

Jeffcoat-Sacco, Illona

From: Wade C. Mann <wmann@crowleyfleck.com>
Sent: Monday, September 16, 2013 3:54 PM
To: Hoberg, Allen C.; zep@pearce-durick.com
Cc: Jeffcoat-Sacco, Illona
Subject: Thunder Spirit Wind, LLC; Case No. PU-11-601
Attachments: PSC - Testimony of Dan Albano - PU-11-601.pdf; PSC - Testimony of Tracey Dubuque - PU-11-601.pdf

Dear Judge Hoberg and Mr. Pelham,

During the September 9th pre-hearing conference, Judge Fetch had indicated a preference that the testimony for the hearing be pre-filed with the Commission and a summary of the pre-filed testimony be given at the hearing. It is my understanding, based in part upon Mr. Pelham's September 12th correspondence to Judge Hoberg that it may be the preference of the Commission that the full testimony be read into the record as opposed to merely providing a summary at the hearing of the pre-filed testimony. In light of this preference, I'm not sure that pre-filing is necessary. Thunder Spirit intends to read the full testimony into the record at the September 19th hearing. I'm not aware of any procedural rule requiring pre-filed testimony and I don't believe that it is necessarily consistent with PSC procedure at past hearings.

While Thunder Spirit has some reservation about pre-filing when it is not set forth in the rules or consistent with prior PSC protocol, it is nonetheless providing the attached testimony in an effort accommodate the Commission and the public in preparing for the hearing. This hearing is an adjudicative proceeding in which a couple, represented by counsel, has made public objections to the application in the past. The couple has not intervened and is thus not subject to any pre-filing requirements or other procedural constraints at this time yet they will be afforded the advantage of being privy to Thunder Spirit's testimony days in advance of the hearing. The same advantage is not afforded to Thunder Spirit with respect to any potential opposition testimony. Regardless, Thunder Spirit is comfortable with its testimony and application and hereby submits the attached pre-filed testimony as a courtesy to the Commission and the public.

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NORTH DAKOTA PUBLIC SERVICE COMMISSION

THUNDER SPIRIT WIND, LLC

September 19, 2013, Hearing

PREPARED TESTIMONY OF
DANIEL ALBANO, PhD

1. Please state your name, your employer and your business address.

ANSWER: My name is Dan Albano. I am Vice President of Development and Environmental Affairs with Global Winds Harvest and an authorized representative of Thunder Spirit Wind, LLC. My business address is 103 Front Street, Schenectady, New York.

2. Showing you what is marked as Thunder Spirit Wind Exhibit No. 1, would you please identify it?

ANSWER: This is the application of Thunder Spirit Wind, LLC to the North Dakota Public Service Commission for a Certificate of Site Compatibility for the Thunder Spirit Wind Energy Project located in Adams County, North Dakota, including the Revised Amendment to the Application filed September 11, 2013.

3. Please briefly describe the Thunder Spirit Wind Energy Project.

ANSWER: The Project is located in Adams County, North Dakota approximately 2 miles northeast of Hettinger. It will have a maximum nameplate capacity of approximately 150 megawatts (MW) consisting of up to 75 wind turbine generators. Additional facilities will include access roads, electrical collection systems and cabling, a substation, a construction laydown area, and an approximately 0.85 mile overhead radial transmission line. Assuming certain net capacity factors, the projected average annual output is estimated at 676,710 megawatt hours per year. However, as with all wind projects, output is dependent upon the wind resource, final design, site specific features, and equipment.

The Project will interconnect to the MDU Hettinger 230kV Substation and will transmit power into the MISO grid. The Project's collection substation will include a power transformer to step up the voltage from 34.5 kV to 230 kV, enabling the interconnection to the MDU Substation. The Project substation will be located less than a mile away from the MDU Substation in the southeast corner of Section 31, Township 130 North, Range 95 West.

The project area encompasses approximately 26,867 acres (42 square miles) in Adams

County. The turbines will be placed throughout the project area. However, it is estimated that the turbines and associated infrastructure will permanently occupy only 176 acres, or less than 0.7% of the total land area.

