NOTICE OF CONFIDENTIALITY
A PORTION OF THIS DOCUMENT HAS BEEN FILED UNDER SEAL

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF THE 600 MW RUSH CREEK WIND PROJECT PURSUANT TO RULE 3660(H), A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE RUSH CREEK WIND FARM, AND A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE 345 KV RUSH CREEK TO MISSILE SITE GENERATION TIE TRANSMISSION LINE AND ASSOCIATED FINDINGS OF NOISE AND MAGNETIC FIELD REASONABLENESS.	**)**	**PROCEEDING NO. 16A-0117E**

HIGHLY CONFIDENTIAL DIRECT TESTIMONY AND ATTACHMENTS OF WILLIAM P. ZAWACKI

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

NOTICE OF CONFIDENTIALITY:
PORTIONS OF THIS DOCUMENT HAVE BEEN FILED UNDER SEAL

Page 26, line 4
Attachment WPZ-1

May 13, 2016

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

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF THE 600 MW RUSH CREEK WIND PROJECT PURSUANT TO RULE 3660(H), A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE RUSH CREEK WIND FARM, AND A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE 345 KV RUSH CREEK TO MISSILE SITE GENERATION TIE TRANSMISSION LINE AND ASSOCIATED FINDINGS OF NOISE AND MAGNETIC FIELD REASONABLENESS.	**)**	**PROCEEDING NO. 16A-0117E**

SUMMARY OF THE DIRECT TESTIMONY OF WILLIAM P. ZAWACKI

Mr. William P. Zawacki is employed by Xcel Energy Services Inc. ("XES or Service Company") as Plant Director. Mr. Zawacki is responsible for the overall direct operation and maintenance of the wind, hydro and bio-mass of Xcel Energy utilities-owned generation. This includes managing safety, operations, engineering, maintenance, budgeting, licensing, regulatory compliance, and staffing.

Mr. Zawacki describes the Operations and Maintenance ("O&M") activities associated with a wind generation project, consisting of scheduled maintenance and unscheduled maintenance. It is a different world than the wind farm operations world of 20 years ago, mainly due to the fundamental changes in system components, and also in data collection, data analysis, and monitoring. We have seen the development and deployment of centralized data systems,

which allows for improved monitoring of wind turbines. More advanced Supervisory Control and Data Acquisition ("SCADA") systems improve remote monitoring and control over communication channels. All of these technological developments have led to fundamental changes in the way the Company's wind farm O&M strategies are developed and deployed.

Mr. Zawacki discusses how we have developed our O&M capabilities through our experience with our five wind farms in the Northern States Power Company ("NSP") region totaling 850 Megawatts ("MW") of wind. This experience has led to a staffing strategy and contracting approach that has informed the O&M model that will be similarly applied at Rush Creek I and II. He introduces and sponsors the Service, Maintenance, and Warranty Agreement with Vestas and discusses how internal and external personnel will be deployed to maintain Rush Creek I and II. To this end, he discusses the O&M estimate over the 25-year life of Rush Creek I and II of approximately $604 million, and further explains how this O&M estimate is reasonable as compared to O&M for other wind projects. It accounts for internal and external personnel being assigned exclusively to Rush Creek I and II, as well as reasonable assumptions about preventative maintenance projects, unexpected maintenance requirements, and other investments that may be necessary to ensure that Rush Creek I and II produce the expected generation over the entire life of the Project. For these reasons, Mr. Zawacki shows that our estimated O&M costs are reasonable.

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

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF THE 600 MW RUSH CREEK WIND PROJECT PURSUANT TO RULE 3660(H), A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE RUSH CREEK WIND FARM, AND A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE 345 KV RUSH CREEK TO MISSILE SITE GENERATION TIE TRANSMISSION LINE AND ASSOCIATED FINDINGS OF NOISE AND MAGNETIC FIELD REASONABLENESS.	**)**	**PROCEEDING NO. 16A-0117E**

DIRECT TESTIMONY AND ATTACHMENT OF WILLIAM P. ZAWACKI

INDEX

LIST OF ATTACHMENTS

Highly Confidential Attachment No. WPZ-1	Service, Maintenance, and Warranty Agreement

GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
AWEA	American Wind Energy Association
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
MW	Megawatt(s)
NSP	Northern States Power Company
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
Public Service or Company	Public Service Company of Colorado
ROW	Right of Way
SCADA	Supervisory Control and Data Acquisition
SMWA	Service, Maintenance, and Warranty Agreement
TSA	Turbine Supply Agreement
UVIG	Utility Variable Generation Integration Group
Vestas	Vestas American Wind Technology Inc.
Xcel Energy	Xcel Energy Inc.
XES or Service Company	Xcel Energy Services Inc.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF THE 600 MW RUSH CREEK WIND PROJECT PURSUANT TO RULE 3660(H), A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE RUSH CREEK WIND FARM, AND A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE 345 KV RUSH CREEK TO MISSILE SITE GENERATION TIE TRANSMISSION LINE AND ASSOCIATED FINDINGS OF NOISE AND MAGNETIC FIELD REASONABLENESS.	)	**PROCEEDING NO. 16A-0117E**

DIRECT TESTIMONY AND ATTACHMENTS OF WILLIAM P. ZAWACKI

I. INTRODUCTION, QUALIFICATIONS, AND PURPOSE OF TESTIMONY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is William P. Zawacki. My business address is 1400 Western Avenue, Eau Claire, WI, 54703.

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

A. I am employed by Xcel Energy Services Inc. ("XES or Service Company") as Plant Director. XES is a wholly-owned subsidiary of Xcel Energy Inc. ("Xcel Energy"), and provides an array of support services to Public Service Company of Colorado ("Public Service" or "Company") and the other utility operating company subsidiaries of Xcel Energy, which include

Northern States Power Company ("NSP"), a Minnesota corporation, on a coordinated basis.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THE PROCEEDING?

A. I am testifying on behalf of Public Service.

Q. HAVE YOU INCLUDED A DESCRIPTION OF YOUR QUALIFICATIONS, DUTIES, AND RESPONSIBILITIES?

A. Yes. A description of my qualifications, duties, and responsibilities is included at the end of my testimony.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my direct testimony is to describe the Company's operation and maintenance ("O&M") plan for Rush Creek I and II. In my testimony I will describe:

1. How we have developed our O&M capabilities through our experience with our five wind farms in the NSP region - totaling 850 MW of wind. This experience has led to a staffing strategy and contracting approach that has informed the O&M model that will be similarly applied at Rush Creek I and II;
2. The significant changes in wind farm O&M over the past 20 years and how we have adapted our O&M strategy with the changing times in response to advancing and increasingly sophisticated wind technologies;

3. The Service, Maintenance, and Warranty Agreement ("SMWA") we have entered into with Vestas-American Wind Technology Inc. ("Vestas"), which is a key component of our O&M plan for Rush Creek I and II. The SMWA is included as Highly Confidential Attachment WPZ-1; and
4. The O&M cost estimate we have developed for Rush Creek I and II and a comparison of our O&M cost estimate to other wind projects to illustrate that our projected O&M costs over the estimated life of the Project are reasonable.

II. WIND O&M OVERVIEW AND OUR O&M PLAN

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. The purpose of this section of my testimony is to describe the development of our O&M capabilities and address our general O&M plan for the Project as well as the SMWA. I discuss how our O&M experience has evolved and what activities we will undertake as a part of the O&M on Rush Creek I and II.

Q. WHAT IS INVOLVED IN THE O&M OF A WIND PROJECT?

A. O&M activities associated with a wind project generally involve two categories of maintenance: (1) scheduled, and (2) unscheduled. Scheduled maintenance includes general preventative maintenance, while unscheduled maintenance stems from the identification of operational issues from our monitoring of the wind turbines and the subsequent repair of these identified issues.

Q. DOES THE COMPANY HAVE EXPERIENCE WITH WIND FARM O&M?

A. Yes and we continue to gain experience through our five Company-owned wind farms in the NSP region. We coordinate and apply best practices across all four Xcel Energy utilities. We do so primarily by consolidating activities across company lines through XES as a service company. This structure facilitates our ability to take what we learn from one utility and apply it to another. After the completion of the 600 MW Rush Creek Wind Project, Xcel Energy utilities will own 1,450 MW of wind resources, all of

which require O&M. The existing wind farms in the NSP region are shown in the table below.

