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BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Power Siting Board's Adoption of Chapter 4906-17 of the Ohio Administrative Code and the Amendment Of Certain Rules in Chapters 4906-1, 4906-5, and Rule 4906-7-17 of the Ohio Administrative Code to Implement Certification Requirements for Electric Generating Wind Facilities	)	**Case No. 08-1024-EL-ORD**

REPLY COMMENTS OF UNION NEIGHBORS UNITED

Union Neighbors United ("UNU") offers the following additional comments in response to the initial comments of AMP-Ohio, AWEA, Babcock & Brown, BQ Energy, Buckeye Wind LLC, E-Coustic Solutions, FPL Energy, Great Lakes Wind Development Task Force, Invenergy, JW Great Lakes Wind LLC, Ohio Farm Bureau Federation, and Tom Stacy.

1. Authority of the Ohio Power Siting Board to Regulate Electric Generating Wind Facilities under R.C. § 4906.20:

AWEA, Great Lakes Energy Development Task Force, and JW Great Lakes Wind LLC contend that R.C. § 4906.20(B) does not authorize the Board to promulgate rules requiring applicants to establish the need for the facility or to evaluate alternative sites. For the following reasons, their position is erroneous:

R.C. § 4906.20(B)(1) requires the Board's rules to include "an application process for certificating economically significant wind farms that is identical to the extent practicable to the process applicable to certificating major utility facilities under sections 4906.06, 4906.07, 4906.08, 4906.09, 4906.11, and 4906.12. . . ." R.C. § 4906.20(B)(1)(emphasis added). The "application process" incorporated into R.C. § 4906.20(B)(1) from R.C. § 4906.06(A) requires an application containing the following information:

(3) A statement explaining the need for the facility;

(4) A statement of the reasons why the proposed location is best suited for the facility;

(6) Such other information as the applicant may consider relevant or as the board by rule or order may require.

R.C. § 4906.06(A)(emphasis added). Far from specifically excluding consideration of need and alternative sites as suggested by these commenters, R.C. § 4906.20 expressly authorizes it. Moreover, to the extent practicable, the statute mandates these inquiries. If there could be any doubt about that point (there is not), the sixth subsection of R.C. § 4906.06(A) authorizes the Board to require "other information . . . as the board by rule. . . may require."

These commenters rely on a sentence in R.C. § 4906.20 that "[a] certificate shall be issued only pursuant to this section." Initial comments of AWEA at 2, Great Lakes Energy Development Task Force at 5, and JW Great Lakes Wind LLC at 4-5. While the meaning of this sentence is unclear, it does not preclude the consideration of need and alternative site analysis for the reasons expressed above. Otherwise, the statute would not require the Board to follow the process in R.C. § 4906.06 for obtaining information on these topics in wind farm applications.

Section 4906.20(B)(2) contains the following additional authority for the Board's rules:

> Additionally, the rules shall prescribe reasonable regulations regarding any wind turbines and associated facilities of an economically significant wind farm, including, but not limited to, their location, erection, construction, reconstruction, change, alteration, maintenance, removal, use, or enlargement and including erosion control, aesthetics, recreational land use, wildlife protection, interconnection with power lines and with regional transmission organizations, independent transmission system operators, or similar organizations, ice throw, sound and noise levels, blade shear, shadow flicker, decommissioning, and necessary cooperation for site visits and enforcement investigations.

R.C. § 4906.20(B)(2) (emphasis added). By starting this subsection with "[a]dditionally," the General Assembly signified that this subsection's rulemaking authority does not limit the authority in the prior subsection. R.C. § 4906.20(B)(1). Thus, the commenters err by attempting to invoke the Latin maxim "*expressio unius est exclusio alterius*" to argue that the list of specific

rulemaking topics in R. C. § 4906.20(B)(2) limits the Board's rulemaking authority to just those topics.

The Ohio Supreme Court has instructed the courts not to use the rule of *expressio unius est exclusio alterius* where there are other indications that the legislature did not intend to limit the statute's application to the specific circumstances listed in the law. *Baltimore Ravens, Inc. v. Self-Insuring Emp. Evaluation Bd.*, 94 Ohio St.3d 449, 455 (2002). By providing that the Board's rules may include, but are not limited to, the specific topics in R.C. § 4906.20(B)(2), the General Assembly expressed its intent not to limit the Board's rulemaking authority to those specific topics. This language precludes the use of the *expressio unius* maxim to restrict the rulemaking to these issues. None of the court decisions cited by these commenters used this maxim on laws that provided an agency with expansive "but not limited to" authority. For example, one case used the maxim to apply a housing law only to residences because the statute mentioned only residences, not commercial properties. *Maggiore v. Kovach*, 101 Ohio St.3d 184, 187 (2004). Unlike R.C. 4906.20(B)(2), the housing statute did not expand its coverage by providing that it was "not limited to" this topic. To pretend that the "not limited to" language is absent from the statute would violate the courts' admonition against creating exceptions not expressly stated in the law. See *Wachendorf v. Shaver*, 149 Ohio St. 231, 237 (1948).

The commenters argue that all examples of rulemaking topics in R.C. § 4906.20(B)(2) describe the characteristics and operation of wind farms. Accordingly, they rationalize that the General Assembly meant to authorize the Board to regulate only the wind farms' characteristics and operation, not need and site selection. However, the first example in the list is the "location" of wind farms, which denotes a review of site selection, not just the wind farms' characteristics and operation. Therefore, the General Assembly did not intend to limit the subjects of the rules to the characteristics and operation of wind farms.

JW Great Lakes Wind LLC asserts that R.C. § 4906.20 does not contain an authorization to review a wind farm's cultural impact. Initial comments of JW Great Lakes Wind LLC at 10. Presumably, the commenter is referring to subsection (D) of proposed O.A.C. § 4906-17-08, labeled "cultural impact." This subsection would review the wind farm's environmental impacts on registered landmarks and recreation areas. R.C. § 4906.20(B)(2)

authorizes the Board to review these impacts using "reasonable regulations regarding . . . an economically significant wind farm, including, but not limited to, their location, . . . aesthetics, recreational land use, [and] wildlife protection. . . ." Even if the authority in R.C. § 4906.20(B)(2) were limited to a wind farm's characteristics and operation, this would be ample authority to regulate the effects that a wind farm's characteristics and operation have on landmarks and recreation areas.

JW Great Lakes Wind LLC also argues that the draft rules are inconsistent with Executive Order 2008-04S, which instructs state agencies to exercise common sense in rulemaking. Initial comments of JW Great Lakes Wind LLC at 2. As the Board represented in its September 15, 2008 order soliciting public comments on the draft rules, the Board has considered the executive order's principles in drafting these rules. As explained later in these reply comments, the Board's proposed reviews of need and alternative site selection are necessary, common sense provisions to protect the public from the ill-effects posed by poorly sited or badly operated wind farms. *See* Comments 6-7, pages 8-9 below.

2. Proposed §4906-1-01(U): AWEA proposes to eliminate the 50 MW ceiling from the definition of "wind farm." By doing so, the term "wind farm" would encompass both Economically Significant Wind Farms (as defined in R.C. § 4906.20) and facilities of greater capacity. Such a change is unnecessary provided the Board has concluded that wind power facilities with an aggregate generating capacity of > 50 MW are major utility facilities. If that is the case, wind power facilities with > 50 MW generating capacity are already covered under the Board's existing rules.

The practical application of AWEA's proposed change to the definition of "wind farm" is found in its next proposal to delete the term "wind farm" in O.A.C. § 4906-5-04(C) . AWEA's rationale for this change is that R.C. § 4906.20 does not authorize the Board to require an alternatives analysis for Economically Significant Wind Farms. As discussed above, *UNU* does not agree that the Board lacks this authority. Ironically, the combination of AWEA's proposed change to the definition of "wind farm" and its proposed deletion of the term in § 4906-5-04(C) would not only strip the Board of the ability to require an alternatives analysis of Economically

Significant Wind Farms, but also larger wind farms that the Board deems to be major utility facilities. For these reasons, AWEA's recommended changes to these sections are unwarranted.