4. Why is the Thunder Spirit Wind Energy Project needed?

ANSWER: North Dakota's per capita energy consumption is among the highest in the nation with nearly 30% of North Dakota households using electricity as their primary energy source for home heating. Additionally, in recent years, the Mid-Continent Area Power Pool (MAPP) has consistently reinforced the regional need for increased generating capacity in the coming decade. Cost fluctuations and reliability problems serve to reinforce the need for sufficient capacity, low-cost energy, and diverse generation sources.

According to the Energy Information Administration, in 2010, 82 percent of North Dakota's net electricity generation came from coal, 12 percent came from wind energy, and 6 percent from conventional hydroelectric power sources. Energy sources such as coal are finite and public policy has dictated that additional sources of energy such as wind energy should be pursued.

In March 2007, North Dakota enacted legislation adopting a voluntary renewable portfolio objective that aims to have ten (10) percent of electricity generated from renewable sources by 2015. In addition to this statutory policy objective, a March 2009 report prepared by the EmPower ND Commission, stated that one of the state's energy goals is to increase installed wind energy capacity to 5,000 MW by 2025.

Independent power producers such as Thunder Spirit are widely recognized as essential to meeting regional energy needs, stabilizing energy costs, and enhancing energy reliability. The Thunder Spirit Wind Project offers North Dakota and the MAPP region the opportunity to add to capacity, to stabilize wholesale power prices, and to provide electricity from a clean, cost-effective renewable energy generation facility, consistent with the State's statutory policy objectives. Once completed, the Thunder Spirit Wind Energy Project will be a significant source of energy for meeting the region's energy needs for the next 20-25 years.

5. Why was this site chosen for a wind energy facility?

ANSWER: Thunder Spirit evaluated wind resources throughout North Dakota for siting an approximately 150 MW wind generation facility. We utilized wind data from meteorological towers on the project site in addition to securing and analyzing information from other long-term references to aid in correlating the wind data on site.

The proposed Project Area was identified as optimal from wind resource, transmission interconnection, environmental, and economic perspectives. It was selected considering the exclusion and avoidance criteria outlined in the Commission's rules and the Adams County Wind Energy Facility Ordinance and in addition, very importantly, it was selected based upon the willingness of landowners to participate in the project.

We also consulted with various agencies and conducted a variety of studies in the development process. Ultimately, we settled on what we consider to be an optimal area that will balance the needs of the Project, the local community, and the need to avoid and/or minimize environmental impacts.

6. Would you please describe the wind power technology proposed to be used at the Thunder Spirit Wind Energy Project?

ANSWER: Thunder Spirit is currently evaluating three turbine models for the Project in an effort to select the technology that will ultimately ensure optimization of wind and land resources while also weighing cost efficiency.

At a maximum build-out, the Project will consist of either 75 x 2-MW turbines, 65 x 2.3-MW turbines, or 50 x 3.0-MW turbines, depending on the model that is ultimately selected in order to fill the 150 MW generation capacity. The turbines being evaluated will have a hub height range of 80-92 meters (262-302 feet) and a rotor diameter range of 100-116 meters (328 – 380ft).

Each tower will be secured by a concrete foundation that can vary in design depending upon soil conditions. Turbines will be interconnected by fiber optic communication cables. The Project includes a computer-controlled communication system that permits automatic independent operation, and remote supervision, thus allowing the simultaneous control of many turbines. The turbines feature variable-speed control and independent blade pitch to assure aerodynamic efficiency and each turbine will be accessible by all weather, aggregate-surface roads up to 16 feet in width which will connect with public roads.

The electricity generated by each turbine is brought to a pad-mounted transformer where the voltage is stepped up to power line voltage of 34.5 kv. Electricity is collected by a system of underground power collection cables within the project site. The power collection lines and communication cables will be buried within acquired rights-of-way.

The feeder system distributes power to the project substation where the power will be transformed to 230 kV enabling interconnection to the MDU Hettinger 230 kV substation.

All utility protection and metering equipment will meet the National Electric Safety Code Standards for parallel operations.

7. Would you please briefly describe the Project layout?

ANSWER: Wind powered electric generation is entirely dependent on the availability of the wind resource at a specific location. Analysis of wind selection data suggests a prevailing NW wind. Thus the optimal turbine string alignments are generally from southwest to northeast. And while this alignment is generally true of the Project layout, deviations occur due to the combined vagaries of land control, elevation differences, and the need to avoid sensitive environmental features, such as wetlands, avian use areas, and cultural resources. Beyond these siting considerations, design of the turbine arrays and collection system are based largely on minimizing energy losses due to wind turbine wakes turbulence, and electrical line losses.

