

**Wind/Hydro Feasibility Study (WHFS)
Western Area Power Administration
Project Work Plan
November 5, 2007**

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Introduction

The Energy Policy Act of 2005, Sec. 2606, required a study be performed by the Department of Energy (DOE) involving wind-hydro integration. Western Area Power Administration (Western) was tasked by DOE to perform a study of cost and feasibility to develop a demonstration project that uses wind energy generated on Indian Tribal lands and Federal hydroelectric power generated on the Missouri River to supply firming power to Western to meet its contractual obligations.

EPAct 2005, Sec 2606 Requirements

The Energy Policy Act of 2005 (EPAct 2005), Section 2606 required that the Secretary of Energy perform a study of the cost and feasibility of developing a demonstration project that uses wind generated electrical energy by Indian tribes and hydropower on the Missouri River by the US Army Corps of Engineers to supply firming power to Western.

EPAct 2005 stipulated that the study shall:

- a. Determine the economic and engineering feasibility of blending wind and hydropower generated from the Missouri River dams operated by the Army Corps of Engineers including an assessment of the costs and benefits of blending wind energy and hydropower compared to the current sources used for firming power to Western,
- b. Review historical and projected requirements for, patterns of availability and use of, and reasons for historical patterns concerning the availability of firming power,
- c. Assess the wind energy resource potential on tribal land and projected cost savings through a blend of wind and hydropower over a 30-year period
- d. Determine seasonal capacity needs and associated transmission upgrades for integration of tribal wind generation and identify costs associated with these activities.
- e. Include an independent tribal engineer and a Western customer service representative as study team members, and
- f. Incorporate, to the extent appropriate, the results of the Dakotas Wind Transmission study prepared by Western

EPAct 2005 further requires that the study report shall describe the study results including:

- a. An analysis and comparison of the potential energy cost or benefits to the customers of Western through the use of combined wind and hydropower.
- b. An economic and engineering evaluation of whether a combined wind and hydropower system can reduce reservoir fluctuation, enhance efficient and reliable energy production, and provide Missouri River management flexibility.
- c. If found feasible, recommendations for a demonstration project to be carried out by Western, in partnership with an Indian Tribal government or tribal energy resource development organization, and Western customers to demonstrate the feasibility and potential of using wind energy produced on Indian land to supply firming energy to Western
- d. An identification of :
 1. The economic and environmental costs of, or benefits to be realized through, a Federal-tribal-customer partnership.
 2. The manner in which Federal-tribal-customer partnership could contribute to the energy security of the United States.

Pursuant to the DOE tasking, a Project Team was established that includes participants from affected Federal Agencies and Western customers including Western Tribal customers. On March 12, 2007 Western initiated the development of the project team via formal request to the Tribal Chairperson of each Tribal organization within Western's Upper Great Plains Region (UPGR). Project team members designated to represent non-Tribal customers were identified through coordination with the Mid-West Electric Consumers Association.

The Project Team members currently include:

- Blackfeet Nation – Bozeman, MT
- Ft. Peck Tribal Energy Department – Lakewood,
- Santee Sioux Nation – Niobrara, NE
- Intertribal Council on Utility Policy (ICOUP) – Ft. Pierre, SD
- Midwest Electric Consumers Association - Rushmore Electric Cooperative – Rapid City, SD; Nebraska Public Power District-Columbus, NE; Heartland Rural Electric Cooperative-Girard, KS
- National Renewable Energy Laboratory Denver, CO
- U.S. Army Corps of Engineers – Omaha, NE
- U.S. Bureau of Reclamation
- U.S. Bureau of Indian Affairs
- Western Area Power Administration Upper Great Plains Region

Stanley Consultants, Inc. was selected by Western as the prime contractor to perform the studies to address the DOE tasking under its existing contract. Stanley Consultants will

utilize the services of NewEnergy Associates (NEA) as a major subcontractor to perform the work scope.

It is the purpose of this Project Work Plan to outline the approaches and schedule to be utilized to perform the work scope.

Background

The purpose of the WHFS is to focus on the potential of wind generation to displace energy purchased by Western to supplement available hydro generation to serve contracted requirements and the impact of that generation on UGPR transmission network. The tribal wind energy would be supplied by long term contracts between Western and tribal-owned wind generation for the entire projects' output. Potential impacts to the UPGR grid and Western customers would be studied. Impacts would include those caused by the potential physical interconnection, wind facility operations, and economic costs and benefits to Western customers.

There has been significant study performed over the past few years defining and analyzing the electric generation wind resource. These studies have identified operational and system interactions between wind installations and the general transmission network. Their analysis and results will be used to support and potentially provide specific data to the WHFS analysis.

The significant work to date includes:

- Studies that concerned the general UPGR include:
 - *Final Report – 2006 Minnesota Wind Integration Study: Volumes I and II*, November 30, 2006, Prepared for The Minnesota Public Utilities Commission

This study was performed in response to the May 2005 Minnesota Legislature's requirement to evaluate the impact on electric system reliability and costs associated with increasing wind penetration in electric utilities in Minnesota to twenty (20) percent. Covering the general areas of Minnesota and the eastern parts of North and South Dakota, this study provides background on different levels of wind penetration effects on system generating operations, production costs and reserve margins. It also discusses impacts on the transmission grid in this area. Although not specifically addressing the Western UPGR, it does provide a review of the issues associated with significant wind penetrations on the displacement of coal and gas fired generation which have similar costs to those that Western may have historically purchased along with highlighting operational requirements.

- *Draft Report: WAPA Missouri River Wind Integration Study, August 4, 2006, Prepared for The National Renewable Energy Laboratory*

This study focused on the impacts of a wind generation scenario on Western hydroelectric operations for the 2003 calendar year. The study provides data and analysis of potential overall Western responses to different wind penetration level in the Dakotas. The results will provide supporting data to operational characteristics.

- *Dakota Wind Transmission Study – Task 1: Non-Firm Transmission Potential to Deliver Wind Generation; Task 2 Final Report: Transmission Technologies to Increase Power Transfer; and Tasks 3 and 4 Draft Report: System Impact Study and Transfer Capability Study Prepared for the Western Area Power Administration In 2005*

This study reviewed the impacts of the insertion of 500MW of wind turbines into the electric transmission grid at various locations throughout North and South Dakota. The studies provided a detailed analysis of transmission grid impacts including power flows, short circuit, and transient stability considerations. The report provides a significant data resource for quantifying transmission response to wind energy operations on the transmission grid.

- Other studies of interest would include the *Northwest Wind Integration Action Plan*, pre-publication dated March 2007 provides a discussion of an approach that one geographic region is taking to the integration of wind energy sources into the overall regional electric system. The report highlights potential issues that may also need to be addressed by a demonstration project in Western UGPR.