3. Proposed § 4906-17-01: UNU wishes to address several comments regarding this proposed rule.

Mr. Tom Stacy recommends deletion of the phrase "with a single interconnection to the grid" in subsection (A). Initial Comments of Tom Stacy at 1. UNU acknowledges that such a change is not feasible with regard to wind farms of less than 50 MW capacity, since the single interconnection language is found in the definition of "Economically Significant Wind Farm" in R.C. § 4906.13. Mr. Stacy's comment has merit, however, with respect to larger wind farms that the Board deems to be major utility facilities. Unless Economically Significant Wind Farms and larger facilities are regulated on even footing, developers of large facilities may include more than one interconnection to the grid in an attempt to circumvent more stringent regulation. Similar environmental regulatory programs such as the Clean Air Act and the National Environmental Policy Act strictly prohibit circumvention through project segmentation or "disaggregation." In the case of the Board's proposed wind power rules, UNU suggests that this problem can be eliminated in several ways:

(i) The Board can regulate Economically Significant Wind Farms in the same manner as major utility facilities in order to eliminate any incentive to circumvent. UNU believes this approach is preferable because there is no legal or practical reason for Economically Significant Wind Farms to receive less stringent review than larger wind farms.

(ii) If the Board concluded that different levels of review are warranted, the rules should be amended to utilize the terms "Economically Significant Wind Farm" and "Major Wind Power Facility" (or a similar term).

Buckeye Wind recommends that the definition of "Wind Power Facility" be revised to include anemometers, presumably to bring anemometers within the exclusive jurisdiction of the Board and thus to preclude local zoning. Initial Comments of Buckeye Wind LLC at 2. UNU disagrees with this proposal. Anemometers are not directly essential to the operation of wind

turbines, the generation of electricity, or the transmission of electricity from individual wind turbines or from the overall facility. Furthermore, if anemometers are to be deemed part of the facility itself, an applicant would need to obtain a certificate of environmental compatibility and public need before constructing the anemometers. Since anemometer data is needed to assess the viability of the project from the outset, such an approach does not appear to make sense.

4. Proposed § 4906-17-02(A): Buckeye Wind suggests that any siting consideration "be done in conjunction with consideration of the project's potential benefits to the community as a whole." Initial Comments of Buckeye Wind LLC at 3. This suggestion appears innocuous at first glance, but is in fact an invitation for the Board to approve projects without ensuring that host communities are adequately protected. This is best illustrated by Buckeye Wind's requested revisions to § 4906-17-08(A), where Buckeye Wind again suggests that the Board should consider health and safety impacts "relative to the weight of the project's benefit to the community as a whole." Initial comments of Buckeye Wind LLC at 9. It is noteworthy that Buckeye Wind's use of the term "benefit to the community as a whole" is far broader than local community benefits, and would include "economic benefits, energy security for Ohio and the country, and emission reductions." Buckeye Wind's proposal would allow broad, undefined considerations of national geographic scope to trump the well-being of residents and businesses in the immediate vicinity of proposed wind farms. The Board should not allow public benefits—particularly economic benefits—to override public protection. This is precisely why the wind siting rule package should include objective minimum siting criteria to ensure adequate public protection from project impacts such as noise and shadow flicker.

Buckeye Wind further suggests that the potential impacts of a proposed facility should be considered relative to emission reductions resulting from that facility. Initial Comments of Buckeye Wind, LLC at 3. UNU acknowledges that wind turbines do not emit air pollutants such as CO_2 at the point of generation. However, assessment of national emission reductions from wind power generation is a very complex matter, requiring consideration of the degree to which wind generated power can displace conventionally-generated power over the national supply system on a minute-by-minute basis. Stelling, *Calculating the Real Cost of Industrial Wind Power*, www.wind-watch.org/documents/calculating-the-real-cost-of -industrial-wind-power at 4 (2007). Because fossil-fuel based generation remains necessary to stabilize the electrical supply

system even while wind-based energy is accepted into the grid, there is not a direct correlation between wind-based power generated and CO_2 emissions avoided. In fact, one authority has stated that a substantial part of theoretical CO_2 reductions from wind-based generation does not accrue in practice. *Id.* This is yet another reason to use caution in balancing project impacts against claimed benefits, whether real or theoretical.

5. Proposed § 4906-17-03(A)(1)(a): JW Great Lakes Wind LLC states that an applicant should not be required to specify the type or number of turbines in the application, but rather should be permitted to submit that data at a later time prior to issuance of a certificate. Initial Comments of JW Great Lakes Wind LLC at 6. Information on turbine type (including turbine height and rotor diameter) is essential to the Staff's evaluation of project impacts such as noise, blade throw, ice shedding, and aesthetics. Manufacturer safety specifications cannot be determined without information on the turbine type to be used for the project. Furthermore, information on the number of turbines, the locations of all such turbines, and siting alternatives for each, is essential to the Staff's assessment of the siting of, and mitigation of impacts from, each such turbine on surrounding receptors. For example, the Staff cannot evaluate shadow flicker or noise impacts on adjacent landowners without knowing how many turbines will be sited in the vicinity, and at what locations. Not only should the applicant be required to specify the type and number of turbines, but also the manufacturer(s) and model(s) of the proposed turbines and the entity to be used for construction or operation of the facility. This information is important to evaluate any relevant specifications, recommendations, or practices relating to public safety and environmental impacts. Initial Comments of Union Neighbors United at 4, Comment 4

6. Proposed § 4906-17-03(A)(3): One commenter objects on legal grounds to the requirement that the applicant submit a brief description of the need for new transmission lines. As discussed above, there is no legal impediment to the Board's consideration of this issue. As a practical matter, consideration of need is appropriate to ensure that the wind power project is viable. As the Board is aware, actual power generation from wind power facilities is considerably lower than the nameplate capacity of the wind turbine generators themselves. According to Staff, the capacity factor of Ohio's existing wind power facility is approximately 25% of nameplate capacity. Despite these limitations, there are strong economic incentives for

developers to site wind power facilities, given Ohio's renewable portfolio standard and the likelihood of similar legislative and tax incentives at the federal level. In order to prevent speculative projects that would offer meager generation but major local impacts, the Board should ensure that proposed wind facilities, and their associated transmission lines, are viable and needed.

7. Proposed § 4906-17-04: As discussed above, there is no legal impediment to the Board's consideration of site alternatives for Economically Significant Wind Farms under R.C. § 4906.20. In addition to legal objections, however, several commenters assert that a site alternatives analysis is unnecessary or impractical. Although UNU agrees that this rule needs clarification, *see* Initial Comments of Union Neighbors United at 5-7, UNU strongly disagrees that the alternatives analysis should be dispensed with entirely.

Several commenters suggest that a site alternatives analysis is infeasible or impractical because, in the words of counsel for JW Great Lakes Wind LLC, "the energy resource IS the site." Initial Comments of JW Great Lakes Wind LLC at 7. However, simply because wind resources may be concentrated along a 40-mile ridgeline—as is the case in western Ohio--does not mean that alternative sites along ridge cannot or should not be considered. Nor is it an excuse simply to declare categorically that "the [wind] industry does NOT perform formal site alternative analysis." *Id.* Alternative facility locations, facility boundaries, or facility densities can and should be considered wherever possible.