8. Does the Thunder Spirit Project layout comply with all applicable setback requirements?

ANSWER: Yes. The layout complies with all Adams County setback requirements as well as the recent setbacks set forth in the PSC's administrative rules, which can be found in Table 2.1 Exclusion Areas (p. 3) of the amendment to Thunder Spirit's Site Compatibility application.

9. Please briefly describe the construction process.

ANSWER: Several activities must be completed prior to the proposed commercial production date. The majority of the activity relates to equipment ordering lead-time, as well as final design implementation and construction of the facility.

During the construction phase, several types of light, medium and heavy-duty construction vehicles will travel to and from the site, as well as private vehicles used by the construction personnel. Thunder Spirit estimates that there will be approximately 50 additional trips per day in the area during peak construction periods. That volume will occur during the peak time when the majority of the road, foundation and tower assembly is taking place. At the completion of each construction phase this equipment will be removed from the site or reduced in number.

Throughout the construction phase, ongoing coordination will occur between the Project development team and the construction teams. An on-site Project construction manager will help to coordinate all aspects of the Project, including ongoing communication with local officials, citizens groups and landowners. Even before the Project becomes fully operational, the O&M staff will be integrated into the construction phase of the Project. The construction manager and the O&M staff manager will work together continuously to ensure a smooth transition from construction through wind farm commissioning and, finally, operations.

10. What is the status of right of way acquisitions on property used for construction of the Thunder Spirit Wind Energy Project?

ANSWER: Thunder Spirit has agreements in place with all landowners necessary for the proposed Project.

11. Please briefly describe the commissioning process.

ANSWER: The project will undergo detailed inspection and testing procedures prior to final turbine commissioning. Inspection and testing will occur for each component on the wind turbines, as well as the communication system, meteorological system, obstruction lighting, high voltage collector and feeder system, and the SCADA system.

12. Please briefly describe the maintenance schedule for the Project.

ANSWER: After construction is complete, on-site personnel will operate and maintain all components of the Project, including the substation. Additionally, each turbine will be monitored continuously by a SCADA system that communicates major aspects of operation through communication lines to the O&M staff and a 7-day-per-week, 24-hour-per-day facility. Alarm systems will be triggered if operational characteristics fall outside set limits. Each turbine has an automatic braking system to stop the blades in the event of malfunction or excessive wind speed, including a battery back-up in case a turbine is disconnected from the grid. Any problems will be reported promptly to on-site O&M personnel for correction.

Scheduled maintenance will be performed approximately every 12 months on each turbine. On average, each turbine will require 40 to 50 hours of scheduled mechanical and electrical maintenance per year. O&M personnel will perform routine maintenance, including periodically replacing lubricating fluids, checking parts for wear, generator alignments, visual inspection, and recording operating parameters. All roads, pads, and trenched areas will be inspected regularly and maintained to minimize erosion. The O&M staff will perform most repairs with the assistance of contracted personnel, as needed.

13. What is the proposed schedule for operation of the Project?

ANSWER: Thunder Spirit could begin construction in 2014, provided all preconstruction permits and approvals have been obtained. Construction will take approximately six months to complete. Depending on the status of power purchase agreements, Thunder Spirit anticipates that testing and operation could begin in the late fall of 2014, with the potential for commercial operation of the project to begin in the fourth quarter of 2014.

14. Who will purchase the power from the Project?

ANSWER: The project will interconnect into the MDU Hettinger Substation and deliver power into the Midwest ISO (MISO) grid. In all likelihood, a MISO-member utility will be the power offtaker.

15. What is the anticipated cost of the Project?

ANSWER: Approximately \$300,000,000.00.

16. Will Thunder Spirit construct the project in compliance with the National Electric Safety Code Standards?

ANSWER: Yes.

