Rebuttal Testimony and Schedules
Steven W. Wishart

Before the North Dakota Public Service Commission
State of North Dakota

In the Matter of the Application of
Northern States Power Company, a Minnesota Corporation
for an Advance Determination of Prudence for a
200 MW Prairie Rose Wind Generation Project and
Power Purchase Agreement with Geronimo Wind Energy, LLC

Case Nos. PU-12-059
Exhibit___ (SWW-2)

Modeling

October 4, 2012

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Schedules

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Steven W. Wishart. My business address is 414 Nicollet Mall, 7th Floor, Minneapolis, MN 55401.

Q. ARE YOU THE SAME STEVEN WISHART WHO SUBMITTED PRE-FILED DIRECT TESTIMONY IN THIS PROCEEDING?

A. Yes.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. The purpose of my testimony is to discuss the Strategist modeling questions raised in Mr. Raymond Hahn's Direct Testimony on behalf of Commission Staff, and to clarify some of the items that appear to be sources of confusion. Our conservative modeling results continue to support the reasonableness of the Prairie Rose Wind, LLC (Prairie Rose or PRW) Power Purchase Agreement (PPA).

II. STRATEGIST PLANNING MODEL

Q. WHAT STRATEGIST MODELING ISSUES DO YOU WISH TO ADDRESS IN YOUR REBUTTAL TESTIMONY?

A. I will provide support for the discussion in Mr. Haeger's testimony regarding the conservative nature of the assumptions in our Strategist modeling. In particular, I will address the inclusion of a capacity credit in our Strategist model, wind integration costs, and our natural gas alternative analysis.

Q. WHAT IS YOUR RESPONSE TO MR. HAHN'S CONTENTION THAT THE PRAIRIE ROSE PPA SHOULD NOT REFLECT A CAPACITY CREDIT IN THE STRATEGIST MODEL?

A. I agree with Mr. Haeger that it is technically feasible and economically beneficial to our customers to convert the Prairie Rose project to a conventional interconnection at some point in the future.

As discussed by Mr. Oye for the Company, MISO's planned multi-value project (MVP) portfolio and other transmission projects are expected to increase transmission outlet in the area of the Prairie Rose project, coinciding with the Company's next expected capacity resource need in 2017-2018. In our latest resource planning analysis, the capacity need in 2017-2018 is to be met with natural gas combustion turbines (CTs). Our preliminary estimate of the capacity cost of these CTs is approximately $7.00/kW-month. Using this cost assumption, the value of the 24 MW potentially available from PRW is $2 million per year.[1]

This potential savings gives the Company strong incentive to consider conversion of the PRW project to a conventional interconnection once the MVP transmission projects are complete. Because the PRW project represents "low hanging fruit" for a capacity addition, I believe it is reasonable to assume for modeling purposes that the Company will capture this capacity benefit. As a result, we include a capacity credit in the Strategist modeling, starting in 2018 based on the price of a CT.

[1] $7.00/kW-mo x 24MW x 12months = $2,016,000

Q. IS THIS A CHANGE FROM YOUR DIRECT TESTIMONY?

A. Yes. We initially incorporated a capacity credit starting in 2013. Consistent with our generally conservative modeling approach and Mr. Hahn's assessment that 2013 capacity accreditation is not expected, we have reduced the value of the capacity credit in the model to reflect a 2018 conversion to a conventional interconnection.

In Exhibit ___(SWW-2), Schedule 1, I provide the calculation of this revised capacity credit. The revised capacity credit value is $13.5 million in terms of present value of revenue requirements (PVRR). This is a $4.2 million decrease in the credit from the $17.7 million in my original analysis.

Q. PLEASE EXPLAIN HOW THE WIND INTEGRATION COST ASSUMPTIONS USED IN STRATEGIST ARE GENERALLY CONSERVATIVE.

A. The Company used a conservative estimate of wind integration costs for the Prairie Rose project based on the 2006 Minnesota Wind Integration Study. However, there are three reasons why actual wind integration costs are likely to be lower than the original estimate used in the Strategist modeling:

- The wind integration costs were based on a modeling assumption of $9/mmBtu gas. This was the forecasted price of natural gas when the Wind Integration Study was conducted in 2006. By the time the Company was analyzing the system cost impacts of the PRW PPA using Strategist, natural gas prices had fallen significantly. Lower gas prices have the effect of reducing wind integration costs, as natural gas fired units are the primary source of operating reserves used to integrate wind. However, because the Prairie Rose project was cost effective when employing the older wind integration cost estimate based on

$9/mmBtu gas, we decided to keep this conservative cost estimate in the model and not update the value until a new integration study could be completed.