Study Approach

The WHFS Project Team has met on two occasions to address the completion of this project. On May 2, 2007, the Team met via conference call to discuss the overall scope of the WHFS study as outlined in EPAct 2005 Section 2606 and the role of the Team members. The identification of potential tribal projects and the development of the Work Plan was also reviewed.

The Project Team then met on June 1, 2007, in Rapid City, SD, to develop an overall project approach as well as to identify specific needs or issues of the participating project team members. The Project Team identified several key components that translate into the overall WHFS approach:

- The WHFS will concentrate on wind energy delivered to UGPR customers

- Indian Nation wind energy will be used to displace purchases that Western would historically have made to replace energy requirements that were not served by hydro-generation
- The WHFS will address the operating recommendations as previously identified in previous studies listed above
- The potential impacts will be based on candidate demonstration projects identified on tribal lands that would meet the aggregated historical Western needs as selected from candidates' responses to a questionnaire to be developed by the project
- There will be Project Team technical reviews at various identified stages of the project
- The transmission analysis will incorporate Western's already identified network additions

The WHFS project will address the EPAct 2005 requirements through a series of Work Elements described below and referenced in Chart 1. Each Work Element will include written summaries for input into the concluding report.

- **Work Element 1 – WHFS Work Plan**

This WHFS Work Plan was developed to communicate the approach to the WHFS Project Team and the general public. The DRAFT Work Plan was submitted for WHFS Project Team review and comment and updated as agreed and distributed through Western for public comment. One public meeting was held in Bismarck, ND on September 27, 2007. This Work Plan was prepared considering all comments received.

- **Work Element 2 - Analysis of Historical Western Purchase Requirements**

Data will be requested from Western that describes the historical requirements and cost for additional energy required to meet obligations. From this historical cost and load data, an effective minimum and maximum potential for capacity and energy replacement will be developed.

The data required will include but is not limited to:

- Contractual requirements including, but not limited to:
 - Customer list with maximum capacity obligations
 - Historical hourly load obligations by control area or smaller geographical area if constrained (ie, North of NDEX, etc).
- Actual energy purchased and generated
- Losses and actual system deliveries
- Historical water availability and forecasts
- Excess sales including energy and revenues
- Historical, current, and projected reserve requirements
- Transmission analytical models

- Organizational and institutional operating requirements
- Current operational procedures
- Forecasted water availability for generation
- Historical and Projected Purchase Power Costs
- Historical Hourly DC Tie flows
- Historical Hourly Hydro Generation by Unit and/or Plant
- Duplicate Hourly Wind Project Input to UGPR Transmission System by Project and Geographical Locations

The historical data will form the basis for a multi-year operational model that reflects historical Western operations. These historical operations will be used to estimate an effective amount of capacity and energy available for tribal wind energy projects.

Work Element 3 – Wind Project Identification

Work Element 3 provides the selection of the representative sample project identification and the requirements for wind projects to meet.

- **Questionnaire Development**

A questionnaire (Appendix A) has been developed to provide information on proposed projects for use in selection to demonstrate potential costs and benefits associated with the use of wind power to displace purchased energy. The draft questionnaire requests data required to support Work Element 3 along with characteristics that may be identified in Work Element 2 as required of tribal wind energy. The questionnaire will be provided as requested to potential wind projects for their consideration and completion.

- **Wind Project Review and Identification**

Completed questionnaires submitted by candidate wind projects will be reviewed and projects selected for further review. Potential wind projects will be selected based on the completeness and comprehensiveness of data provided to support the Work Element 5 scope and the stage of actual project development. The selection of the sample projects to demonstrate the operation and interactions with the UGPR will be based on the results of Work Element 2 requirements and potential project data that support the analysis.

The projects submitted by the tribes combined with the historical and projected Western energy requirements will form the basis of the maximum utilizable wind energy to meet Western firm power obligations.

- **Work Element 4 – Transmission System Evaluation**

The tribal wind energy projects selected in Work Element 3 will be used to evaluate UGPR potential transmission system impacts. Note that any sample project used for this analysis will be subject to the Western OATT process and therefore will require formal Feasibility, System Impact and Facility Studies be performed at a later date for wind project Interconnection and Network Service as with any other generation project.

The base transmission system will reflect the transmission improvements in the grid as identified by Western for the study period. Existing Western transmission studies will reflect the currently projected transmission operating characteristics.

Estimates of required sample wind project physical interconnection requirements will be determined based on similar wind projects and transmission reliability standards. Work Element 4 will identify potential UGPR system impacts initially based on previous wind-transmission system network studies listed above. Augmentation of available transmission impacts along with the need for additional specific load flow, short circuit, and stability analysis will be identified and reviewed with the WHFS Project Team prior to any execution.

- **Work Element 5 – Assessment of UGPR Impacts**

Work Element 5 will concentrate on the impacts on Western total net production costs over the study period. The PROMOD IV software will be used to model system operations and loads based on agreed water forecasts and wind project energy projections using hour-by-hour simulation. Water forecasts will be agreed with Western planners for the entire simulation period. Similarly, wind energy forecasts will be either supplied by the potential project or agreed with the selected project(s) based on mesoscale modeling.

The study performed will have two major components; long term economics and operational feasibility. The long term economics of replacing Western's current purchased power are driven mainly by the market price of energy given that Western buys a majority of its supplemental energy from the spot market and has no long term contracts in place for that energy. For this portion of the study, a 30 year zonal analysis of the MAPP energy prices will be performed. Under that approach, transmission constraints are reflected between zones, but detailed transmission operations are not modeled.

The operational feasibility portion of the study will be performed in more detail, but over a shorter time frame. Utilizing PROMOD IV security constrained economic dispatch (or nodal) modeling capabilities, the effects of detailed transmission constraints resulting from the inclusion of tribal wind energy in the Western portfolio will be captured.

Three major cases will be evaluated using the following approach:

- **Base Case Zonal Study** – This case will represent a 30-year outlook designed to measure Western’s power supply costs, and to reflect the long-term economic impacts associated with integrating energy from wind projects being developed by the Indian Nations. A base case will be prepared to specify Western load requirements, supply, hydroelectric energy and fuel price forecasts in the upper Midwest/MAPP region, in addition to other key fundamental study assumptions. This will include the sample wind projects in the UGPR system over the study period, as determined through the Work Element 3 process. Simulations will be completed both with and without the sample wind projects included, with the latter case being used to establish a baseline set of projections to be used as comparison in evaluating the impacts of integrating energy from those projects.