17. Please briefly describe the decommissioning process?

ANSWER: Thunder Spirit will develop a Decommissioning Plan in accordance with statutory requirements and the Commission's rules. Additionally, we have a contractual obligation to the landowners to remove the wind facilities, including foundations to a depth of forty-two (42) inches, when the wind easement expires. We will explore alternatives regarding Project decommissioning at the end of the Project Certificate term. Retrofitting the turbines and power system with upgrades based on new technology may allow the wind farm to produce efficiently and successfully for many more years. Based on estimated costs of decommissioning and the salvage value of decommissioned equipment, the salvage value of the wind farm is expected to exceed the cost of decommissioning.

18. Has Thunder Spirit completed avian surveys?

ANSWER: Yes. Avian surveys were completed in June to October of 2007 at 20 locations within the project area and again from April 2011 to March 2012 at 25 locations within the project area.

In the 2007 avian surveys, 57 avian species were observed during the avian point count surveys. Four species dominated the observations, European starling, horned lark, ring-necked pheasant and western meadowlark, which accounted for 61.5 percent of all observations. Nine species of raptors were observed, including golden eagles (two individuals). Golden eagle observations occurred during the fall surveys and the individuals were observed flying within the anticipated rotor-swept area. Fourteen sensitive species listed as North Dakota Species of Conservation Priority (including the golden eagle) were observed. No other threatened or endangered (T&E) species were observed.

In the 2011-2012 avian surveys, 73 avian species were observed during the avian point count surveys. Two species, sandhill crane and horned lark, accounted for 53.5 percent of

all observations with 7.1 percent of the horned larks and 95.6 percent of all sandhill cranes recorded flying within the anticipated RSA. These cranes were all observed among four (4) flocks on a single day in April 2012. Eight species of raptors were observed, including golden and bald eagles (six individuals and one (1) individual, respectively). Golden eagles were observed in all survey seasons in 2011-2012 with four observations recorded flying within the anticipated RSA. The bald eagle was observed perched during the winter survey. Twenty-one (21) sensitive species, listed as North Dakota Species of Conservation Priority, (including the eagles) were observed including the federal candidate species Sprague's pipit. One Sprague's pipit was observed during the spring point count survey while two other individuals were observed during the late spring as incidental observations. No other threatened or endangered (T&E) species were observed.

19. Were any grouse surveys conducted?

Yes. One season of sharp-tailed grouse leks surveys was conducted in the spring of 2011. Five grouse leks were identified, including one confirmed lek, three probable leks, and one possible lek. The confirmed lek was located within the Project area in planted grassland habitat. Two of the three probable leks were located in native prairie habitat outside of the Project area while the third was within the Project area in alfalfa hay cropland. The one possible lek was located in an unknown grassland habitat type inside the Project area. The two leks outside the Project area were within the 1.6 kilometer (km; 1 mile) survey buffer.

20. How about raptors?

Aerial and ground raptor nest surveys were conducted in spring 2011. Two active raptor nests were identified within the Project area, including one nest occupied by great-horned owls and one nest occupied by Swainson's hawks approximately 1.2 km (0.75 miles) east of the Project. Although no eagle nests were identified during the aerial surveys, WEST requested a database review of known eagle nest locations within 10 miles of the Project area from USFWS in 2011. One known golden eagle nest approximately 5 miles west of the Project boundary was identified by the USFWS, but was not observed during the 2011 season.

Given that eagles were observed during the avian pt counts, even though infrequently, Thunder Spirit and WEST undertook a dedicated eagle nest survey in May 2013 using a helicopter within the Project area and a surrounding 10-mile buffer area. During this survey, a single golden eagle nest was found adjacent to the project area and a minimum 2 mile buffer was instituted between the nest and the closest proposed turbine. Behavioral observations at the nest and throughout the project area were then immediately begun to evaluate potential eagle use of the Project Area by the nesting parents. Observations were conducted for two weeks before the nesting effort was judged to be a failure (no nestlings were found but the parents abandoned the nest). Observations continued for 2 additional

weeks throughout the project area but only one observation of an adult golden eagle was made during that time, so the survey was discontinued.

21. Did you notify the USFWS about the eagle nest and, if so, are you required to obtain an Incidental Take Permit in order to operate the project?