- The integration costs used in Strategist also assumed a 25% wind penetration level, consistent with the 2006 Wind Integration Study. However, Prairie Rose is only expected to bring total wind penetration on the NSP system to 13% (NSP System includes all customers in North Dakota, South Dakota, Minnesota, Wisconsin, and Michigan). Study results showed that average integration costs were lower for lower levels of wind penetration on a $/MWh basis. So, the PRW project was modeled with extra costs related to additional levels of wind that may or may not be added to the system in the future.
- The 2006 Wind Integration study was based on the assumption that as wind is added to the NSP System, additional operating reserves must also be added to compensate for wind generation's intermittent characteristics. But since 2006, operating reserves required by MISO have actually fallen as a result of implementation of the MISO Ancillary Services Market. This is not conclusive evidence that wind does not require ancillary services; however, it does contradict the expectation that operating reserves would necessarily need to be increased with additions of wind energy. The only identifiable "costs adders" attributable to placing more wind on the MISO system are the MISO Revenue Sufficiency Guarantee charges that are incurred due to inaccurate day-ahead forecasts of wind generation. Using the best available information, from January 2011 through August 2012 these charges averaged only $0.28/MWh of wind generation, compared to

the approximately $3.00/MWh wind integration cost assumed in the Strategist modeling.

Q. HOW DID THE CONSERVATIVE LEVEL OF WIND INTEGRATION ASSUMED IN THE MODEL IMPACT YOUR INITIAL ANALYSIS?

A. The Strategist model assumed that wind integration in 2013 would cost $2.82/MWh and escalate at an average of 5.1% through the term of the PPA. The impact of this assumption was to effectively add $4.28/MWh to the levelized price of the Prairie Rose project. The impact on the Strategist PVRR was $29 million. This assumption is overly conservative for the reasons explained previously.

Q. HOW DOES INCORPORATING THE LOWER GAS PRICES AND LOWER WIND PENETRATION LEVELS INTO YOUR ANALYSIS AFFECT YOUR ESTIMATE OF WIND INTEGRATION COSTS?

In the Strategist modeling completed for the Prairie Rose project, gas prices started at $5.22/mmBtu in 2013 and escalated at an average rate of 4.1%, compared to the $9/mmBtu assumed in the 2006 Wind Integration Study. And the Prairie Rose project will put wind penetration at about 13% compared to 25% contemplated in the study. Adjusting for these two factors, the estimated wind integration costs in 2013 are $1.48/MWh, escalating at 4.1%. The levelized cost is $2.22/MWh and the revised PVRR impact of the integration costs would be $15 million, rather than our initial estimate of $29.3 million. See Exhibit ___(SWW-2), Schedule 2. I believe this approach is more accurate, as it uses the same gas prices that were used in the rest of the Strategist modeling at the time we conducted our analysis in early 2011, and only burdens the project for the wind penetration levels that Prairie Rose is expected to cause.

I further believe that even this lower level of wind integration costs is conservative. As I explained previously, our recent experience with MISO has been that the additional system costs associated with adding wind have averaged only $0.28/MWh. As this is a relatively new development, however, I have not factored our recent experience into my revised analysis at this time.

Q. ASSUMING NO OTHER CHANGES IN THE MODEL, DO THESE CHANGES IN THE CAPACITY CREDIT AND WIND INTEGRATION COSTS AFFECT YOUR ASSESSMENT OF THE REASONABLENESS OF THE PRAIRIE ROSE PPA?

A. No. My original Strategist analysis resulted in an estimated PVRR impact of $5.4 million. The $4.2 million reduction in the capacity credit increases the overall cost of the project, but this is offset by the $14.1 million reduction in wind integration costs. After these changes are reflected, the value of the Prairie Rose project to the NSP System is greater than originally estimated:

Net Benefit of PRW PPA

PVRR Impacts ($millions)

	Original Strategist Analysis	Change to Original Values	Updated Strategist Analysis
Net Energy Savings	($5.7)		($5.7)
Capacity Savings	($17.7)	+ $4.2	($13.5)
Wind Integration Costs	$29.3	-$14.1	$15.2
SOx Value	($0.4)		($0.4)
Total	**$5.4**		**($4.5)**

Q. MR. HAEGER PRESENTED A RANGE OF REASONABLE COST ESTIMATES FOR THE PRAIRIE ROSE PROJECT. HOW DOES YOUR UPDATED STRATEGIST ANALYSIS COMPARE?