Table WPZ-1 – NSP Wind Farm Key Details

NSP Region Wind Project	Location	Year of Commercial Operation	Nameplate Capacity (MW)	Number of Turbines
Grand Meadow	Dexter, MN	2008	100	67
Nobles	Worthington, MN	2010	200	134
Pleasant Valley	Hayfield, MN	2015	200	100
Border Winds	Rolette, ND	2015	150	75
Courtenay	Jamestown, ND	2016	200	100
Total			850	476

In addition, Public Service has experience with the recently retired Ponnequin Wind Farm in northern Colorado, which is discussed later in my testimony. Experience with these wind farms informs our O&M plan for Rush Creek I and II in two ways. First, we have seen a significant change in wind farm O&M and have been able to adapt to, and incorporate, changes into our general O&M strategies. Second, our experiences with these wind farms inform our O&M staffing strategy and contracting approach for the Rush Creek Wind Project.

III. THE EVOLUTION OF WIND O&M

Q. WHAT ARE THE KEY AREAS WHERE WIND FARM O&M HAS CHANGED OVER THE PAST 20 TO 25 YEARS?

A. It is a different world than the wind farm operations world of 20 years ago, mainly due to the fundamental changes in system components, and also in data collection, data analysis, and monitoring. There are two general areas where wind farm O&M has changed significantly over this time period. We have seen the development and deployment of centralized data systems, which allows for improved monitoring of wind turbines, and increases in turbine size. All of these technological developments have led to fundamental changes in the way the Company's wind farm O&M strategies are developed and deployed.

Centralized data systems allow us to continuously collect data on key metrics that affect the performance of wind turbines such as vibration and temperature. Today, Supervisory Control and Data Acquisition ("SCADA") systems have been the primary form of centralized data systems deployed at Company-owned wind facilities as part of our wind farm O&M. These systems allow for remote monitoring and control over communication channels. Collecting data on turbine vibration on bearings and gears is an important indicator of negative operational issues with a turbine. It allows us to catch these issues early so more widespread problems do not develop and also allows us to schedule work during low

wind periods. Collection of temperature data is also important because it can indicate early component damage. For example, a hot generator bearing can indicate under or over greasing or internal bearing damage. Knowing about these issues early on allows us to correct or manage the situation before additional and more costly damage occurs.

Centralized data systems such as SCADA systems have also led to improved monitoring activities. With improved data availability and collection on issues such as vibration and temperature, the Company has been able to develop trend analyses and identify potential operations issues more quickly. Issues such as vibration can be slow in developing. Accordingly, looking at performance trends and continuous data from turbines can help to identify potential problems early and allows us to react to such problems quickly.

Over time, turbines have grown much larger, such as the 2.0 MW turbines being used for the Rush Creek Wind Project. Land based turbines have grown taller and rotor diameters have become larger to capture more wind. The internal components such as the gearbox and generators have also increased in size, which has allowed for a corresponding increase in power output. In the last decade, turbine manufactures have focused on workhorse turbines by refining the previous models to improve reliability and increase power output through improved sub-components, blade designs, and control system upgrades

while generally using the same drive train equipment. Increases in turbine size over the years, combined with the increasingly sophisticated monitoring that has developed over the same timeframe, has refined our ability to monitor more points on the turbine and allowed us to identify issues more quickly due to the increased condition monitoring. Moreover, the use of condition-based monitoring systems has increased because it has become more cost effective with the larger MW turbines. This is the case because the same hardware is required to be installed regardless of turbine size.

Q. HOW WOULD YOU CHARACTERIZE THE EVOLUTION OF WIND TURBINE O&M?

A. O&M monitoring and analysis is more sophisticated than it previously was due to the developments and advancements described above. Further, as wind technologies have matured, there are more robust user groups that have developed to share issues and collaborate to upgrade parts and eliminate future failures. The Company is an active member of two of these user groups, the American Wind Energy Association ("AWEA"), and the Utility Variable–Generation Integration Group ("UVIG"). The forums these groups provide are a way for industry personnel and other stakeholders to share information on what they are doing to operate and maintain turbines and continue to improve and refine industry best practices regarding wind facility performance and reliability.