We did notify the USFWS immediately after the eagle nest was found and because of the proximity of the nest to the Project area, and the fact that eagles had been observed there before, the Bismarck USFWS office staff recommended that we develop an eagle conservation plan. They also recommended that we consider applying for an eagle take permit after conferring with staff at the Region 6 Migratory Bird Office in Denver. We are now in the process of compiling a Bird and Bat Conservation Strategy, which contains a strong emphasis on eagle conservation measures during both construction and operation phases of the Project. Our intention, once all this information is compiled, is to meet with USFWS staff in Denver to share this information and to discuss the appropriateness of seeking the voluntary eagle take permit. As is well known in the wind industry and among the avian conservation community, although virtually all wind projects west of the Mississippi are faced with similar issues of eagle use within their project areas, the USFWS to date has not issued a single eagle take permit.

22. Were any bat surveys conducted?

In 2007, detectors collected 126 bat passes (mean of 1.13 passes per night). Bat passes identifiable to species included the hoary and eastern red bat. Neither species is designated as a North Dakota Species of Conservation Priority. In 2011, bat detectors were operational for approximately 82 percent of the survey period, and detected 406 bat passes (mean of 0.78 passes per night). Bat passes identifiable to species again included the hoary and eastern red bat. According to our consultant WEST, based on the expected relationship between pre-construction bat activity and post-construction fatalities, bat fatality rates at the Thunder Spirit Project are expected to be relatively low compared to that observed at other facilities.

23. Do you anticipate any significant impacts to avian species?

No. In general, most wildlife species do not use disturbed agricultural land, heavily grazed land, or maintained pastures and hayfields as their primary habitat. As a result, there will be minimal impacts to most species. Most non-raptors had relatively low risk of collision due to the majority of individuals flying below the likely RSA. It is unlikely that non-raptor populations will be adversely affected by direct mortality from the operation of the wind energy facility given the robustness of their overall populations and overall low impacts to any one species.

The mean raptor use in the Project area is considered to be low to moderate with the most abundant raptors at the project being northern harrier, red-tailed hawk, and Swainson's hawk.

The presence of wind turbines may alter the landscape so that wildlife use patterns are affected, displacing wildlife such as prairie grouse away from the Project facilities and suitable habitat. While the potential exists for wind turbines to displace prairie grouse from occupied habitat, studies examining the extent of this potential impact are currently lacking. While there is no requirement for a buffer setback for wind energy, Thunder Spirit has imposed a 0.5 mile setback from known grouse leks (this is a buffer based on recommendations for petroleum development).

24. Despite the minimal impacts, does Thunder Spirit intend to undertake any mitigative measures to protect avian species?

Yes. Thunder Spirit has conducted environmental studies of the Project Area to aid in the initial placement of turbines, roads, and associated facilities to avoid or minimize impacts to wildlife and habitat. Thunder Spirit is currently developing a Bird and Bat Conservation Strategy (BBCS) that outlines the species of concern for the Project, how investigations were done to identify use of the area and results of those studies, what actions were done and will be done to avoid, minimize, and mitigate potential impacts, and what measures will be taken during the operation of the Project. This plan will include specific sections on golden eagles, Sprague's pipit, and sharp-tailed grouse but will also include other species of concern. In addition, the following measures will be used, to the extent practicable, by Thunder Spirit to help avoid potential impacts to wildlife in the Project Area during selection of the turbine locations and subsequent development and operation:

- Thunder Spirit will bury all collection lines and has reduced the overhead radial transmission line to 0.85 miles to reduce the likelihood of avian collisions;
- Siting access roads and turbines away from wetlands, water bodies, and native prairies to the greatest extent practicable;
- Other than an approximately 0.85 mi overhead radial transmission line from the Project substation to the MDU Hettinger 230kV Substation, no overhead power lines will be used;
- A minimum 2 mile buffer around the eagle nest was instituted while ongoing behavioral observations are being conducted to evaluate eagle use of the Project Area.
- Thunder Spirit imposed a 0.5 mile setback around the five (5) known grouse leks in the design of the layout.
- Restricting construction and/or operation activities due to active raptor nests; mapping and flagging raptor nests found during construction; placing turbines as far away from raptor nests as project engineering constraints permit and avoid removal of trees.
- Implementing a Wildlife Response Reporting System (WRRS) once turbine construction is completed. The WRRS will include protocols for field technicians to report and document avian mortalities during routine maintenance operations.
- Minimizing the use of lights on turbines when practicable in accordance with state, federal, and local requirements;