FPL Energy urges the Board to eliminate the alternatives analysis because "unlike fossil-fired electric generating units, wind generation sites generally cover tens of thousands of acres. . . ." Initial Comments of FPL Energy, LLC at 2. To the contrary, this is precisely why an alternatives analysis is needed. The geographic scale of commercial wind farms, and their impacts on their host communities, will be vastly greater than electric generating facilities reviewed by the Board to date. The scale of these facilities is not a reason to abandon alternatives studies. Rather, it is the reason they are essential.[1]

[1] FPL Energy also states that in its experience, it has not evaluated two alternative sites to the level of detail requested in the Staff's proposed rule. However, FPL may not have experience in siting wind power facilities in relatively densely-populated areas such as Ohio. On its website, FPL has published photographs of each of its 47 wind farm facilities. Http://www.fplenergy.com/portfolio/wind/plantfactsheet.shtml. Based on those photographs,

These commenters' objections underscore UNU's initial comments about the need for an alternatives analysis for individual turbine locations. Initial comments of UNU at 5-6. As proposed, § 4906-17-04 appears to call for a site alternatives analysis for the overall facility boundary, not individual locations of turbines and other elements of the project. If that is the intent of the rule, and assuming the wind industry and Ohio Farm Bureau Federation are correct that such site analysis may be impractical, then this rule will result in no meaningful alternatives analysis at all. And even if it is feasible to perform an alternatives analysis for the overall facility boundary, a micrositing analysis is still essential in order to assess the impact of each individual turbine and other facility element, and the interaction of multiple such elements, on nearby receptors. The Staff has stated that it intends to review the siting of each turbine within a wind facility, but the proposed rules do not appear to require sufficient information to evaluate micrositing alternatives. For these reasons, UNU recommends the revisions set forth in Comment 6 of its initial comments.

AMP-Ohio asserts that wind data assessments are "generally considered highly proprietary." Initial Comments of AMP-Ohio at 3. Wind data is not a "trade secret" eligible for protection under Ohio's Trade Secrets Act because such information can be reasonably ascertained by anyone who puts up an anemometer tower on a nearby property. *See* R.C. § 1333.61(D)(1). Anemometer data is critical to both the Board's and the public's understanding of the viability of a proposed project. UNU objects to its treatment as confidential proprietary information.

8. Proposed § 4906-17-05(A)(1)—The five-mile radius specified in the proposed rule is necessary for the Staff and Board adequately to assess aesthetic impacts. FPL and other commenters assert that the five-mile radius specified in the rule is unnecessarily broad. However, the aesthetic impact of wind power facilities would be far broader than the one-mile radius recommended by FPL Energy and other commenters. UNU recommends that the rule retain the five-mile radius in order for the Staff and in Board adequately to assess project impacts on nearby population centers, parks, recreational areas, residences, and businesses. That this

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only FPL's three facilities in Pennsylvania appear to have any proximity to nearby residences or businesses. FPL purchased at least two of those Pennsylvania facilities after they were constructed.

may require mapping of large geographic areas is simply reflective of the fact that wind projects impact large geographic areas, which other commenters readily acknowledge.

9. Proposed § 4906-17-05(A)(5): FPL Energy suggests deletion of the required information concerning high wind potential as "not applicable." Initial Comments of FPL Energy at 3. UNU disagrees. High wind data is directly applicable to the potential for tower collapse and blade throw. Champaign County is prone to high winds, as evidenced no only by the severe windstorm experienced in September 2008, but also by accompanying storms on June 13, June 21, and June 26 that were capable of generating winds of up to 60 mph, 55 mph, and 50 mph respectively. High winds are one factor contributing to the risk of physical injury and property damage from blade failure. Knight & Carver Blade Division, *Economic Benefits of Scheduled Rotor Maintenance* § 2.3.3 (June 7, 2006) (attached as Appendix 1).

10. Proposed § 4906-17-05(B)(3)(D): FPL Energy recommends making optional the photographic interpretation/artist sketches. Initial Comments of FPL Energy at 3. To the contrary, as stated in its initial comments, UNU believes a more robust aesthetic study is warranted than is provided for in this rule. Initial Comments of Union Neighbors United at 8, comment 8. UNU's position is supported by the National Research Council, which recommends visual impact analysis as part of the wind farm siting process:

> Excellent methods exist for identifying the scenic resource values of a site and its surroundings, and they should be the basis for visual impact assessments of proposed projects. Tools are available for understanding project visibility and appearance as well as the landscape characteristics that contribute to scenic quality. Lists of potential mitigation measures are also readily available. Nevertheless, the difficult step of determining under what circumstances and why a project may be found to have undue visual impacts is still poorly handled by many reviewing boards. The reasons include a lack of understanding of visual methods for landscape analysis and a lack of clear guidelines for decision making.

National Research Council, *Environmental Impacts of Wind-Energy Projects* 173 (National Academies Press 2007). The NRC publication contains an extensive discussion of various visual assessment methods, mitigation techniques, and guidelines for determining unacceptable or undue aesthetic impacts. *Id.* at 145-151. Appendix D of the publication sets 25 pages of recommendations for developing a visual impact assessment process for evaluating wind-energy

projects. *Id.* at 349-375.[2] Assessment of aesthetics should not, as FPL Energy suggests, be optional. Instead, UNU urges the Board to adopt the recommendations in its initial comments and to develop a protocol for aesthetics review guided by the recommendations of the National Research Council.

11. Proposed § 4906-17-05(B)(5): AMP-Ohio requests that this section be clarified to address situations where wind power facilities are developed in phases. UNU agrees with AMP-Ohio that this situation must be addressed to avoid circumvention of the certification process. *See* Initial Comments of Union Neighbors United at 9, comment 10. As UNU stated in its initial comments, a power siting certificate should be required for any expansion, modification, or repowering of a wind power facility. *Id.*

12. Proposed § 4906-17-05(C): Several commenters objected to supplying a copy of the turbine manufacturer's safety manual or similar document, claiming that this information is confidential. No commenter explained the basis for such confidentiality. This information would not meet the definition of a "trade secret" under Ohio's Uniform Trade Secret Act, R.C. § 1333.61(D)(1). In fact, relevant publications of GE Energy, Vesta, and Nordex can be found on the internet. Furthermore, it is UNU's understanding that this information is publicly available in the context of European wind farm certification proceedings. Information relevant to public health and safety should not be shielded as confidential, and this information is relevant to the Board's and Staff's review of facility impacts.

FPL Energy suggests that this information "will most likely not be known at the time of application" because "generating equipment is not chosen until the last minute." Initial Comments of FPL Energy LLC at 3. For the reasons discussed earlier, this information is essential to review and mitigation of impacts and must be provided in the application. Without this information--and without objective risk mitigation standards such as noise standards--the Board and Staff will have no basis upon which to order necessary risk mitigation for wind power projects.

[2] The fact that the National Research Council publication devotes more space to aesthetic issues than to any other project impact in its publication is an indicator of the significance of this issue.

13. Proposed § 4906-17-05(D): Several commenters objected to the requirement to provide system impact studies, and at least one commenter suggested that the Board should only require that the applicant have made an application to the system queue before submitting a certificate application under these rules. UNU disagrees. The requirement to provide system studies under this proposed rule is identical to requirements that the Board recently enacted with regard to applications for generating facilities. O.A.C. § 4906-13-04(D). Presumably the same delays would apply in the case of interconnection of a new fossil-fired generating utility. There is no reason to treat wind farms differently from other generating facilities with regard to submission of system studies. This information is important to assess the viability of the project. It should be noted that there are substantial questions regarding the current capacity of the PJM grid to accommodate additional interconnects in western Ohio at this time, as well as the required investments needed to expand the capacity of the grid. *See* www.pjm.com/planning/project-queues/queue-gen-active.jsp (queues R and S).

14. Proposed § 4906-17-06: Several commenters objected this rule on the grounds that it calls for information that the commenters deem confidential. Some proposed the addition of special provisions for the preservation of the confidentiality of this information. UNU opposes such amendments. Proposed § 4906-17-06 is identical in substance to the Board's existing § 4906-13-05 applicable to electrical generating facilities. The latter rule contains no special provisions for placing information under seal or otherwise giving confidential treatment to financial data. In the Board's recent review of its existing rules (Case No. 08-581-GE-ORD), the Board's final order enunciated its long-standing policy of making case-by-case determinations of confidentiality by means of protective orders. O.A.C. § 4906-7-07(H). There is no reason to deviate from that policy for purposes of these rules.