IV. DEVELOPMENT OF OUR O&M STRATEGY MODEL

Q. HOW HAS THE RAPID CHANGE WITH REGARD TO O&M INFORMED THE COMPANY'S O&M STRATEGY FOR THE RUSH CREEK WIND PROJECT?

A. Through projects in the NSP region, we have been at the center of these shifts in O&M for wind farms and adjusted our strategies for addressing wind farm O&M accordingly. It has generally informed our O&M strategy in two main areas, from development of our O&M personnel deployment strategy to designing our service and maintenance contracting approach.

Q. HOW HAS THE CHANGE IN O&M AFFECTED YOUR INTERNAL O&M STAFFING STRATEGY?

A. As O&M technologies have evolved, Xcel Energy utilities have simultaneously been adding more utility-owned wind resources. Therefore, the development of our internal staffing strategies has been influenced by both of these factors. As the utility-owned fleet has grown, we have seen significant value in the use of dedicated internal employees to manage O&M on the wind farms and be responsible for these O&M activities on a day-to-day basis. In turn, the staff that we have assigned to these respective facilities has grown more sophisticated and internal expertise has continued to develop as technologies related to O&M have matured, as described earlier in my testimony. At the wind farms in the NSP region, we have dedicated teams that are responsible for O&M for

the wind farms. The activities involved in O&M, including data monitoring and analysis to determine trends and other issues, are a natural extension of the O&M we have been doing on conventional power plants for years. Therefore, we have developed the model of having dedicated internal staff for O&M as a key part of our broader staffing strategy.

Q. HOW DO EXTERNAL CONTRACTORS FACTOR INTO THE STAFFING MODEL?

A. We also employ external contractors as part of our staffing strategy with regard to wind farm O&M. From our NSP experience, we found that during the initial phase of wind farm operation, utilizing the original equipment manufacturer ("OEM") (i.e., the turbine manufacturer) to perform these services is effective for several reasons. First, it lowers the risk of claims of inadequate maintenance during the three-year warranty period. Second, it allows us to readily obtain controls and software updates that help to maintain reliability. Examples of controls and software updates include changes to the computer logic and updates to alarm settings. These updates help maintain reliability by clearing out nuisance faults and modifying the computer control logic to allow for improved performance. And third, it allows our internal personnel to work closely with the OEM during this period on process and procedures for maintaining the turbines. This collaboration is important because the OEM teams have the most up to date understanding of the latest

technological advances, and we can work with them to gain greater knowledge of technological changes, which in turn leads to improved O&M on the turbines over their useful life.

We have a second phase of our use of external contractors for wind farm O&M as well. This involves putting the external maintenance contract out to bid after the expiration of the contract with the OEM. This second contract may be with the OEM or with a new third party. It has been our experience that competitively bidding this work after the initial service agreement expires allows us to reduce O&M costs over the remaining years of the facilities.

Q. HOW DOES THE COMPANY WORK WITH THE OEM OR OTHER THIRD PARTY CONTRACTOR TO PROVIDE O&M ACTIVITIES?

A. Our internal staff monitors and coordinates with contractors from the OEM or another third party to perform the O&M for the facility at issue. We coordinate on scheduled maintenance as well as on responding to issues at the site. The OEM or third party contractor bears responsibility for third party reporting at the site, and that third party contractor will typically inform the internal employees when an operations issue is identified.

In an instance where monitoring of SCADA data or other O&M-related monitoring has revealed a potential operations issue, internal staff will direct the external contractors to schedule a technician to go out to the turbine in question. Depending upon the nature of the potential problem,

the team that goes out to the turbine may include both internal and external personnel. Once at the turbine, they may insert a camera in the gearbox to see if the camera identifies the problem, or inspect the turbine for wear and tear that is leading to the operations issue. In other circumstances there may be too much grease and the grease needs to be flushed out, or perhaps the auto lubers are not working properly such that an appropriate amount of grease is not being added to the turbine to allow for efficient operation. My point here is that, regardless of the issue, we are working hand in hand with the OEM or other third party contractor to address the cause of the issue and fix it as timely as possible.