Specific steps will include:

- Updating the existing databases to reflect current load/supply/hydroelectric energy/fuel price forecasts in upper Midwest/MAPP region
 - Meet with WHFS Project Team to:
 - Finalize the case list
 - Present basic assumptions including proposed 30-year expansion plan
 - Specify basic wind project data from the data collection, project screening, mesoscale modeling results
 - Set any revisions to basic assumptions using WHFS Project Team's feedback
 - Complete Base Case zonal modeling for 30-year study period - with and without new wind capacity
 - Present Base Case zonal results to WHFS Project Team
-
- **Wind/Hydro Scenarios - Zonal Study** – This step will complete additional PROMOD IV zonal modeling. The specific modeling will be designed to measure the impact of wind integration on the UGPR system, under a variety of hydroelectric conditions, and based on differing levels of wind penetration. As such, additional simulations will be completed where the amount of expected hydroelectric energy is varied to reflect wet-year and dry-year conditions. The specific hydro conditions reflected in the scenarios will be derived based upon Western’s historical data provided under Work Element 2, and after seeking feedback from the WHFS Project Team. Varying wind energy penetration will also be reflected in these scenarios. The goal of these scenarios is to provide robust measurement of the economic impacts on Western’s system arising from integration of greater amounts of wind generation, under varying

hydro conditions. Capacity value of wind will be incorporated as appropriate, based on current research and system practices.

Execution steps will include:

- Specify Increased Wind Penetration Scenario, based on Tier 2 and Tier 3 ranked wind projects
- Specify two (2) discrete wind/hydro sensitivity cases based on mesoscale modeling data
- Complete PROMOD IV scenario modeling of both Base and Increased Wind Penetration scenarios, for each of the wind/hydro cases over the 30-year study period.
- Present Scenario case results to WHFS Project Team

Base and Scenario Case Detailed Operational Nodal Study – PROMOD IV simulations of the base case and scenario cases will be performed using detailed transmission modeling and PROMOD IV's security constrained economic dispatch capabilities. The primary goal will be to evaluate how additional injections of wind energy into the UGPR affect overall system operations and transmission constraints. A single year 2011 is proposed for this study and to complete detailed transmission modeling of previous cases for that year. 2011 was selected as it is the year in which the wind projects are likely to be online and is available as a transmission model from industry data. It will be important to model the transmission and generation systems as they are expected to exist when the projects are operational. Hourly analysis will be used.

Results from these cases will be used to assess whether wind integration into Western's system has any favorable or adverse impacts upon system operations and upon transmission constraints on that system.

Included in the analysis for 2011 will be:

- Completion of the nodal MAPP study based on base case conditions with and without new wind projects
- Complete nodal MAPP study based on 2011 base case conditions, plus two wind/hydro sensitivity cases
- Complete nodal MAPP study based on High Wind Penetration conditions
- Complete nodal MAPP study based on the 2011 high wind penetration conditions, plus two wind/hydro sensitivity cases
- Present Nodal case results to WHFS Project Team

The above thirty-year production cost simulations combined with amortized transmission and capacity costs will form the basis of the 30 year present worth costs. Differences between base simulation and simulation incorporating wind projects will form the components of the cost-benefit computations.

- **Work Element 6 – Draft and Final Report Preparation**

A draft report will be prepared for review with the WHFS Project Team that incorporates the summaries developed in each Work Element. A final report will be prepared utilizing agreed WHFS Project Team comments.

Specific topics to be addressed in the WHFS report include:

- Comparison of the potential energy cost or benefits to the customers of Western through the use of combined wind and hydropower.
- Description of the economics and engineering/operational characteristics of the combined wind and hydropower system on Western's UPGR including potential reductions of reservoir fluctuation, impacts on the efficiency and reliable energy production for Western customers, and identified Missouri River management flexibility.
- Recommendations for and general criteria for a project to be carried out by Western, in partnership with an Indian Tribal government or tribal energy resource development organization to demonstrate the feasibility and potential of using wind energy produced on Indian land to supply firming energy to Western
- Discussion of identified economic and environmental costs of, or benefits to be realized through, a Federal-tribal-customer partnership
- Description of the manner in which Federal-tribal-customer partnership could contribute to the energy security of the United States.

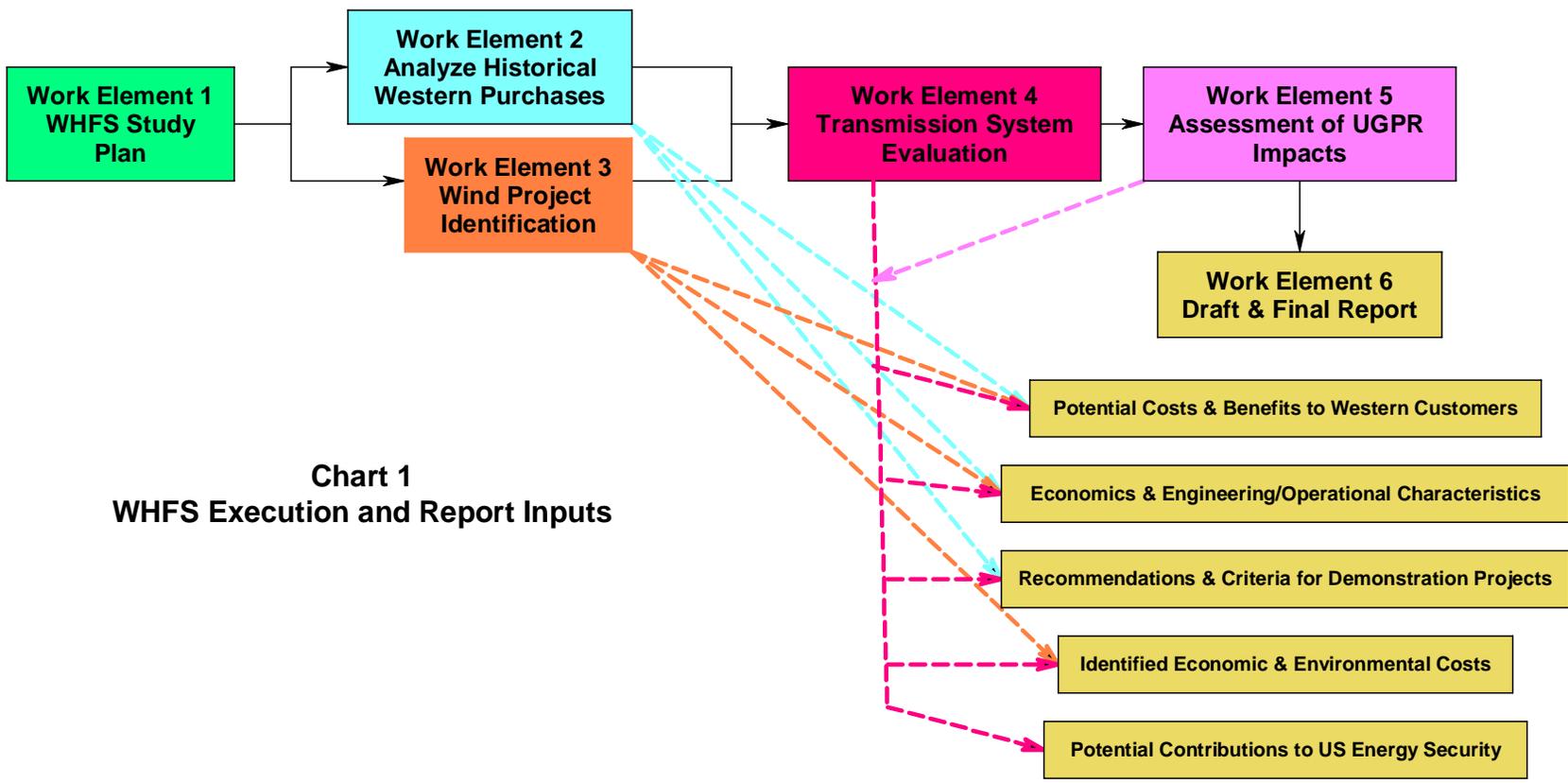


Chart 1
WHFS Execution and Report Inputs

APPENDIX A
RESPONSE TO COMMENTS

The following comments were discussed:

Action Codes: A-Agree Change will be made D-Discussion point only; no change to Work Plan O-Other action will be taken			
Comment No.	Reference	Comment	Review Action
1	Introduction	The Project Team has expanded to include MidWest Electricity Consumers Association; Will team be voting?-All members will be kept informed and have an opportunity to review materials at appropriate intervals	A-Modify Work Plan to reflect new members
2	Background	Replace term “displacement energy” with something more descriptive-supplemental rejected since it already has a specific meaning within the system.	A-Replace “displacement energy” with “tribal wind energy”
3	Study Approach	Question referring to...address the operating recommendations-important to this project— will be discussed further in Work Element 5, i.e., sub hourly	A – Although not specifically addressed in the Work Plan, the need for sub-hourly analysis will be addressed based on the Work Elements 2, 4, and 5 and capacity level based on industry research.
4	Work Element 1	One public meeting to be held in Bismarck, ND, with an information session in the morning immediately followed by public comment forum.	A-A public meeting was held in Bismarck, ND, on September 27, 2007.
5	Work Element 2	Question regarding the phrase...Transmission analytical models	D-Refers to the models used for transmission planning purposes by Western
6		Question referring to...Historical hourly DC tie flows	D – Refers to Ft. Peck generation—the portion of energy generated on the Western portion of the grid that is transferred to the Eastern grid—the information on this transfer of power will be used to schedule power in the future-this will provide more background data than direct impact
7		Question referring to...Duplicate hourly wind project input...question duplicate—referring to wind in system behind the meter	A-Replace “duplicate” with “existing”
8		What is “take away” from historical analysis?	D - To establish Western’s energy purchase needs to provide baseline data to integrate wind into the system under the legislation
9		Discussion regarding the analysis of sufficient levels of total wind generation to yield meaningful results	A – The level of wind usage is a function of actual historical purchase patterns which will be established during Work Element 2.
10	Work Element 3	Questionnaire Development	D – A draft questionnaire from Tom Wind and Mike Costanti was submitted to Mike Radecki
11		Wind Project Review and Identification	A- Information from the questionnaires on the proposed wind projects will determine parameters of demonstration project-the more developed the research in the responses, the higher priority for the project
12		Question regarding release of proprietary information regarding Tribal projects	D - Tribes certainly have the right to with hold proprietary information regarding the development of projects. The impact of incomplete or missing information is unclear at this time; missing information could result in the inability to provide a complete assessment of the cost/benefit and viability of wind integration.
13		Comment regarding amount of wind to be evaluated under this study and any demonstration project should be of a meaningful value; integrating a few MW wouldn’t impact the system-rather, this study should adopt an integration percentage of 10-15% with an ultimate goal of 15-25%	D - Participants generally agreed that any recommendation for a demonstration project should be of sufficient size to provide meaningful information resulting from that integration. Following the requirements of Sec. 2606, the amount of wind identified will be related to the amount that could be integrated for Western’s use in meeting its firm power obligations. Establishing an integration percentage at this point would be premature. A demonstration project recommendation will be sent to Congress for action; there may be a low, medium and high option utilizing more than one project. Although the Dakotas Wind Study indicated that the transmission system could convey up to 500MW on a non-firm basis 95% of time which would represent approximately 25% penetration, this study will address the amount of wind that Western can utilize based upon historical purchase patterns in Work Element 2.
14		Question regarding production tax credits	D - The questionnaire will include a section to describe partnership arrangements that could be part

			<i>of a demonstration project such as allowing PTCs to be used.</i>
15	Work Element 4	Comment regarding transmission system study should include a “full integration of tribal wind power assuming” various hydrologic years	<i>D - Work Element 2 utilizes historic lows and highs to define the minimum and maximum hydro generation. Work Element 3 identifies total potential tribal generation. Work Element 4 synthesizes this information and refines the potential impact on the transmission system.</i>
16		Question regarding Large Generator Interconnect Agreement process	<i>D - This will be responsibility of demonstration project team; basic feasibility of interconnect will be part of demonstration project</i>
17		Comment made that distribution system impact will need to be determined for each project as well as transmission system impacts	<i>D – Western is responsible for its transmission system. It is unclear at this point in time as to whether or not there are distribution systems involved in specific projects.</i>
18		Question regarding use of previous wind transmission system network studies	<i>D - These will be used in addition to a review of current models to evaluate feasibility of project submittals</i>
19	Work Element 5	Question regarding inter-annual variation of water availability and its affect on the hydro – wind coordination	<i>D – Projected water variation will be based on available forecasting from the US Corps of Engineers and reflected against the operations as dictated by the Master Manual</i>
20		Question regarding the impact of wind-energy availability on water use optimization of Missouri River	<i>D – Water usage is regulated by the Master Manual</i>
21		Question regarding the effects of short-term hydro generation fluctuations arising from coordination with wind generation	<i>D – Hydro operations are constrained by existing contracts and Master Manual operating rules</i>
22		Question on impacts of hydro and river constraints on wind penetration and value	<i>D – Wind requirements will be computed in Work Element 2. See also responses to Comments 19 - 21</i>
23		Question regarding Zonal analysis and approach	<i>D – Approach includes a broad overview (30 years) of projected costs/savings for blended wind/hydro and includes a simplified determination of value costs of offsets and purchases. The nodal study has full representation of the transmission and generation systems.</i>
24		Discussion regarding sub-hourly modeling	<i>D – Previous studies have indicated that large penetrations of a size greater than the projected demonstration project are required for sub-hourly effects to be of concern. The need for sub-hourly analysis will be determined based on the actual recommended levels of wind integration. In addition, 15 minute interval wind output data is available for existing projects that will be reviewed for possible trends. Also, it is assumed that adequate wind forecasting should minimize wind project forced outage rates.</i>
25		Question regarding development of statement of work for mesoscale modeling	<i>D - Should a SOW for mesoscale modeling be required, the WHFS project team would have the opportunity to provide input</i>
26	Work Element 6	Question about ...Recommendations for and general criteria for a project...singular form	<i>D - Wording taken directly from the legislation</i>
27	Other	A comment was made that FreedomWorks, LLC is an organization that exists in the Western United States	<i>D - The comment regards issues and organizations outside the scope of the WHFS</i>

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Mid-West Electric Consumers Association

October 19, 2007

Mr. Robert Harris
Regional Manager
Upper Great Plains Region
Western Area Power Administration
2900 4th Avenue, North
Billings, MT 59101-1266

Dear Mr. Harris,

The Mid-West Electric Consumers Association appreciates the opportunity to comment on the Western Area Power Administration's ("Western") Draft Wind/Hydro Feasibility Study (WHFS) Project Work Plan, pursuant to Western's September 19, 2007 Federal Register notice.