In its initial comments, UNU recommended that section 17-06 be revised to require the disclosure of each partner or member of an applicant which is an LLC or partnership. Initial Comments of Union Neighbors United at p. 10, comment 12. To illustrate the need for this requirement, it is worth noting that a commenter submitted individual comments in connection with this rulemaking without disclosing that he is a member and/or employee of a wind developer and has a financial interest in the outcome of these rules. Information on parent, subsidiary, or affiliate entities is also warranted because the list of wind development players in

Champaign County has evolved over the past two years, with the result that multiple entities of the same developer have offered and secured wind lease options for the same proposed project. In order to evaluate the viability and need for any wind power project, the Board and Staff must understand the relationship between all of the developer entities involved in the project.

15. Proposed § 4906-17-08(A): For the reasons discussed in Comment 4, pages 6-7, above, UNU strongly objects to Buckeye Wind's proposal to allow health and safety considerations to be discounted if the developer can demonstrate "community benefits." Note that Ohio EPA has enacted objective solid waste siting criteria to mitigate the impacts of landfills on ground water, surface water, and nearby properties. O.A.C. § 3745-27-07(H). Those solid waste siting criteria apply regardless of the proposed landfill's potential benefits to the state or the host community. Furthermore, objective siting criteria bring clarity to the siting process--clarity which benefits all parties involved, including the developer. If, as Buckeye Wind suggests, health and safety considerations should be measured on a subjective sliding scale measured relative to community benefit, every new wind farm siting proposal will be uncharted territory for the developer, the host community, and the Board, with no fixed criteria to guide planning or decisionmaking.

16. Proposed § 4906-17-08(A)(1): FPL Energy suggests elimination of the requirement to provide projected population estimates because wind farms do not store large quantities of hazardous materials. Initial Comments of FPL Energy at 3. This comment completely overlooks the relevance of such data in evaluating wind farm impacts such as noise, shadow flicker, and aesthetics, as well as impacts on the value of properties in the host community. FPL Energy's comment again calls into question its experience in siting wind farms in densely populated areas such as Ohio.

17. Proposed § 4906-17-08(A)(2): Numerous commenters objected to the treatment of wind turbine noise in the rule. For example, FPL Energy suggests that noise assessments and associated modeling should only be required in instances where state or local noise standards apply to the project. Initial Comments of FPL Energy at 5. There currently are no state noise standards applicable to wind turbines, and developers will argue that local governments have no authority to impose noise standards through zoning. Thus, FPL's position would result in no

controls on wind turbine noise whatsoever, unless the Board enacts objective noise standards as urged by UNU in its initial comments.

Buckeye Wind opposes evaluation of noise levels at the facility boundary because "[w]ind facilities by nature are sited in areas characterized by open space which is not inhabited." Initial Comments of Buckeye Wind at 8. Ironically, Buckeye Wind is working to site a wind farm in Union Township, Champaign County. Far from being uninhabited, Union Township has an average population density of 51 persons per square mile according to 2000 U.S. Census data, and has grown significantly in population since 2000. Buckeye Wind further asserts that "maintaining even minimally restrictive noise levels at the property boundary would effectively eliminate the feasibility of developing utility scale wind facilities in most areas of Ohio." Initial Comments of Buckeye Wind at 8. This would not not be the case if developers are required to purchase or lease buffer areas in order to ensure setbacks sufficient to mitigate noise impacts at adjacent nonparticipating property lines.[3] Such an approach is contemplated in the Staff's definition of "project area" in proposed § 4906-17-01.

Instead of evaluating project impacts at adjacent nonparticipating property lines, Buckeye Wind and other commenters advocate the assessment of noise and shadow flicker at nearby residences. For example, Invenergy suggests that Paragraph (A)(2) should evaluate noise levels and potential shadows "at the most sensitive receptors, which in the case of a wind farm, are the off-site residences." Initial Comments of Invenergy at 15. But a residence is not a "receptor." People are receptors, and they are not confined to their homes 24 hours a day, seven days a week. They play and work outdoors and in other buildings on their properties. They engage in recreation at nearby parks, golf courses, and other facilities. To limit noise and shadow flicker assessments to residences overlooks the basic fact that people move about and can be affected by project effects in a variety of contexts. UNU firmly maintains that evaluation of, and mitigation

[3] UNU would not object to a provision in the rules allowing noise standards to be waived by landowners participating in a wind power project by lease.

of, all project impacts should be done at the boundary of the "project area" as defined by the Staff in the proposed rules.

Buckeye Wind further asserts that the rules should not specify the types of noise to be modeled, but that the modeling should simply be based on "generally-accepted computer modeling software or similar methodology." In response, UNU respectfully suggests that the Board and Staff should decide what data is needed for its noise evaluation, and include sufficient specificity in its rules to ensure that it receives that data in the application. Ohio EPA and U.S. EPA take this approach in the context of air quality modeling, where both agencies list recommended modeling software for use in permit applications. 40 C.F.R. Part 51, Appendix W; O.A.C. § 3745-31-18; OEPA Engineering Guide 69, "Air Dispersion Modeling Guidance" (2003). Furthermore, for the reasons set forth in UNU's August 4, 2008 recommendations to the Staff, UNU disputes Buckeye Wind's assertion that low frequency noise from wind farms is inconsequential. Initial Comments of Union Neighbors United, Appendix B at 6.

CONCLUSION

For the foregoing reasons, Union Neighbors United recommends that the above comments and changes be considered and adopted by the Board as it finalizes the wind turbine siting rules.

Respectfully submitted,

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APPENDIX 1

ECONOMIC BENEFITS OF SCHEDULED ROTOR MAINTENANCE

PREPARED FOR
AMERICAN WIND ENERGY ASSOCIATION
WINDPOWER 2006

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1.0 INTRODUCTION

Traditionally, wind blades have been overlooked as a part of a wind turbine that needs maintenance. Blades are meant to last 20 years. After they are mounted on the turbine and begin service, they are expected to last the life of the turbine, baring lightning or other natural disasters that might affect the blade. Since the blade does not have mechanical parts (or so it seems), oil changes and other mechanical maintenance is not needed.

Blades need another type of attention that may not be immediately evident when purchasing a turbine. They need a scheduled maintenance followed by preemptive blade repair.

Before observing a case study, it is important to know what causes blade problems and what those problems are.

2.0 CAUSES OF BLADE PROBLEMS

We will discuss four major causes of blade problems: Engineering, Manufacturing, Natural Causes and Improper Operations and Maintenance

Figure 1 A catastrophic failure that needs to be prevented

2.1 Engineering

2.1.1 *Pressure from management to lower costs*

The engineering department designs wind blades. The management of the company needs to make a profit. Many times there is a lot of pressure from the management to design a cheaper machine which enables the turbine manufacturer to make a larger profit (or a profit at all). When this happens, the engineering department starts to look for ways to make the blade cheaper. Many times the design has not ended as the designer wanted and compromises had to be made. Sometimes, these compromises later result in premature problems in the blade. Some blades, for example had the root diameter reduced which saved money on the cost of the hub and the blade. Later, it resulted in a fleet of blades being rebuilt because of problems due to a root too small for the size of the blade.

2.1.2 *Manufacturing changes without engineering approval*

During the development of the manufacturing process, new ideas are formed to better build the blade. These changes require engineering review and approval. If engineering agrees without enough knowledge, the blade's integrity can be compromised.

2.1.3 *Manufacturing challenges*

Sometimes to reduce cost, weight or just to build a more complex blade, the engineering department expects too much of manufacturing. Processes that are very difficult make it through design. These are minimized when there is a system cooperation and communication between the design and manufacturing team.