Q. HOW ARE THE WIND FARMS MONITORED IN YOUR O&M STRATEGY MODEL?

A. We have internal and external staff on site Monday through Friday during normal business hours, so if an issue arises during this time we can respond quickly. After hours, the SCADA system is monitored remotely and personnel can be dispatched if an issue arises that requires an immediate response. Turbines can also be turned off remotely if a problem is observed and the turbine needs to be taken offline. Under both emergency and non-emergency situations, however, the O&M response is just like any other power plant: when you get an alarm, you go out there and address it as soon as practicable given the issue.

Q. HOW DOES THIS STRATEGY COMPARE TO THE O&M FOR THE PONNEQUIN WIND FARM?

A. I cannot compare the strategies because of the advancements and changes to wind farm O&M that have occurred since the late 1990s when those turbines were installed. The turbine sizes are different between the Ponnequin Wind Farm and more recent wind farms, and more importantly, as I discussed earlier in my testimony, the monitoring and data analysis technologies and capabilities have changed drastically since that time. The Ponnequin Wind Farm had an older SCADA system, and for a period of time parts were not functioning; as a result, personnel had to go out to each turbine to collect data. Now, with the integrated SCADA system, we have the ability to collect data and monitor vibration and temperature in a way we could not at that time. This additional data allows us to identify trend lines and react to operations issues in a more sophisticated and expedited manner. To be sure, with the increasing sophistication of data monitoring and our current O&M strategy, we could have had better results with regard to the availability of and the output at the Ponnequin Wind Farm. However, as discussed, there have been significant advancements in O&M technologies since that time and we now use these technologies to operate and maintain our newer wind farms in a more efficient and effective way.

V. OUR RUSH CREEK I AND II O&M STRATEGY

Q. PLEASE PROVIDE AN OVERVIEW OF THE COMPANY'S PLAN FOR OPERATING AND MAINTAINING RUSH CREEK I AND II.

A. The Company's plan for O&M of Rush Creek I and II is similar to the O&M strategy that we have developed over time with our NSP wind farms as discussed above. We will have internal personnel assigned to the Rush Creek I and II site, as well as the SMWA with Vestas for a three-year term. Pursuant to the SMWA, Vestas will provide the external contractor work for this period of time. After this contract expires, we intend to bid out the third party contractor work to Vestas and other qualified third parties.

Q. WHY IS THE USE OF THE O&M STRATEGY DEPLOYED FOR NSP REGION PROJECTS APPROPRIATE FOR RUSH CREEK I AND II?

A. Public Service will be utilizing a proven turbine manufacturer. While the turbines proposed for Rush Creek I and II are a newer Vestas model, Vestas is an established turbine manufacturer, with more than 48,000 turbines installed across the world. We use the same turbine technology at the Courtenay Wind Farm, Pleasant Valley Wind Project, and Border Winds Project in the NSP region. Based on my experience, the two phased approach of (1): having dedicated internal staff to oversee and manage the O&M along with the OEM team for the first three years, and (2) retaining the OEM or another third party O&M contractor team for the

second phase of external O&M contracting constitutes a sound approach to O&M of a wind generation facility.

Q. APPROXIMATELY HOW MANY INTERNAL STAFF WILL MONITOR AND COORDINATE THE O&M ACTIVITIES OF THE CONTRACTORS AND WHAT TYPE OF EXPERTISE DO THESE INTERNAL PERSONNEL HAVE THAT IS RELEVANT TO O&M OF THE PROJECT?

A. The internal staff that will oversee the operations and maintenance of the Rush Creek I and II will consist of plant management, engineering, and administrative personnel. We anticipate that up to six internal personnel, who will be Public Service employees, will be engaged in day-to-day operations of the facility. These personnel will have related operational and maintenance experience depending on their area of expertise and assigned duties. In addition, XES personnel will provide various support services. These support services will include technical service groups for assistance with engineering issues, material and chemical analysis, grid reliability, equipment analysis, safety, and site security.

