,655 | 21,502,835 | |
| 11 | | | AAT | 2,907,010 | 53,163,822 | 93,414,452 | |
| 12 | | | **Weighted** | **2,542,357** | **18,109,417** | **34,146,457** | **<-- applied in Appendix I** |
| 13 | Huntley - Wilmarth 161 kV | Traditional MISO APC Benefits | EF | 678,634 | 1,236,437 | 1,241,221 | |
| 14 | | | PR | 2,766,678 | 7,133,553 | 19,457,765 | |
| 15 | | | AAT | 2,233,562 | 46,134,101 | 89,699,186 | |
| 16 | | | **Weighted** | **1,980,774** | **15,445,589** | **32,073,406** | |
| 17 | | Emissions Cost Portion of APC Benefits | EF | 6,351 | (31,977) | (17,416) | |
| 18 | | | PR | 4,842 | 301,689 | 1,171,366 | |
| 19 | | | AAT | (8,889) | 3,487,398 | 28,244,964 | |
| 20 | | | **Weighted** | **1,740** | **1,026,537** | **7,841,979** | |
| 21 | | Modified APC Benefits | EF | 672,284 | 1,268,414 | 1,258,636 | |
| 22 | | | PR | 2,761,835 | 6,831,864 | 18,286,400 | |
| 23 | | | AAT | 2,242,452 | 42,646,704 | 61,454,222 | |
| 24 | | | **Weighted** | **1,979,035** | **14,419,053** | **24,231,427** | **<-- applied in Appendix I** |

## Analysis

The Huntley – Wilmarth 345 kV Project produces higher emission reductions than the 161 kV alternative. As a result, the 345 kV Project was identified to have more economic and public policy benefits than the 161 kV alternative. A range of net benefits is calculated for the three 345 kV Project route/design options and the 161 kV alternative applying high and low CO2 externality values. Each of the evaluated combinations of projects or routing estimates is evaluated by benefits and net benefits on page 2 of Appendix I.

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Date: June 8, 2018