2.1.4 *Design restrictions cause marginal design*

Many times the designer is restricted by the rest of the turbine. Tower clearance is always an issue which causes the design to be stiffer. The size of the shaft and bearings may restrict the weight of the blade. Many factors must be taken into consideration during the blade design. Too many restrictions can cause a marginal design.

2.1.5 *Safety margins are reduced*

During any phase of the blade design when there needs to be compromise, the safety margin of the operating loads is reduced. Since the actual operating and static loads are not always predicted accurately, the blades can be damaged because of this reduction in safety margin.

2.2 Manufacturing

2.2.1 Non-compliant materials

To save costs, a manufacturer can look for cheaper gel coat, resin or fiberglass. Sometimes these materials do not meet the design criteria by which the blade was designed. This can cause a perfectly built blade to fail sooner.

2.2.2 Inadequate quality control

One of the biggest causes of blade problems is the lack of quality control during manufacturing. As the blade is manufactured, there must be check points that are passed before the manufacturing process can be continued. When these check points do not exist or are ignored, problems can occur. Many times, the problem is not evident and the original quality control process was not set up to determine that fault. As production evolves, so must the quality control system that will uncover problems. Many times dozens of blades are made with a defect that could have been caught if it were part of quality control procedures.

2.2.3 Changes in the fabrication process

When manufacturing decides to change some thing in the process, engineering must be brought into the process. When this loop is not closed, the blades can have problems that the production team cannot see. An example would be when the blade in the field is found to be too flexible and it strikes the tower. Manufacturing decides that all they need to do is add some glass to stiffen the blade. Now the tower strike problem is solved. Later when the gearboxes start to break, it is found that the frequency of the blade has changed and put it into resonance which causes greater loads on the gearbox.

2.2.4 Manufacturing process is too difficult

If the manufacturing process is made difficult, then there is little chance to have a process that is repeatable.

2.3 Natural Causes

2.3.1 *Lightning*

Lightning is the major problem in early blade destruction. When lightning strikes a blade, the current is transferred to the turbine if the lightning protection system is working properly. Even if it is, there can be an accumulation of water in the tip which is vaporized upon the lightning strike. This steam pressure causes the blade to explode and open up. Many times this is a catastrophic failure. Even though nature cannot be controlled, the lightning system of a blade can be checked for continuity and the tip's drain holes cleared of debris.

2.3.2 *Airborne Particles*

As the blade turns it is striking particles in the air. The tip speed of a blade is in excess of 70 meters/second in many cases. At that speed, the particles in the air cause abrasion to the leading edge. The leading edge bond can be compromised causing it to split open. Even if the damage is not structural, the loss of energy due to eroded leading edges can be substantial.

2.3.3 *High Winds & Wind Shear*

Normally with the modern wind turbine, the blades feather as the wind increases. When the wind becomes too strong, the blades are feathered until the turbine stops entirely. Strong shear winds or big gusts can push the blade past its design loads. Also, very high winds can damage blades in the static state.

2.3.4 *Fatigue*

If the blade has reached its fatigue life, you are the happy owner of a well-built blade operated correctly.

2.4 Improper Operation and Maintenance

2.4.1 *Overpowering*

Many wind farm operators have set the controllers to let the turbines run in higher and higher winds. There is a big temptation to do this because it is a time when the production can be increased dramatically. However many times when the machine is overpowered, the blades begin to fail.

2.4.2 *Runaway*

When the machine pitching system fails, the brakes on many machines will not stop the rotor. On other machines when there is a power failure the blades also cannot be stopped. When this runaway occurs, the blades continue to spin out of control until either the wind slows or a blade(s) are thrown.

2.4.3 *Lack of Preventative Maintenance*

This brings us to the main topic of this discussion. Preventative maintenance of blades can be a large factor in reducing operating costs over the life of an turbine. Taking the time to find small problems and to repair them while they're still small saves costly down-time and expensive repairs later.

3.0 BLADE DAMAGE

3.1 Common Types of Damage

3.1.1 Leading edge erosion

The erosion of the leading edge causes the airfoil to change. As it worsens there is a reduction of energy capture which has been found to be 5% or more.

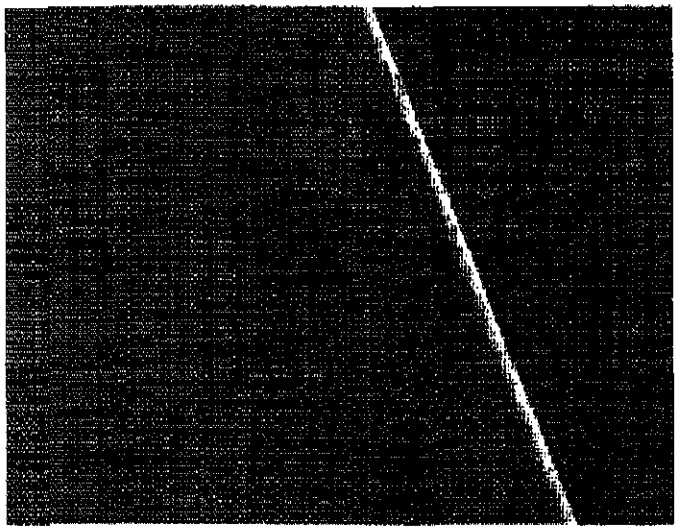

Figure 2 Typical leading edge erosion which is easy to repair in this stage.

Leading edge damage is easy to repair in the early stages when inspecting the blades or performing scheduled maintenance

3.1.2 Split leading edge

If the blades are not repaired soon after a leading edge split is found, the split eventually gets long enough to open up and catch the air. When this happens, the skins come apart, and break away. Typically about 6 feet of blade skins are lost and the blade can be repaired. If more is gone, the entire blade may need replacement.