A. Our results are largely the same, with one exception. The Strategist analysis does not include a value for renewable energy credit (REC) sales. While it is understood that RECs allocated to North Dakota will be sold for the benefit of North Dakota customers at some point in the future, a majority of Prairie Rose wind RECs will be allocated to other states and retired for renewable energy standard compliance. Therefore, in Strategist we typically do not include the impact of REC sales. However, given Mr. Hahn's suggestion that the Company monetize the RECs accrued to our North Dakota customers, I believe it is appropriate to include some measurement of REC value in the modeling assumptions we use for the PRW PPA. As described in Mr. Haeger's Rebuttal Testimony, using very conservative REC pricing significantly increases the benefits of the Prairie Rose project.

Q. MR. HAHN CONTENDS THAT THE NATURAL GAS PRICING ASSUMPTIONS IN THE STRATEGIST MODEL SHOULD BE THOSE IN EFFECT WHEN THE ADVANCE DETERMINATION OF PRUDENCE (ADP) APPLICATION WAS FILED. HAVE YOU ADJUSTED YOUR MODEL TO ACCOUNT FOR THIS SUGGESTION?

A. No. Our model is intended to represent the factors in place at the time the decision was made to enter into the Prairie Rose PPA. The type of update suggested by Mr. Hahn is only plausible when you have the benefit of 20/20 hind sight. When the wind bids were received in the 2010 RFP, we performed the Strategist analysis with the best information available at the time, which included a blend of natural gas forecasts from three industry-respected consulting firms. Neither the Company nor our consulting firms had foreknowledge that natural gas prices would continue their decline throughout the year.

In addition, regardless of natural gas prices Prairie Rose was the lowest cost project identified among over 100 bids received through the RFP process, and the lowest cost wind project we have seen recently. The project will provide low cost, clean energy and valuable diversification to our energy resource portfolio even if the economic analysis is viewed differently than we propose.

III. NATURAL GAS ALTERNATIVE ANALYSIS

Q. WHAT IS YOUR RESPONSE TO MR. HAHN'S ASSERTION THAT THE CAPACITY CREDIT SHOULD HAVE BEEN REMOVED FROM THE NATURAL GAS ALTERNATIVE ANALYSIS, AND THAT MORE RECENT GAS PRICING ASSUMPTIONS SHOULD HAVE BEEN USED?

A. For the reasons stated previously, we continue to believe that the appropriate modeling approach is to assume a capacity credit beginning in the year 2018 and natural gas pricing as of January 2011 – when the Prairie Rose PPA was executed – for either Strategist or the natural gas alternative analysis.

Q. HOW WOULD THIS POSITION AFFECT YOUR DETERMINATION OF THE REASONABLENESS OF THE PRAIRIE ROSE PROJECT?

A. Because we believe our initial assessment was perhaps overly conservative, we believe the actual PVRR impact of the Prairie Rose PPA is likely to be significantly lower than initially estimated. This provides further support for the prudence of the Prairie Rose PPA.

Q. DO YOU AGREE WITH MR. HAHN'S RECOMMENDATION THAT ONLY THE STRATEGIST ANALYSIS SHOULD BE USED AS A BASIS FOR DETERMINING THE PRUDENCE OF THE PRAIRIE ROSE PPA?

A. No. The natural gas alternative analysis allows us to make a comparison between the Prairie Rose PPA and a conventionally-fueled resource. Such a comparison is important to assess the prudence of the PPA. While Mr. Hahn is correct that, by definition, the range of alternatives depicted by the natural gas alternative analysis is not as comprehensive as the Strategist analysis, the natural gas alternative analysis simply offers an alternative comparison. The natural gas analysis shows that the Prairie Rose PPA is still less costly than the natural gas alternative. In conjunction with Strategist modeling, these results underscore the overall prudence of the Prairie Rose PPA.

IV. CONCLUSION

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. In response to Mr. Hahn's testimony and our own analyses, we have considered the impacts of delaying the impact of the capacity benefit from Prairie Rose and of reduced wind integration costs. I disagree with Mr. Hahn's contention that the natural gas prices used in our analysis and decision to proceed with the PRW project should have been updated retroactively for purposes of determining prudence. Overall, our modeling results are robust and bear out the prudence of the Prairie Rose PPA.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes, it does.