The Mid-West Electric Consumers Association was founded in 1958 as the regional coalition of over 300 consumer-owned utilities (rural electric cooperatives, public power districts, and municipal electric utilities) that purchase hydropower generated at federal multi-purpose projects in the Missouri River basin under the Pick-Sloan Missouri Basin Program.

The Wind/Hydro Integration Feasibility Study (WHFS) is mandated by the Energy Policy Act of 2005 (EPAAct2005). The instructions for the study, frankly, do not make sense. The legislative language seeks to explore "the economic and engineering feasibility of blending wind energy and hydropower generated from the Missouri River dams . . . including an assessment of the costs and benefits of blending wind energy and hydropower compared to current sources used for firming power to the Western Area Power Administration . . ."

All of the marketable hydropower in the Pick-Sloan Missouri Basin Program has been allocated to preference customers, including Native American Tribes. So, the only hydropower available for this "blending" would be the allocation of a tribe seeking to integrate its wind resource. EPAAct2005 does permit the tribes to use their allocation for this purpose. Is that Pick-Sloan allocation sufficient to meet the engineering requirements of the blending of hydropower and wind energy envisioned by the study?

As indicated in the statute and as utilized in the Wind/Hydro Integration Feasibility Study (WHFS) approach, the term “firming” refers to purchases required by Western to meet Western’s current long term allocation commitments. The term “blending” is equivalent to integrating wind into the hydro generation along with other purchased generation to provide enough generation to meet these long term allocation commitments. The WHFS plan does not include the incorporation of Tribal wind energy that is firmed with Tribal hydropower allocations, as such the WHFS approach does not impact any specific allocation.

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It is not at all clear how using federal hydropower generation to firm Native American wind development will be able to then be used to firm the hydropower Western markets under the Pick-Sloan Missouri Basin Program. If this means that Western will be selling federal hydropower at cost-based rates and then re-buying a mix of wind and federally generated hydropower at market rates, the economics would clearly discriminate against Western’s firm power customers.

The WHFS approach does not “firm Native American Wind energy.” This project will only recommend whether or not to run a demonstration project using some level of intermittent, non-firm Tribal Wind energy as part of the existing purchases made by Western to meet current allocation commitments.

The modeling that the study proposes must be conducted for a variety of hydrology conditions in the basin – both good water and bad. The study must address that range of generation scenarios in determining the amount of renewables that Western could purchase.

There are high and low water scenarios built into the production model analysis specifically in Work Element #5 (Wind/Hydro Scenarios-Zonal Study) . The evaluation of multiple hydrologic conditions is expected to result in an appropriate integration level for tribal wind energy as supported by the accompanying economic analysis demonstrating mutual benefit.

Western’s marketing of federal hydropower surpluses is an important piece of the financial structure of Pick-Sloan. In no event should Western eschew marketing federal hydropower generation and be marketing customer wind resources instead.

The amount of wind will be determined by the sustainable minimum/maximum amount of purchases in the system given high and low water conditions. This amount is being carefully determined, so as not to overlap with available hydro generation. Additionally, the ability to market excess hydro generation and concurrent excess wind generation will factor into the determination of an appropriate level of wind

integration. Work Element #2 addresses this issue. Should this effort eventually proceed to a demonstration project, criteria will need to be determined at that time how excess generation would be marketed so as to not negatively impact existing firm power customers and still provide mutual benefits.

The U.S. Army Corps of Engineers (“Corps”) determines generation at the Pick-Sloan Missouri Basin Program main stem dams. The WHFS study must assess wind generation on a finer scale than hour to hour generation patterns. The WHFS study must also address the ability to integrate wind generation as a result of sudden changes in hydropower generation. Downstream precipitation can force the Corps will make rapid adjustments in generation to avoid downstream flooding. How will the study address this sort of scenario?

Hydro operational considerations will be part of the analysis and is included in Work Element #5. An appropriate generation pattern scale will be used to meet the established objectives of study.

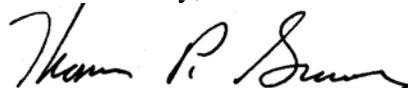
The WHFS study appears not to recognize statutory limitations on the marketing of federal hydropower by firm power customers. The statutes and regulations surrounding the federal power program have been developed over many years and cannot be brushed aside in seeking to accommodate new missions for Western. To do so could divide Western’s Pick-Sloan customers and threaten the viability of the Pick-Sloan Missouri Basin Program.

The WHFS approach has not identified any statutory limitations that may preclude a recommendation for a demonstration project. Western’s statutory requirements would be considered as appropriate in any recommendations from this WHFS.

Mid-West recognizes Western’s trust responsibility to Native American tribes. Under the Energy Planning and Management Program (EPAMP), Western has already provided additional allocations to Pick-Sloan tribes – an opportunity specifically prohibited for other Pick-Sloan customers. Western cannot and should not meet what it may consider trust responsibilities at the expense of its other firm power customers.

The Congressionally directed WHFS will assess three primary objectives; physical integration, operational integration and the economics associated with integration of Tribal wind energy. We believe any recommendation for a demonstration project would only be feasible if the WHFS supported favorable energy costs and or benefits to the customers of Western.

Sincerely,



Thomas P. Graves
Executive Director

APPENDIX B—WRITTEN COMMENTS

From: Matt Schuenger [mattschuenger@earthlink.net]
Sent: Friday, August 17, 2007 7:52 AM
To: 'Michael Radecki'
Cc: 'Brian Parsons'; 'Bradley Nickell'
Subject: Follow-up Comments RE: Conference Call Agenda Aug 9 07 12:00 Mountain / 1:00 Central
Good morning Mike,

As you requested at the end of the WHFS conference call on August 9th, I have outlined brief follow-up comments below which cover the questions and concerns that I raised during the call regarding the Draft Work Plan (Preliminary – July 11, 2007).

Key Recommendations – WHFS Draft Work Plan

1) Analyze Sufficient Levels of Total Wind Generation to Yield Meaningful Results

The Section 2606 legislative language articulates a clear intent to analytically explore the potential technical and economic benefits of blending wind generation and Missouri River hydropower. These benefits arise from mitigation of potential system operating cost impacts due to the variability and uncertainty of wind generation. A number of recent studies have demonstrated that such operating and cost impacts are unlikely to be significant at wind penetrations up to 20% of system peak demand. For the Western Area Power Administration's Upper Great Plains region (approximately 3,500 MW control area load including approximately 2,000 MW of Western peak load), this threshold requires study of at least 400 MW of total wind generation.