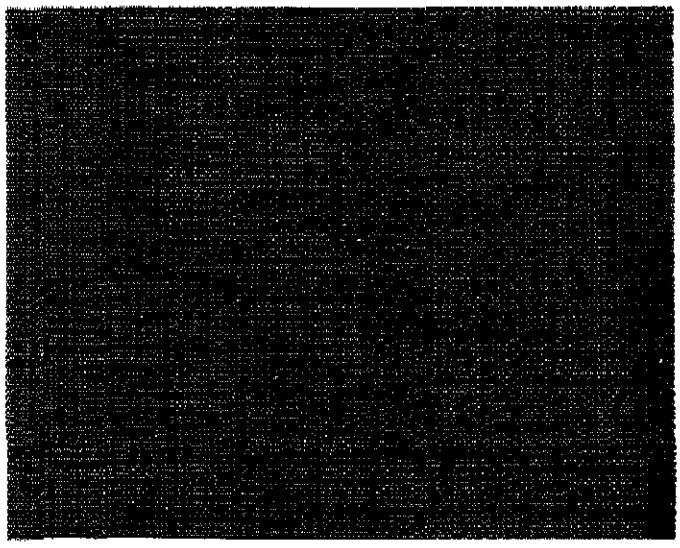

Figure 3 Small crack forming on the leading edge

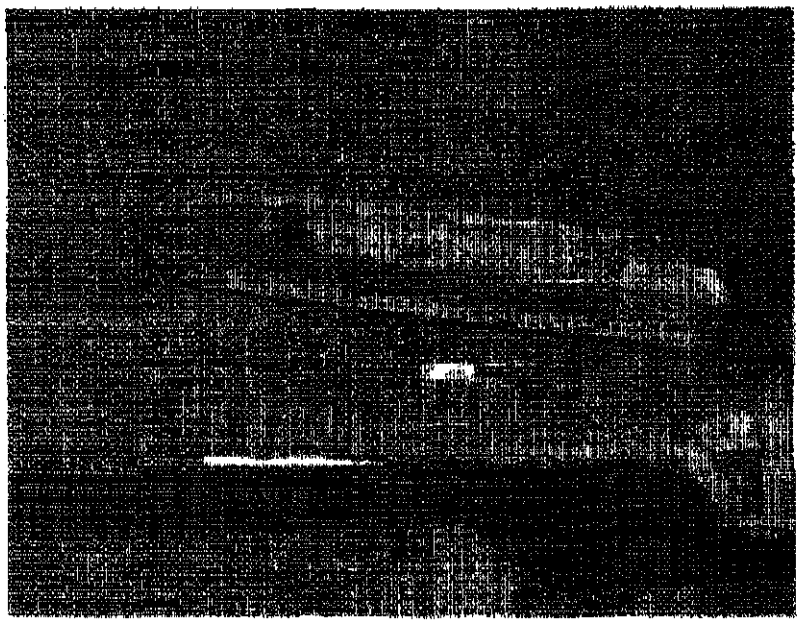

Figure 4 Skins delaminated from the spar

3.1.3 Trailing edge damage

Trailing edge damage can be treated easily in the early stages

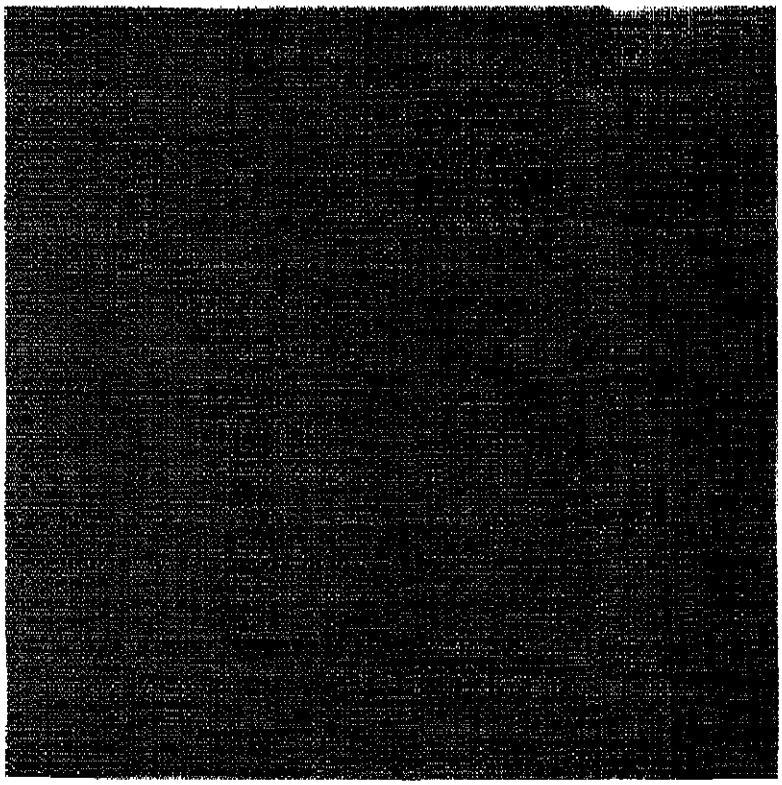

Figure 5 Small trailing edge damage

If left unattended, small trailing edge damage can lead to larger problems. In the following photo the crack split the blade chord wise until it reached the spar. The split then continued along the spar. This blade was very close to a catastrophic failure.

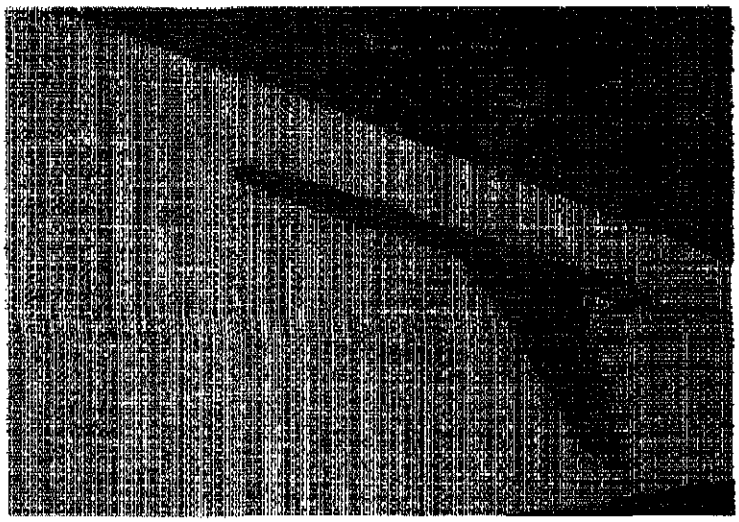

Figure 6 Crack run from the trailing edge to the spar and then along the spar

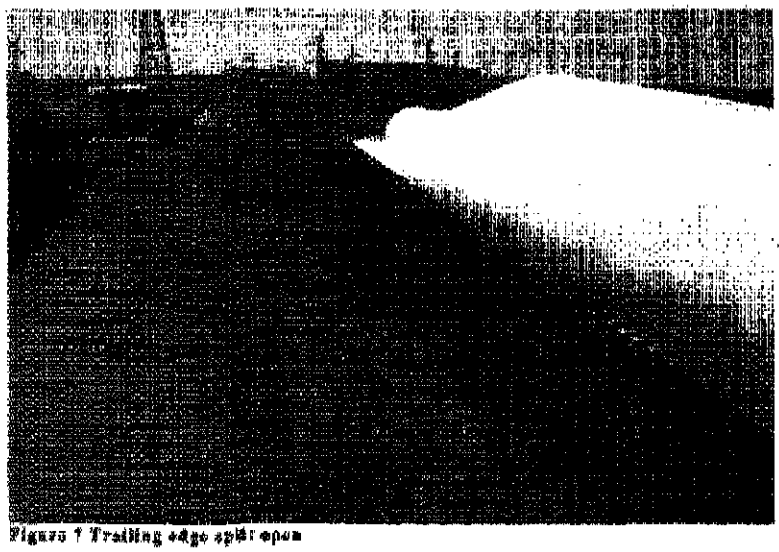

Figure 7 Trailing edge split open

3.1.4 *Root fractures*

Root fractures must be detected early because a root failure always causes catastrophic failures. This blade's root crack has grown until it is doubtful it can be repaired.

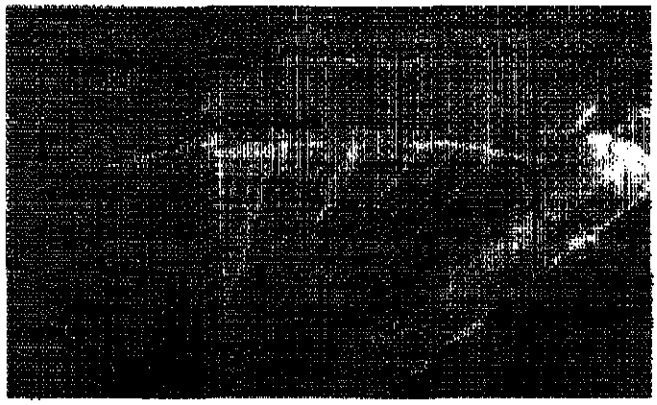

Figure 8 Interior of crack near root

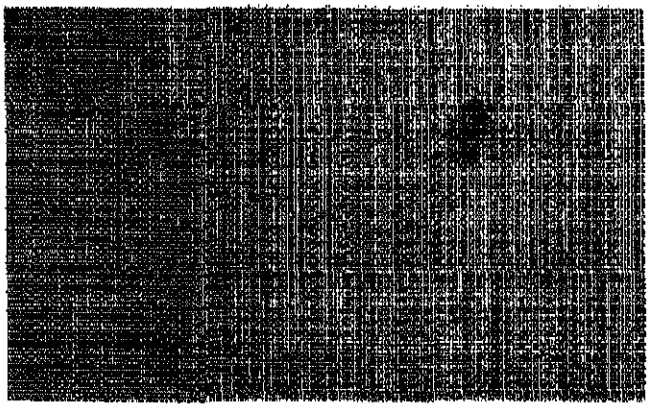

Figure 9 Exterior of the same crack near root

3.1.5 Surface cracks

Even the smallest crack can allow water to enter the composite. This water can freeze causing a quick deterioration of the coving. All small cracks can grow larger eventually causing buckling of the panel and the blade.