Q. PLEASE DESCRIBE THE SMWA THAT THE COMPANY HAS ENTERED INTO THAT WILL COVER EXTERNAL O&M FOR THE INITIAL THREE YEARS OF RUSH CREEK I AND RUSH CREEK II OPERATION.

A. The SMWA that the Company has entered into with Vestas is a three-year contract that ensures Vestas will perform warranty work and periodically

required scheduled maintenance. This contract covers warranty work and scheduled maintenance for the towers, turbines, generators, blades, and associated equipment for the O&M of the 300 wind turbines that will be installed over the term of the agreement. Examples of warranty work include replacement of failed parts such as bearings, electronic components and the labor associated with the replacement. The SMWA does not cover maintenance of roads, the collector system, or the substations. We will separately contract that work out.

I would also note that whether the SMWA goes into effect is conditioned on Commission approval of the Rush Creek Wind Project.

Q. WHY DID THE COMPANY ENTER INTO THE SMWA?

A. First, a minimum three-year service agreement was part of the broader TSA described in more detail in the testimony of Mr. Riley Hill. This three-year service agreement is the SMWA. Through these interrelated agreements, Vestas agreed to provide the warranties and price structure that Public Service ultimately obtained for the purchase of the 300 wind turbines. Further, as discussed in detail earlier in my testimony, we have had good experience by contracting with the OEM for the initial years of wind farm operation then transitioning to the second phase of external contracting after the site is up and running for a few years. Therefore, I believe that entering into the SMWA was the best course of action from an

O&M standpoint for the first three years of operation of Rush Creek I and II.

VI. ESTIMATED O&M COSTS

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. The purpose of this section of my testimony is to describe the estimated O&M costs over the life of Rush Creek I and II.

Q. PLEASE DESCRIBE THE GENERAL PROCESS USED BY THE COMPANY TO DEVELOP THE O&M ESTIMATE.

A. To develop the O&M cost estimate for the Rush Creek I and II, we started with the O&M cost estimates for the Courtenay Wind Farm and Pleasant Valley Wind Project located in North Dakota and Minnesota, respectively. The Courtenay Wind Farm and Pleasant Valley Wind Project estimates were developed based upon key cost factors such as turbine quantity, output, blade length, tower height, and site layout. The estimates also factored in staffing needs for wind farm operation. These estimates were generally scaled up by a factor of three to take them from a 200 MW facility to a 600 MW facility. We felt that this scaling was appropriate because these two wind projects use the same turbines as will be used for the Rush Creek Wind Project, which provided a basis to assume that similar O&M would be required for these turbines which are the same as those at Pleasant Valley and Courtenay. These NSP region projects are relatively new and we do not have a significant period of actual O&M costs to compare the O&M estimates to for these projects. However, these

recent estimates constitute the best available data for purposes of deriving our estimate for Rush Creek I and II.

Q. BASED ON YOUR EXPERIENCE, DO YOU BELIEVE THAT THIS ESTIMATE IS REASONABLE?

A. Yes. First, the O&M costs are generally consistent with the O&M costs for our NSP region projects. Comparison with other non-Xcel Energy utilities is more difficult as other utilities do not share O&M with one another or share this data publicly. Earlier in my testimony, however, I discussed our participation in the AWEA and UVIG user groups. Members of my team have discussions through these groups with other utility personnel that oversee wind farm O&M as part of their portfolio. We compare notes on what technologies and general O&M strategies are working or not working to continually make improvements. Based on discussions with my team about these interactions, I believe our O&M estimate is appropriate and reasonable. This conclusion is borne out by the comparative exercise I go through later in my testimony.

Q. WHAT IS THE ESTIMATED LIFE OF THE FACILITY?

A. The estimated life of the Rush Creek Wind Project is 25 years.

Q. WHAT ARE THE ESTIMATED O&M COSTS OVER THE LIFE OF THE FACILITY?

A. The estimated O&M costs over the 25-year estimated life of the Project is approximately $604 million. This total cost is broken out into major

categories in Table WPZ 2 below. This estimate primarily consists of Company labor, contract labor, land leases, materials, office and shop, miscellaneous expenses, and projects.