- Restricting construction and/or operation activities due to active raptor nests; mapping and flagging raptor nests found during construction; placing turbines as far away from raptor nests as project and engineering constraints permit and avoid removal of trees;
- Minimizing impacts to native vegetation and wetlands during design and construction of turbines and associated infrastructure;
- Reseeding or planting disturbed areas with native material;
- Enhancing existing degraded habitat, where practicable, through the removal and replacement of invasive species with plants native to the site;
- Developing a management plan to prevent the spread of noxious weeds throughout the Project Area or adjacent areas during construction and ongoing operations;
- Thunder Spirit has committed to a minimum of one year of post-construction mortality avian and bat monitoring; and
- Implementing a wildlife reporting protocol once turbine construction is completed. The protocol will include measures for field technicians to report and document avian mortalities during routine maintenance operations.

25. Is it your request that the proposed Thunder Spirit Wind Energy Project be approved by the Public Service Commission, and that the Commission issue a Certificate of Site Compatibility for the project?

ANSWER: Yes.

I have no further questions of this witness, we offer Exhibit 1 into the record.

This concludes the testimony of Dan Albano.

NORTH DAKOTA PUBLIC SERVICE COMMISSION

THUNDER SPIRIT WIND, LLC

September 19, 2013, Hearing

PREPARED TESTIMONY OF
TRACEY DUBUQUE

1. Please state your name and business address.

ANSWER: Tracey Dubuque. I am employed by Tetra Tech, Inc. of 160 Federal Street, Boston, Massachusetts.

2. What is your position with Tetra Tech?

ANSWER: I am a Senior Project Manager at Tetra Tech. I have over fifteen years of experience in environmental consulting. I have prepared and secured environmental permits for energy related facilities, coordinating and managing biological and cultural field surveys, and contributing to the National Environmental Policy Act ("NEPA") documentation. I also manage siting studies, prepare environmental permits, and consult with local, state and federal stakeholders in the development of wind energy projects.

3. Were you involved in the preparation of the environmental and cultural resource reports to the Public Service Commission as set forth in the Application, being Thunder Spirit Exhibit No. 1?

ANSWER: Yes.

4. Do you intend to testify today about environmental and cultural resource matters pertaining to the Thunder Spirit Wind Energy Project?

ANSWER: Yes.

5. Regarding the Public Service Commission exclusion areas, would you briefly describe any exclusion areas that are found within the Thunder Spirit Wind Energy Project?

ANSWER: (Summarize exclusion areas that are located in the project site, Table 8, page 12 of Application and any information that was updated as summarized in the Amendment.)

6. Would you please briefly describe any Public Service Commission avoidance areas that are contained within the Thunder Spirit Wind Energy Project?

ANSWER: (Briefly summarize the avoidance areas that are located within the project site – Table 9, page 13 of the Application.)

7. Regarding the Public Service Commission selection criteria, would you please identify and potential impacts.

ANSWER: (Please summarize selection criteria impacts – Table 10, pages 14 and 15.)

8. Please briefly summarize how the project may affect the policy criteria of the Commission.

ANSWER: (Briefly summarize the policy criteria impacts - Table 11, page 16.)

9. Please briefly summarize any anticipated land use impacts caused by construction of the Thunder Spirit Wind Energy Project, and how these impacts will be mitigated.

ANSWER: (Briefly summarize the impacts anticipated - Table 16, page 31.)

10. What other local, state or federal permits are needed for this project, and what is the status of those permits.

ANSWER: (Briefly summary the information set forth on Table 24, page 75.)

11. Please describe the surveys of cultural and archeological resources conducted and the status of your contacts with the North Dakota State Historic Preservation Office.

ANSWER: Tetra Tech provided the necessary information for the State Historical Society review by performing a Class I Literature Review, a Class II Historic Architecture Survey, and a Class III Cultural Resources Inventory. The Class I Literature Review included identifying archaeological sites and surveys, and structures, bridges, and cemeteries within one mile of the Project layout. The Class II Historic Architecture Survey examined potential impacts to historic architecture within one mile of the nearest turbine. The Class III Cultural Resources Inventory included a pedestrian survey of the Area of Potential Effects (APE) which is basically a survey corridor established around the layout and included all facilities.