I recommend study of wind generation penetration levels of 20%, 30%, and 40% of Western system peak demand, corresponding to approximately 400 MW, 600 MW, and 800 MW of total wind generation (tribal and non-tribal wind within the control area).

2) Analyze Sub-Hourly Operating Impacts Using the Current Best Practices

It's important to use the current best practices for the study of operating impacts of wind generation. Generally, these best practices include:

- Capture system characteristics and response through operational simulations and modeling – this should include high quality modeling of the hydro system and it's capabilities in the relevant time frames.

- Develop and use multiple years of synthetic wind plant output time series data (based on large-scale meteorological modeling) , synchronized with load data for the same time period
- Capture wind deployment scenario geographic diversity through the synchronized weather simulation
- Couple with actual historic utility load and load forecasts
- Use actual large wind farm power statistical data for short-term regulation and ramping
- Examine wind variation in combination with load variations and hydro system capabilities
- Utilize wind forecasting best practice and combine wind forecast errors with load forecast errors
- Examine actual costs independent of tariff design structure

Please call me with any questions.

Thank you,

Matt Schuerger

From: Michael Radecki [mailto:Radecki@wapa.gov]

Sent: Friday, July 27, 2007 2:59 PM

To: Pat Spears; Tom Weaver; Karl Wunderlich; Matt Schuerger; Paulette Schaeffer; Warren Mackey; Mike Costanti; Brian Parsons; Jody S NWD02 Farhat; Trevor R NWO McDonald; Vic Simmons; FarrarRobert@stanleygroup.com; Robert Rusch; James Haigh; Walter Whitetail Feather; Bill Schumacher

Cc: Bob Gough; Tom Wind; Steve Wegman; Douglas Hellekson; Mark Messerli; Bradley Nickell; Stephen Tromly; Ed Weber

Subject: Conference Call Agenda Aug 9 07 12:00 Mountain / 1:00 Central

All,

Agenda for the August 9 conference call..

Please let me know if you have any questions.

Michael Radecki
Energy Services Specialist
Western Area Power Administration
Code 6210.BL
406-247-7442
FAX 406-247-7408
Radecki@wapa.gov

From: Matt Schuerger [mailto:mattschuerger@earthlink.net]

Sent: Monday, October 08, 2007 7:26 AM

To: 'Michael Radecki'

Cc: 'Tom Wind'; 'John Richards'; 'Steve Wegman'; 'Douglas Hellekson'; 'Mark Messerli'; 'Bradley Nickell'; 'Stephen Tromly'; 'Ed Weber'; 'Tom Weaver'; 'Karl Wunderlich'; 'Matt Schuerger'; 'Bob Gough'; 'Pat Spears alt'; 'Paulette Schaeffer'; 'Warren Mackey'; 'Mike McDowell'; 'Mike Costanti'; 'Dave Rich'; 'Brian Parsons'; 'Jody S NWD02 Farhat'; 'Trevor R NWO McDonald'; 'Vic Simmons'; Farrar, Robert; Rusch, Robert; 'James Haigh'; 'Walter Whitetail Feather'; 'Bill Schumacher'; 'Corbus, David'

Subject: RE: Work Plan Status ? -- WHFS

Good morning Mike,

I have received no response to the comments that I submitted to you on August 17th (attached).

How will Project Team comments be combined with public input and Federal Register comments (due Oct 19?) to develop the final work plan?

Please provide an update on the current status of the work plan and the process and schedule going forward.

Thank you,

Matt Schuerger

Matthew J. Schuerger, P.E.
Energy Systems Consulting, LLC
mattschuerger@earthlink.net
651-699-4971 (office)
651-231-1270 (cell)

From: DKates [dkates@sonic.net]
Sent: Friday, September 21, 2007 8:38 AM
To: UGPWindHydroFS@wapa.gov
Cc: 'Rex Wait (Rex Wait)'; 'Rob Bakondy'; 'Peter Lewandowski'; arlin.travis@morganstanley.com
Subject: Wind Hydropower Integration Feasibility Study
Please add me to the distribution list for the referenced study, and provide me with a copy of the study work plan.

Thank you very much. Please let me know if you have any questions.

David Kates
[The Nevada Hydro Company](#)
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403
Telephone: (707) 570-1866
Fax: (707) 570-1867



Mid-West Electric Consumers Association

October 19, 2007

Mr. Robert Harris
Regional Manager
Upper Great Plains Region
Western Area Power Administration
2900 4th Avenue, North
Billings, MT 59101-1266

Dear Mr. Harris,

The Mid-West Electric Consumers Association appreciates the opportunity to comment on the Western Area Power Administration's ("Western") Draft Wind/Hydro Feasibility Study (WHFS) Project Work Plan, pursuant to Western's September 19, 2007 Federal Register notice.

The Mid-West Electric Consumers Association was founded in 1958 as the regional coalition of over 300 consumer-owned utilities (rural electric cooperatives, public power districts, and municipal electric utilities) that purchase hydropower generated at federal multi-purpose projects in the Missouri River basin under the Pick-Sloan Missouri Basin Program.

The Wind/Hydro Integration Feasibility Study (WHFS) is mandated by the Energy Policy Act of 2005 (EPAAct2005). The instructions for the study, frankly, do not make sense. The legislative language seeks to explore "the economic and engineering feasibility of blending wind energy and hydropower generated from the Missouri River dams . . . including an assessment of the costs and benefits of blending wind energy and hydropower compared to current sources used for firming power to the Western Area Power Administration . . ."

All of the marketable hydropower in the Pick-Sloan Missouri Basin Program has been allocated to preference customers, including Native American Tribes. So, the only hydropower available for this "blending" would be the allocation of a tribe seeking to integrate its wind resource. EPAAct2005 does permit the tribes to use their allocation for this purpose. Is that Pick-Sloan allocation sufficient to meet the engineering requirements of the blending of hydropower and wind energy envisioned by the study?

4350 Wadsworth Blvd., Suite 330, Wheat Ridge, CO 80033

Tel: (303) 463-4979 Fax: (303) 463-8876

It is not at all clear how using federal hydropower generation to firm Native American wind development will be able to then be used to firm the hydropower Western markets under the Pick-Sloan Missouri Basin Program. If this means that Western will be selling federal hydropower at cost-based rates and then re-buying a mix of wind and federally generated hydropower at market rates, the economics would clearly discriminate against Western's firm power customers.

The modeling that the study proposes must be conducted for a variety of hydrology conditions in the basin – both good water and bad. The study must address that range of generation scenarios in determining the amount of renewables that Western could purchase.