[redacted]

Line Item	***Cost Category***	***Amount (Nominal dollars)***
1	Company Labor	$19,523,019
2	Contract Labor	[redacted]
3	Land Leases	[redacted]
4	Materials	$113,312,071
5	O&M and Sub Buildings	$1,859,175
6	Miscellaneous Expenses	$2,794,971
7	Projects	[redacted]
	Total	$603,971,795

Q. PLEASE DESCRIBE THE TYPES OF COSTS THAT ARE INCLUDED WITHIN EACH LINE ITEM.

A. Company labor simply reflects our estimated labor expenses over the life of Rush Creek I and II. Contract labor includes our labor expenses pursuant to the SMWA as well as our forecasted external labor costs to conduct O&M activities on the turbines and transmission line. This number includes an estimate of the anticipated costs of the subsequent O&M services agreement that we will enter into with a third-party contractor (or perhaps Vestas again if they provide the best offer) following the expiration of the SMWA. The land leases line item consists of the costs

associated with land lease payments over the 25-year estimated life of the facility. These costs are discussed in the testimony of Company witness Mr. John Lupo. Materials include the materials necessary for O&M such as oils, grease, filters, and small spare mechanical and electrical parts. The O&M and Sub Buildings line item includes costs associated with building utilities such as heating, cooling, water, and janitorial services. Miscellaneous Expenses include costs such as employee expenses, training costs, office supplies, and safety supplies. Finally, the Projects line item includes costs for activities like leading edge blade repairs, gearbox oil changes, and end of warranty inspections. In addition, end of warranty inspections near the end of the three-year SMWA term are also planned prior to the turbine warranty expiring to ensure any unreported issues or damage are repaired under the terms of the warranty agreement. These referenced activities are meant to be illustrative of the types of O&M costs we have included in our O&M cost estimate for Rush Creek I and II.

Q. ARE THE ABOVE O&M COSTS THE ONLY COSTS ASSOCIATED WITH MAINTAINING THE PROJECT?

A. No. We will also have capital replacement costs over the life of Rush Creek I and II, which has been included in Ms. Deborah Blair's revenue requirements model.

Q. PLEASE DESCRIBE THESE CAPITAL REPLACEMENT COSTS AND THE COMPONENTS OF THE ESTIMATE.

A. Although preventive maintenance will keep turbines from degrading long term, the projected capital budget accounts for the potential failure and replacement of turbine components such as blades, blade bearings, gearboxes and generators. To account for these capital replacement costs, we have included approximately $135.7 million for these types of expenditures in the modeled cost of the Project over its estimated life.

Q. ARE THERE ANY PROJECT O&M COSTS NOT INCLUDED IN THE TABLE ABOVE THAT YOU WANT TO REFERENCE?

A. Yes. The O&M estimate for the Rush Creek Gen-Tie is addressed in the testimony of Company witness Mr. Brad Cozad.

Q. ARE THESE DOLLARS ESCALATED IN THE ESTIMATE?

A. Yes. The dollars were totaled and then escalated to account for inflation.

Q. DO ESTIMATED O&M COSTS VARY FROM YEAR TO YEAR?

A. Yes. The estimated annual O&M cost varies from year to year. The variance in costs from year to year is primarily based on the preventive long-term maintenance items described earlier in my testimony.

VII. O&M COST COMPARISON

Q. DID YOU COMPARE THESE O&M COSTS TO O&M COSTS FOR OTHER WIND PROJECTS?

A. Yes. I reviewed the August 2015 report from the Lawrence Berkeley National Laboratory within the U.S. Department of Energy, which was also reviewed by Company witness Mr. Riley Hill for purposes of his construction cost comparison and attached to his testimony as Attachment RH-9. I compared the all-in O&M costs of the Rush Creek Wind Project (i.e., Rush Creek I and II and the Rush Creek Gen-Tie) to the findings relevant to O&M in this Lawrence Berkeley National Laboratory report.