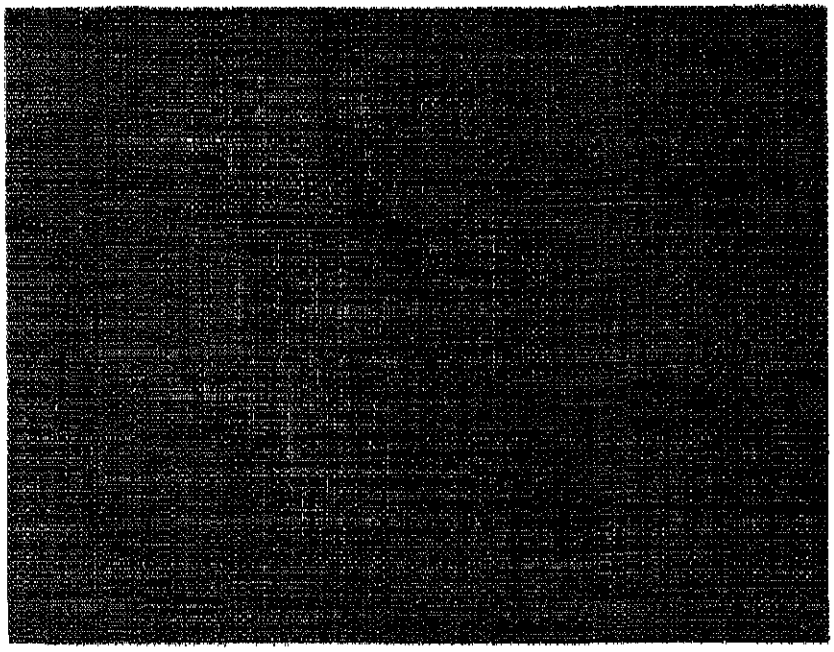

Figure 10 The beginning of a surface crack

3.1.6 Lightning damage

Lightning system damage may have been caused by lightning. If the receptor is faulty or missing, then the blade is susceptible to destruction if lightning strikes it again. It has been proved that lightning will strike some turbines numerous times while others in the same farm will never be struck. That makes it even more important to repair the lightning system when is is found to be damaged.

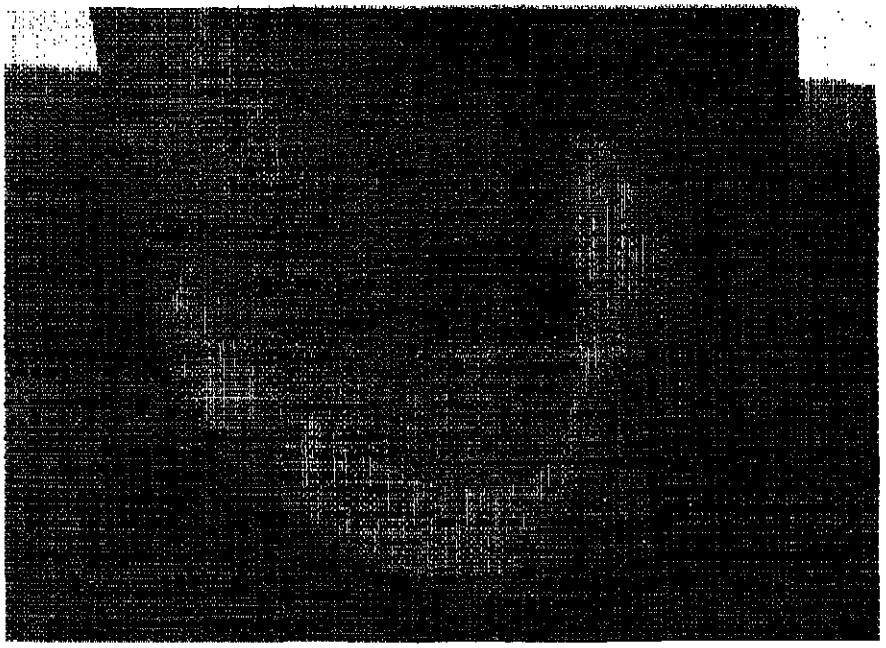

Figure 11 Lightning receptor that protected the blade once and now must be replaced

4.0 ROTOR REPAIR

4.1 Crane Comparisons

4.1.1 Large expensive cranes are needed for rotor replacement or to bring down blades for major repairs

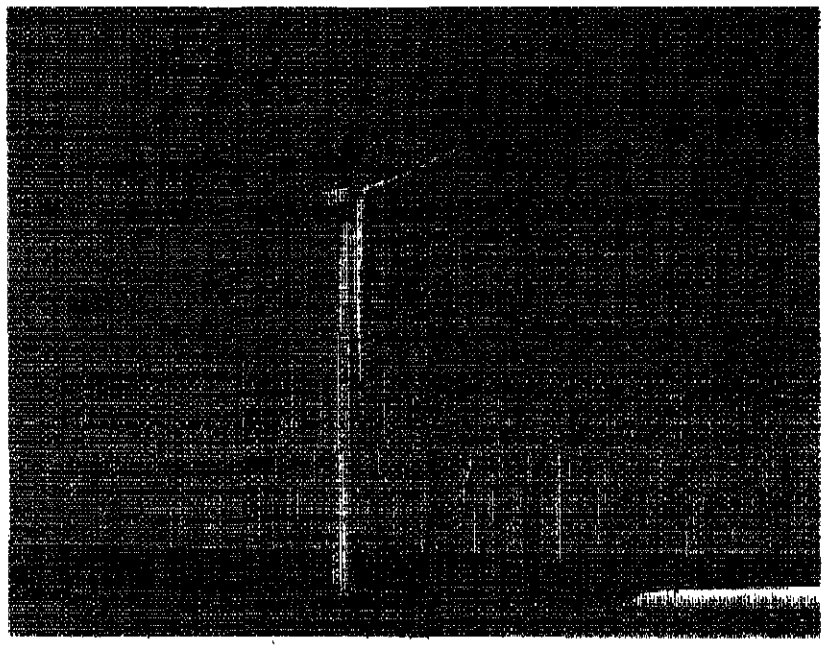

Figure 12 Large crane installing a rotor

4.1.2 Smaller cranes are used for inspection and up-tower repairs

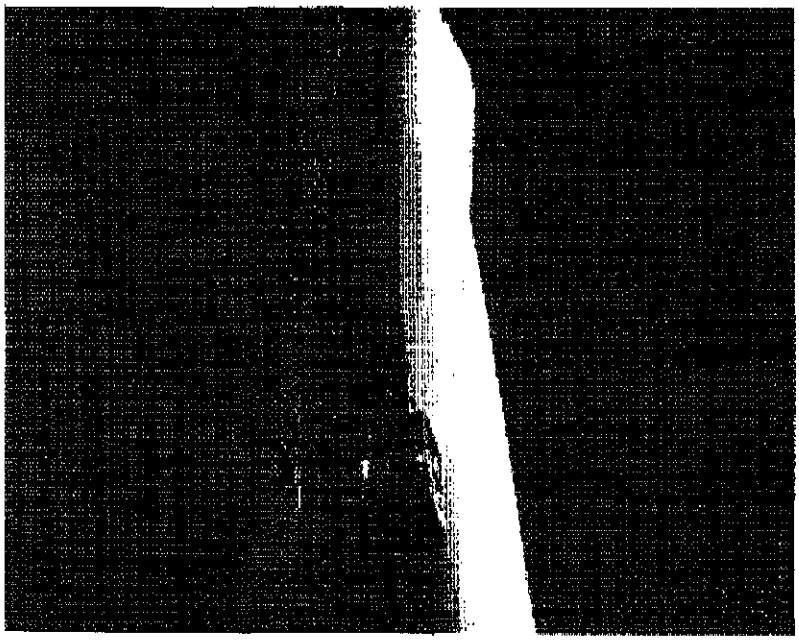

Figure 13 Crew in a basket repairing a blade up-tower

4.2 Two Approaches to Blade Maintenance

Two approaches will be discussed regarding blade maintenance

4.2.1 *Do Nothing*

This approach is most common in the operation of wind farms. Unless something drastic happens, the blades are left on the turbine until an obvious problem is found. The turbine is then stopped and the blade problem resolved. This approach saves the cost of inspections. The problem is when these problems occur; it most probably is the windy season. As soon as the turbine is off line, there is a loss of revenue.