Western's marketing of federal hydropower surpluses is an important piece of the financial structure of Pick-Sloan. In no event should Western eschew marketing federal hydropower generation and be marketing customer wind resources instead.

The U.S. Army Corps of Engineers ("Corps") determines generation at the Pick-Sloan Missouri Basin Program main stem dams. The WHFS study must assess wind generation on a finer scale than hour to hour generation patterns. The WHFS study must also address the ability to integrate wind generation as a result of sudden changes in hydropower generation. Downstream precipitation can force the Corps will make rapid adjustments in generation to avoid downstream flooding. How will the study address this sort of scenario?

The WHFS study appears not to recognize statutory limitations on the marketing of federal hydropower by firm power customers. The statutes and regulations surrounding the federal power program have been developed over many years and cannot be brushed aside in seeking to accommodate new missions for Western. To do so could divide Western's Pick-Sloan customers and threaten the viability of the Pick-Sloan Missouri Basin Program.

Mid-West recognizes Western's trust responsibility to Native American tribes. Under the Energy Planning and Management Program (EPAMP), Western has already provided additional allocations to Pick-Sloan tribes – an opportunity specifically prohibited for other Pick-Sloan customers. Western cannot and should not meet what it may consider trust responsibilities at the expense of its other firm power customers.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas P. Graves". The signature is fluid and cursive, with the first name "Thomas" being the most prominent part.

Thomas P. Graves
Executive Director

From: Tim Williamson [TimWilliamson@frontiernet.net]
Sent: Friday, October 19, 2007 6:35 PM
To: UGPWindHydroFS@wapa.gov
Subject: Response to Request for Public Comment

Dear Upper Great Plains Wind/Hydro Feasibility Study,

FreedomWorks, LLC provides the following response to Feasibility Study Request for Public Comment:

Existing generation capacity exists in Montana to replenish WAPA capacity losses as a result of last seven years drought.

Request consideration of alternate wind energy solution with small business FreedomWorks, LLC to maximum Northwestern Energy eastbound ATC available at Crossover, MT, to augment existing hydropower provided by Yellowknife Power Plant. FreedomWorks, LLC requests accommodation within in the WAPA Wind/Hydro Feasibility Study for the express purpose of providing 800 MW renewable wind energy power generation, on near short term contract basis to Western Federal Power Loads in response to EPACT 2005, E.O. 13423 and pending energy policy act of 2008.

FreedomWorks proposes to provide 2,926,000 MWh annual generation capacity to WAPA, on short term PPA, to bridge current western drought and duration necessary to accomplish MSTI, MATL and BPA congestion resolution installation(s). Upon accomplishment of these projects, FreedomWorks shall shift proposed short term Western PPA to MSTI, MATL and BPA power loads as capacity becomes available. The intent of this comment is to request consideration of a non-tribal, corporate American small business wind renewable energy solution, until tribal wind becomes viable.

Tim Williamson

FreedomWorks, LLC

525 Wren Lane

Harpers Ferry, WV 25425

Tel: (304) 728-7951

Fax: (304) 728-7951

Mobile: (202) 369-6324

From: Tim Williamson [TimWilliamson@frontiernet.net]
Sent: Saturday, October 20, 2007 5:41 AM
To: UGPWindHydroFS@wapa.gov
Subject: RE: Response to Request for Public Comment

All,

Please note a correction reference to Yellowtail Power Plant, in lieu of previously provided Yellowknife Power Plant.

Tim Williamson

FreedomWorks, LLC

525 Wren Lane

Harpers Ferry, WV 25425

Tel: (304) 728-7951

Fax: (304) 728-7951

Mobile: (202) 369-6324

Please see WHFS webpage at

<http://www.wapa.gov/UGP/PowerMarketing/WindHydro/Default.htm>

for meeting minutes (including public comments) of the September 27, 2007 Public Meeting.

APPENDIX C—WIND DEMONSTRATION PROJECT QUESTIONNAIRE

Wind Demonstration Project Questionnaire
EPAct 2005, Title XXVI, Section 2606

Date of Issue: _____ **Date of Return:** _____

Please provide as much of the information requested below as possible. This questionnaire includes a detailed listing of issues required when developing a wind farm project. Projects at various stages of development will have different levels of data available. As we evaluate projects for the Wind and Hydropower Feasibility Study (WHFS) Wind Demonstration Project, priority will be given to projects that have comprehensive proposal information. The amount of information provided will provide an indicator for the level of development to date. For any project information considered confidential, please indicate within [] to clearly identify information that you would like to remain confidential.

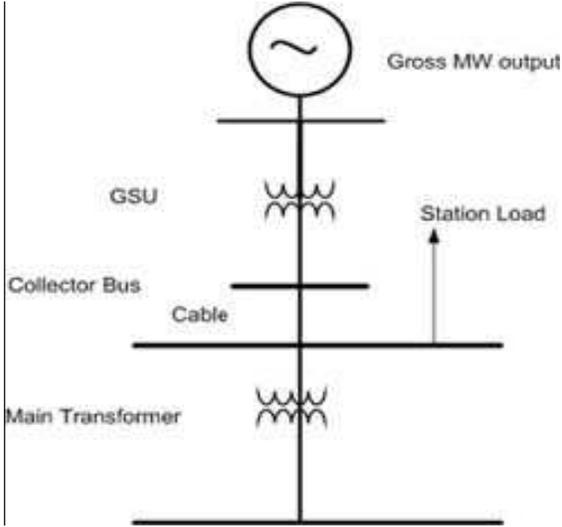
Please review EPAct 2005, Title XXVI, Section 2606 for details on the requirements of the Wind and Hydropower Feasibility Study. For more information on the WHFS Wind Demonstration Project, you may contact Michael Radecki, Energy Services Specialist, Western Area Power Administration, 406 247 7408 radecki@wapa.gov.

Please return completed questionnaires to Michael Radecki, Energy Services Specialist, Upper Great Plains Region, Western Area Power Administration, 2900 4th Avenue North, Billings, MT 59101-1266. Please sign and date the completed questionnaire on page 7.

Completed questionnaires must be returned by _____ in order to be included in the modeling analysis.