12. Please highlight the findings from the Class I Literature Review.

ANSWER: A file review was completed at the State Historical Society of ND in June 2011 and updated on May 3, 2013.

- A total of six archaeological sites and four site leads have been documented within 1 mile of the survey corridor. Of these, two site leads are located within the survey corridor. Due to the sensitive nature of archeological sites, at the request of SHPO, results are considered confidential.
- No architectural history surveys were conducted within the Project area.

- Background research indicated no previously documented structures, bridges, or cemeteries were located within the survey corridor or within 1 mile of the survey corridor.

13. Please highlight the findings from the Class II Historic Architecture Survey.

ANSWER: Thunder Spirit, in consultation with the SHPO, established an APE for this survey that included the zone within one mile of the nearest turbine. The SHPO identified 23 properties for which documentation and assessment of eligibility to the National Register of Historic Places (NRHP) was requested.

As stated above, literature review of the APE identified no previously documented architectural properties within the APE. During fieldwork conducted in Spring 2013, all 23 properties within the APE were photographically documented.

Two of the properties turned out to contain no buildings 50 years old or older, while two others were without any buildings at all at the time of survey. Review of the remaining 19 properties led to the recommendation that these properties are not eligible for inclusion in the NRHP. With respect to potential effects of the proposed Project on architectural properties in the study area a determination of No Historic Properties Affected was recommended. The full report was submitted to SHPO for concurrence and a concurrence letter was received which stated that the SHPO concurs with “No Significant Sites Affected” or “No Historic Properties Affected” provided that the project is of the nature stated and it takes place in the location plotted and described in the project documentation, and avoidance procedures are maintained.

14. Please highlight the findings from the Class III Pedestrian Survey.

ANSWER: A Class III Pedestrian Survey of the APE was also conducted per protocol that was discussed with SHPO.

The survey was conducted in May 2013. Tetra Tech documented 23 new archaeological sites. Tetra Tech recommended avoidance for 18 sites and the creation of avoidance buffers for some of the sites. If these sites and their associated avoidance buffers are avoided during construction, then Tetra Tech recommended a determination of “No Historic Properties Affected”. The remaining sites are not considered eligible for inclusion in the National Register, nor would they appear to have cultural significance to regional Native American tribes; therefore, avoidance is not recommended. If areas beyond the survey corridor are to be used during construction, Tetra Tech recommended that a Class III cultural resource survey be conducted to determine the presence of cultural resources within these areas. The full report was submitted to SHPO for concurrence and on August 14, 2013, a response was received which stated that the SHPO provisionally concurs with a “No Significant Sites Affected” and “No Historic Properties Affected” provided the project is of the nature stated and it takes place in the location plotted and described in the project documentation, and avoidance procedures are maintained.

15. Does Thunder Spirit plan to implement mitigative measures to protect these cultural and archeological resources?

ANSWER: Yes, Thunder Spirit is committed to minimize impacts to these resources and will avoid these resources and any additional resources indentified throughout the life of the Project. For example, it is recommended that the many archaeological sites and an associated avoidance buffer be avoided during construction and snow fencing be placed around the avoidance buffer to reduce the potential that they will be inadvertently disturbed. If avoidance is not possible, Thunder Spirit will work with SHPO to mitigate potential impacts.

16. Are any wetlands impacted by this Project?

ANSWER: A wetland and waters of the US delineation was conducted for the project in Spring 2013. Five potentially jurisdictional wetlands and three waters of the US were identified within the Project Area in locations either intersected by planned Project infrastructure or are near planned Project infrastructure.

Thunder Spirit has committed to zero permanent impacts to wetlands and waters of the US. Horizontal directional drilling could be used to install the electrical collection lines that cross delineated wetland features on the Project site thereby avoiding permanent impacts. However, if there are still temporary impacts to wetlands from construction of any infrastructure, and if that temporary impact cannot be kept below the 1/10-acre threshold for use of a NWP #12, then a pre-construction notification (PCN) and an application for a NWP #12 will be made to the USACE regulatory office in Bismarck, North Dakota. Restricting construction and/or operation activities due to active raptor nests; mapping and flagging raptor nests found during construction; placing turbines as far away from raptor nests as project engineering constraints permit and avoid removal of trees.