Prairie Rose Capacity | **Capacity Credit**

	Name Plate Capacity (MW)	Accredited Capacity (%)	Accredited Capacity (MW)		Accredited Capacity	Capacity Value ($/kW-mo)	Total Capacity Credit ($000)
2012				2012			
2013	200	12%	24	2013			
2014	200	12%	24	2014			
2015	200	12%	24	2015			
2016	200	12%	24	2016			
2017	200	12%	24	2017			
2018	200	12%	24	2018	-24	$7.37	-$2,123
2019	200	12%	24	2019	-24	$7.52	-$2,165
2020	200	12%	24	2020	-24	$7.67	-$2,208
2021	200	12%	24	2021	-24	$7.82	-$2,251
2022	200	12%	24	2022	-24	$7.97	-$2,296
2023	200	12%	24	2023	-24	$8.13	-$2,341
2024	200	12%	24	2024	-24	$8.29	-$2,387
2025	200	12%	24	2025	-24	$8.45	-$2,434
2026	200	12%	24	2026	-24	$8.61	-$2,481
2027	200	12%	24	2027	-24	$8.78	-$2,529
2028	200	12%	24	2028	-24	$8.95	-$2,578
2029	200	12%	24	2029	-24	$9.12	-$2,628
2030	200	12%	24	2030	-24	$9.30	-$2,679
2031	200	12%	24	2031	-24	$9.48	-$2,731
2032	200	12%	24	2032	-24	$9.67	-$2,784

NPV ($000) -$13,507

7.56% Discount Rate

Aproximate completion of MVP Projects

The price of a CT was based on generic units developed for the 2010 Minnesota Resource Plan. Prices were escalated at 1.9%, the assumed inflation rate.

Original Wind Integration Assumption

	NPV	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
$/MWh		$0.00	$0.00	$2.82	$3.00	$3.19	$3.38	$3.58	$3.78	$3.84	$4.16
GWh		-	-	726	726	726	728	726	726	726	728
Total Cost ($000)	$29,314	$0	$0	$2,047	$2,177	$2,315	$2,459	$2,598	$2,743	$2,787	$3,027

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
$/MWh	$4.22	$4.59	$4.39	$4.58	$4.92	$5.41	$5.82	$6.47	$7.01	$7.18	$7.21	$7.22
GWh	726	726	726	728	726	726	726	728	726	726	726	728
Total Cost ($000)	$3,063	$3,331	$3,186	$3,332	$3,571	$3,926	$4,224	$4,707	$5,088	$5,211	$5,233	$5,253

2006 Wind Integration Adjusted For Gas Assumption & Wind Penetration Assumption

The original wind integration assumption was based on $9/mmBtu gas and a 25% wind penetration level. This section adjusts for gas prices used in the Prairie Rose CON and a 15% wind penetration level which is slightly above the level estimated for Praire Rose Wind.

2006 Wind Integration Study pg 75

	Annual Wind Patterns			
Wind Penetration Levels	2003	2004	2005	Average
15%	$2.97/MWh	$2.56/MWh	$2.11/MWh	**$2.55/MWh**
20%	$4.09/MWh	$2.73/MWh	$2.71/MWh	$3.18/MWh
25%	$4.41/MWh	$2.83/MWh	$2.95/MWh	$3.40/MWh

This is a 2020 value assuming $9/mmbtu gas price.

Ratio Value for 2020 gas price used in Prairie Rose Analysis.

2020 Integration Cost	**$2.55/MWh**	**X**	$7.81	PRW 2020 Gas Price	=	**$2.21/MWh**
			$9.00	2006 Study Assumption		

Apply Updated 2020 Value to Stream of Gas Prices used in PRW Analysis

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
PRW Gas Prices	$4.83	$5.22	$5.77	$6.56	$6.85	$7.00	$7.15	$7.49	$7.81	$8.22	$8.66
Revised Integration Costs	$1.37/MWh	$1.48/MWh	$1.63/MWh	$1.86/MWh	$1.94/MWh	$1.98/MWh	$2.02/MWh	$2.12/MWh	$2.21/MWh	$2.33/MWh	$2.45/MWh
GWh	-	726	726	726	728	726	726	726	728	726	726
Total Cost ($000)	$0	$1,071	$1,183	$1,346	$1,408	$1,436	$1,466	$1,538	$1,608	$1,688	$1,778
NPV	$15,177										

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
PRW Gas Prices	$8.93	$8.88	$9.26	$9.56	$9.80	$10.13	$10.44	$10.78	$11.02	$11.25	
Revised Integration Costs	$2.52/MWh	$2.51/MWh	$2.62/MWh	$2.70/MWh	$2.77/MWh	$2.86/MWh	$2.95/MWh	$3.05/MWh	$3.12/MWh	$3.18/MWh	
GWh	726	728	726	726	726	728	726	726	726	728	
Total Cost ($000)	$1,832	$1,826	$1,900	$1,962	$2,012	$2,084	$2,142	$2,213	$2,261	$2,315	
NPV											