Contact Information:	
Project Name	
Tribe	
Contact Name	
Title	
Phone	
Email	

Project Description:	
<p>Brief description of project including total nameplate at build out to be completed prior to 12/31/2010</p>	<p>Total Nameplate Capacity: _____ MW</p> <p>Expected In-Service Date: _____</p> <p>State and Quadrant of Location (e.g., NW quadrant of NE): _____</p> <p>Approximate size of Development: _____ acres</p>
Phasing:	
<p>If additional nameplate capacity will be added after 12/31/2010 please provide staging information including expected in-service date and nameplate of phases (Please number phases)</p>	<p>Phase ____: _____ MW In-Service Date: _____</p> <p>Phase ____: _____ MW In-Service Date: _____</p> <p>Phase ____: _____ MW In-Service Date: _____</p>
Location:	
<p>Provide encompassing longitude and latitude of each discrete site with a reference name for each site listed; also list phase number by site, if appropriate</p>	<p>Site Name: _____ (Phase ____)</p> <p>Encompassing Latitude and Longitude</p> <p>_____</p> <p>_____</p>



Interconnection Information (refer to diagram):	
Maximum gross output (Nameplate per turbine x number of turbines)	_____ MW x _____ Turbines = _____ MW
GSU MW Losses	_____ MW
Station Service Load (MW/MVAR)	_____ MW _____ MVAR
Maximum net output (Gross MW Output - GSU MW Losses – Station Service MW Load)	_____ MW
Proposed point(s) of interconnection (if multiple points, please list in order of preference)	Transmission line segment or closest substation: _____ Voltage: _____ kV Approximate Distance from point of connection to Main Transformer: _____ miles
Site Plan on USGS topo map, tax map, etc.	Provided: Yes _____ No _____
One line diagram of facility electrical arrangement	Provided: Yes _____ No _____

Turbine Data:	
Type of turbine (Please provide a brief description of wind generator, e.g., GE doubly fed induction machine with back-to-back IGBT converters or Micon induction generator, etc.)	
MW Size of each turbine:	_____MW
MVA Base of each turbine:	_____MVA
Number of turbines	
Terminal Voltage	_____kV
Control Mode (Voltage Control or Power Factor Control-if Power Factor Control provide Power Factor range at generator terminal)	Voltage Control: Yes _____ No _____ Power Factor Control-Range at Generator Terminal: _____
VAR Support	Size, location, type (regular/switching shunts & steps) of additional capacitors: _____ Size, location of dynamic VAR: _____
Collector system layout data	Provided: Yes _____ No _____

If available, please provide additional information specific to design as indicated in Appendix A.

Production Cost Modeling Information:	
<p>Wind data for site including measured or modeled data with description of source and comments on spatial diversity of turbines on site to maximize output</p>	<p>Number of wind measurement stations: _____</p> <p>Length of time in place: _____ years</p> <p>Hub heights: _____</p> <p>Wind profile measurements (i.e., wind shear)— If yes, please attach description:</p> <p>If modeling, please attach description:</p> <p>Attachment provided for profile measurements: Yes _____ No _____</p> <p>Attachment provided for modeling: Yes _____ No _____</p>
<p>Maintenance plan (Please specify either anticipated schedule or number of hours per month expected and provide information on expected cost of outages due to maintenance)</p>	<p>Attachment provided: Yes _____ No _____</p>
<p>Storage capability (batteries on site, plans for pumped storage facility, etc.) or other features that would provide firming characteristics</p>	<p>Attachment provided: Yes _____ No _____</p>
<p>Estimated monthly capacity factor (or annual if monthly not available) suggested for site and description of methodology used</p>	<p>Attachment provided: Yes _____ No _____</p>

Pro Forma Analysis (If submitting a pro forma analysis, indicate “pro forma attached” on relevant questions below):	
Anticipated hourly average output (MW per hour for a year or typical day patterns by month)	Attachment provided: Yes _____ No _____
Projected operating costs	\$ _____ O&M \$ _____ Warranty/Replacement \$ _____ Property & Insurance
Assumptions related to firm/non-firm and curtailment decisions used in cost estimate; has conditional curtailment been considered?	Attachment provided: Yes _____ No _____
Projected installed cost per MW	\$ _____ per MW
Expected tax credit/tax exempt vehicles to be used to achieve expected financing structure (e.g., CREB, PTC, flip, etc.)	Attachment provided: Yes _____ No _____
Value associated with Tradable Renewable Certificates	Attachment provided: Yes _____ No _____
Are there net metering or behind the metering opportunities available to displace on-site energy costs that could be incorporated into the project?	If yes, please describe type of on-site energy required (e.g., HVAC, industrial) and approximate capacity/energy that could be displaced. Attachment provided: Yes _____ No _____
Required after-tax internal rate of return for investors	Type of investor: _____ Required IRR: _____%
Projected Total Cost per MW	\$ _____ per MW
Contract Energy Price (i.e., revenue required) to arrive at the minimum amount of revenue to meet debt requirements and/or rate of return requirements	\$ _____ per MWh
Please describe results and methodology of any production cost models (e.g., monthly/seasonal output, expected energy, capacity values) and how the information has been used in pro forma analysis	Attachment provided: Yes _____ No _____

Project Development Status:	
Project timeline with significant milestones through construction and commissioning	Attachment provided: Yes _____ No _____
Financial commitments in place (Please indicate nature and percent of project costs covered by existing commitments)	Attachment provided: Yes _____ No _____
Any agreements signed related to proposed project—please list name and nature of agreement	Attachment provided: Yes _____ No _____
Tribal approval process and status	Attachment provided: Yes _____ No _____
Describe project development steps taken to date regarding site control, wind studies, environmental assessments, transmission service requests, etc. Indicate if studies are required and/or what studies are ongoing or completed	Attachment(s) provided: Yes _____ No _____ Please list attachments provided:
Please list any known or suspected issues or complications with project siting	Attachment provided: Yes _____ No _____

Additional comments and information for consideration:

Completed by (please print)

Signature

Date

Appendix A

Induction Generators:	
Rotor Resistance:	
Stator Resistance:	
Stator Reactance:	
Rotor Reactance:	
Magnetizing Reactance:	
Total Rotating Inertia, H:	_____ per unit on KVA base
Generator exciter and governor data sheets, if available	

Wind Farm Design Specifics:	
Cable length for Wind Farm Collection System	
Cable Type and Impedance per mile	
Embedded Relay for each turbine (Yes or No)	
Voltage relay (Yes or No)	
Manufacturer default voltage relay setting	
Frequency relay (Yes or No)	
Manufacturer default frequency relay setting	

Wind Turbine GSU (each turbine):	
Generator Step-Up Transformer MVA Base	
Generator Step-Up Transformer Impedance (R+jX or % on transformer MVA base)	
Generator Step-Up Transformer Reactance- to-Resistance Ratio (X/R)	
Generator Step-Up Transformer Rating (MVA)	
Generator Step-Up Transformer Low-side Voltage (kV)	
Generator Step-Up Transformer High-side Voltage (kV)	
Generator Step-Up Transformer Off- nominal turns ratio	
Generator Step-Up Transformer Number of Taps and Step Size	

Wind Farm Transformer Data:	
Generator Step-Up Transformer MVA Base	
Generator Step-Up Transformer Impedance (R+jX or % on transformer MVA base)	
Generator Step-Up Transformer Reactance-to-Resistance Ratio (X/R)	
Generator Step-Up Transformer Rating (MVA)	
Generator Step-Up Transformer Low-side Voltage (kV)	
Generator Step-Up Transformer High-side Voltage (kV)	
Generator Step-Up Transformer Off-nominal turns ratio	
Generator Step-Up Transformer Number of Taps and Step Size	