17. Have you been in consultation with other state and federal agencies that may have an interest in this project?

ANSWER: Yes. As demonstrated in Appendix B to the application we have been in contact with numerous state and federal agencies.

18. In addition to the mitigation measures you have already discussed, what other mitigation measures has Thunder Spirit committed to for this project?

ANSWER:

- Setting access roads and turbines away from wetlands, water bodies and native prairies to the extent practicable.
- Reseeding or planting disturbed areas with native materials.
- Developing a management plan to protect the spread of noxious weeds throughout the project area or adjacent areas during construction and ongoing operations.

19. Has Thunder Spirit completed a sound study?

ANSWER: Yes, an acoustic modeling analysis is included in Appendix A of the Application and the revised analysis on the revised turbine layout was included in the Amendment dated September 11, 2013.

20. Would you please discuss the main points on the acoustic assessment.

ANSWER: An acoustic modeling analysis was conducted to assess sound levels resulting from wind turbine operations, as well as a consideration of sound from the electrical substation and sound generated during project construction and maintenance activities. This assessment was updated and the revised report was included in Appendix A of the Revised Amendment submitted on September 11, 2013.

The results of the acoustic modeling results were compared to Adams County zoning ordinance noise levels, ND PSC Avoidance Criteria, as well as U.S. Environmental Protection Agency (EPA) environmental noise guidelines.

21. Please summarize your findings from the acoustic modeling analysis?

ANSWER: Acoustic modeling was conducted to include each of the three potential turbine models. There were no exceedances of the North Dakota noise regulation of the Adams County Zoning Ordinance noise limits which state that sustained noise over 80 dB during the day and 70 dB at night is not allowed. Also, there were no exceedances of the ND PSC Avoidance Criteria that states that sound levels within 100' of an inhabited residence or a community building cannot exceed 50 dBA. And finally, there were no exceedances of the EPA guidelines at occupied residences.

In conclusion, the acoustic modeling analysis, demonstrates the Project has been adequately designed inclusive of a number of conservative assumptions to generate sound levels below the Adams County EPA guidelines, North Dakota noise limit at all occupied receptors or the EPA criteria at any occupied receptor.

22. Has Tetra Tech completed a study of potential shadow flicker impact?

ANSWER: Yes. Included in Appendix A of the Revised Amended Application submitted on September 11, 2013 is the latest Shadow Flicker Impact Analysis for the Thunder Spirit Wind Energy Project which includes analysis for each of the three potential turbine models that may be used for the project.

23. Could you briefly explain shadow flicker and the results of your analysis.

ANSWER: A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker,

and can be a temporary phenomena experienced by people at nearby residences or public gathering places. Shadow flicker generally occurs during low angle sunlight conditions, typical during sunrise and sunset times of the day. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night, or when the turbines are not operating.

Shadow flicker impacts are not regulated in applicable state or federal law, and there is no permitting threshold with regard to hours per year of anticipated impacts to a receptor from a wind energy project. In lieu of specific regulations, a general precedent has been established in the industry that fewer than 30 hours per year of shadow flicker impacts is acceptable to receptors in terms of nuisance and well below health hazard concerns. However, predicted shadow flicker greater than this threshold does not necessarily create a nuisance and is still well below concerns for impacts to health.

As far as the results of the analysis, a total of 26 potentially sensitive receptor locations were identified. Considering all turbine scenarios, only 1 of the 26 receptors modeled had expected shadow flicker impacts of more than 30 hours per year but this was an abandoned structure. The maximum predicted shadow flicker impact at an occupied receptor is 25 hours 20 minutes per year (receptor #23) which is below the 30 hours/year guideline.

The analysis indicates that shadow flicker impacts are expected to be less than estimated within the conservative analysis, and shadow flicker is not expected to be a significant environmental impact. Thunder Spirit will work with landowners to address any complaints of shadow flicker on a case-by-case basis and consider mitigations measures if necessary.

24. To your knowledge, have any state or federal agencies objected to this wind farm project?

ANSWER: No.

25. In your opinion, if the Project is constructed as set forth in the application discussed at this hearing, will there be any significant long-term irreversible effects to the environment or cultural resources?

ANSWER: No.

This concludes the testimony of Ms. Dubuque.