Q. WHAT O&M COST FIGURE DID YOU USE FOR THE RUSH CREEK WIND PROJECT AND HOW DID YOU DERIVE IT?

A. One of the analytical metrics that the Lawrence Berkeley National Laboratory report used for O&M was based on capacity-weighted average $/MWh. Accordingly, I conducted an analysis to come up with a capacity-weighted average $/MWh for the Rush Creek Wind Project. I started with the total estimated O&M expenses over the 25-year life of the Project of is approximately $604 million I then took the total modeled production of the Rush Creek Wind Project over 25 years of 57,317,650 MWh. I arrived at this figure by taking the estimate of Company witness Mr. Matt Hendrickson of Vaisala of 2,292,706 MWh/year of production and multiplying it by 25. For the final step, I divided the total estimated O&M

expenses of $603,971,795 by the total estimated 25-year production of 57,317,650 MWh. Based on this calculation, we arrived at $10.54/MWh.

Q. HOW DOES THE $10.54/MWH COMPARE TO THE O&M RELATED FINDINGS IN THE LAWRENCE BERKELEY NATIONAL LABORATORY REPORT?

A. First, the report includes a general caveat about the O&M data reviewed, specifically referencing "the scarcity, limited content, and varying quality of the data …."[1] Nevertheless, I still believe it is a useful exercise and instructive to compare the estimated Rush Creek Wind Project O&M costs to this data set. The report analyzed a sizeable number of wind projects and found that the "capacity-weighted average 2000–2014 O&M costs for the 24 projects in the sample constructed in the 1980s equal $34/MWh, dropping to $24/MWh for the 37 projects installed in the 1990s, to $10/MWh for the 66 projects installed in the 2000s, and to $9/MWh for the 20 projects installed since 2010."[2] The $10.54/MWh is higher than the $9/MWh average for the most recent set of wind projects analyzed by the Lawrence Berkeley National Laboratory.

Q. WHAT CONCLUSIONS CAN YOU DRAW FROM THIS ANALYSIS?

A. First, the fact that our O&M estimate is higher than the Lawrence Berkeley National Laboratory data set should not be misinterpreted. The Lawrence Berkeley Study certainly notes that its O&M cost data is not perfect, as the

[1] Attachment RH-11, at 52.
[2] Attachment RH-11, at 52.

caveat in it cited above notes, but the delta between these two figures illustrates that our O&M estimate is reasonable. We have taken an estimation approach with regard to O&M that accounts for internal and external personnel being assigned exclusively to Rush Creek I and II, and have also made reasonable assumptions about preventative maintenance projects as well as unexpected maintenance requirements and other investments that may be necessary to ensure that Rush Creek I and II produce the expected generation over the entire life of the Project. We have also budgeted for capital replacement costs and included that in the overall cost of the Project, though it is separate from the overall O&M estimate presented in my testimony.

While it may seem like an oversimplification, I tend to look at O&M of power plants as being just like upkeep on a car. If you undertake the maintenance necessary and keep it in top flight condition, it will last for a period of time and accommodate a large amount of mileage. We take the same approach to O&M for Rush Creek I and II, and our cost estimate reflects a strategy that will keep the turbines in good condition and accounts for capital expenses to replace key turbine components as necessary. Further, because we only collect actual O&M costs, customers benefit if anticipated capital expenditures are not required and we do not need to spend these O&M dollars. However, we have included this large sum within the total cost of the Project for budgeting purposes and for

purposes of modeling and comparing the overall cost to other wind farms, which is done in the Direct Testimonies of Mr. James Hill and Mr. Riley Hill.

For these reasons, I believe this comparison supports a finding that our estimated O&M costs are reasonable.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Statement of Qualifications

William P. Zawacki

As Plant Director Regional Generation I am responsible for the overall direct operation and maintenance of the wind, hydro and bio-mass of Xcel Energy's owned generation. This includes managing safety, operations, engineering, maintenance, budgeting, licensing, regulatory compliance, and staffing. I have over 35 years of experience in the power industry covering engineering, operation and maintenance in generation, transmission and distribution. I have been focused solely on the generation business since 1999. In 2012, I was given the additional responsibility of the Company owned wind plants. During my career, I have held various engineering positions, front line management positions, and higher level management positions.

I have a Bachelor of Science degree in Engineering from the University of Illinois-Chicago, a Master degree in Electrical Engineering from Illinois Institute of Technology, and Master of Business Administration MBA from Cardinal Stritch University. I am a registered Professional Engineer in Wisconsin.