The costs of repairs are always higher. To have a blade problem of this type that has noticeable damage usually leads to costly repairs later. With luck the blade can be repaired up-tower. If not, a larger crane is brought in and the damaged blade removed. Many times the blade must be brought to a shop which adds shipping cost. These repairs can take time and unless the operator is prepared with a spare blade, the loss of revenue is substantial.

4.2.2 *Scheduled Maintenance*

During the season of calm winds, rotors are scheduled for inspection/repair. When the rotors are inspected there is an up-front cost that is spent. When the inspections are complete, the crane can remain to allow minor repairs to be carried out. In this scenario a smaller crane is used to hoist up men in a man basket. The loss of revenue is nil because the activity was scheduled. An additional benefit is that the leading edge erosion can also be repaired at the same time. This will allow the turbine to be more efficient for the up coming windy season.

The recommended approach is for the O & M technicians to record observations throughout the year. Some blades may be suspect because of discoloration or an odd noise. These are the turbines that will be inspected first. As time and money permit, samplings of the turbines are inspected. These inspections should occur first before the warranty is over. The turbine manufacturer will then be responsible for repairs. After that, inspections should come at least semi-annually unless something is noticed. Even though the blades repaired at the early stages of damage could be run for another year or two, the repairs are relatively inexpensive and larger damage is prevented.

Using a case study, the following information is shared to demonstrate how preventative maintenance saves money in the long run. The figures are based on experience and the actual experience could vary. But even if the result of doing no preventative maintenance is halved, there is still a considerable savings.

4.2.3 *Comparisons*

Before going to the comparison charts it will be necessary to show how the costs were determined. These costs can vary but reflect the average cost of a wind farm inspection and repairs as needed. The examples are of a site with 50 turbines between 600kw and 800kw in an area of seasonal winds

4.2.4 *Site inspection costs*

These costs are based on a technician traveling to the site and inspecting as many blades as he can within one week. Depending on the area of the country you are in, the crane costs could vary. The travel cost of the technician could also vary.

Site Inspection Costs	
Labor	$4,000
Expenses	$2,000
Crane	$15,000
	$21,000

Figure 14 Summary of the cost basis of a site inspection

4.2.5 *Repair costs compared*

Not only is there a big cost saving when small repairs are carried out, there is no loss of revenue. Since repair costs can vary widely, a conservative cost basis is used here. Actual repair costs can be substantially higher when the blade is removed and brought to the shop.

Repair Costs		
	Scheduled	Unscheduled
Labor	$600	$6,000
Materials	$300	$800
Expenses	$400	$2,000
Crane	$1,500	$6,600
Loss of Revenue	$0	$3,600
	$2,800	$18,800

Figure 15 Comparison of small repairs carried out in the off season with unscheduled repairs during the windy season

4.2.6 Replacement costs

Blades are not replaced only due to lightning strikes. Many times the blade is left unattended and fails. Most of the time it fails at an inopportune time during the windy season. In our cost basis an expense was assigned not only for the cost of the blade, but for removal and replacement of the blade and loss of energy. This is assuming a blade is available. If spare blades are not available, then the loss of energy capture will be more.

Replace Blade	
Blade	$60,000
Installation	$10,000
Loss of Revenue	$15,000
	$85,000

Figure 16 Blade replacement costs

4.3 Scheduled Maintenance Costs-50 Turbines

The following chart represents maintenance costs over the life of a wind farm. Scheduled inspections occur bi-annually after the warranty period during the calm season. As minor problems are found, they are repaired promptly. All repairs are completed while the crane is onsite for inspections. Even though inspections find most of the problems, some unscheduled repairs cannot be avoided and the costs included in this study. During the life of the wind farm, almost 1/3 of the blades have seen some repair.

YEARS	INSPECTION	REPAIR	REPAIR BREAKDOWN
5	$21,000	$14,000	5 SCHEDULED
7	$21,000	$14,000	5 SCHEDULED
9	$21,000	$33,000	5 SCHEDULED+1 UNSCHEDULED
11	$21,000	$33,000	5 SCHEDULED+1 UNSCHEDULED
13	$21,000	$33,000	5 SCHEDULED+1 UNSCHEDULED
15	$21,000	$33,000	5 SCHEDULED+1 UNSCHEDULED
17	$21,000	$33,000	5 SCHEDULED+1 UNSCHEDULED
19	$21,000	$33,000	5 SCHEDULED+1 UNSCHEDULED
TOTAL	$168,000	$226,000	$ 394,000.00 (46 REPAIRED)

Figure 17 Estimated scheduled blade maintenance costs for a 50 turbine wind farm

4.4 Unscheduled Maintenance Costs-50 Turbines

The following chart represents maintenance costs over the life of a wind farm. Scheduled inspections do not occur as problems are found, they are repaired. Most failures occur during the windy season. Major failures cause blade replacement to become necessary. During the life of the wind farm, almost 1/3 of the blades have seen repairs.

YEARS	INSPECTION	REPAIR	BLADES REPAIRED	REPLACED	BLADES REPLACED
5	$0	$0	-	0	0
7	$0	$38,000	2	0	0
9	$0	$57,000	3	85,000	1
11	$0	$76,000	4	170,000	2
13	$0	$76,000	4	85,000	1
15	$0	$76,000	4	170,000	2
17	$0	$76,000	4	170,000	2
19	$0	$76,000	4	85,000	1
TOTAL	$0	$475,000	23	765,000	9

Figure 18 Estimated unscheduled blade maintenance costs for a 50 turbine wind farm

4.5 Cost Implications with and without Scheduled Maintenance

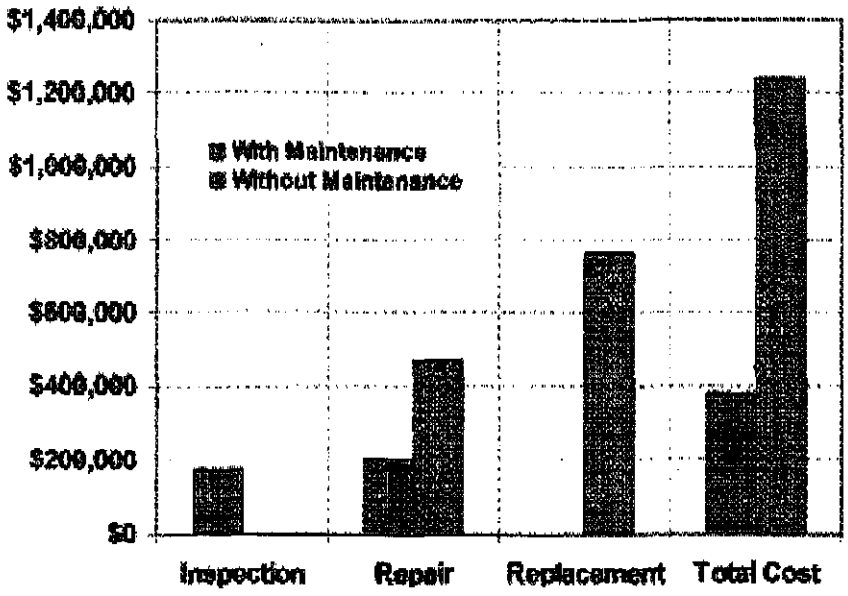

Figure 19 Where the money is spent

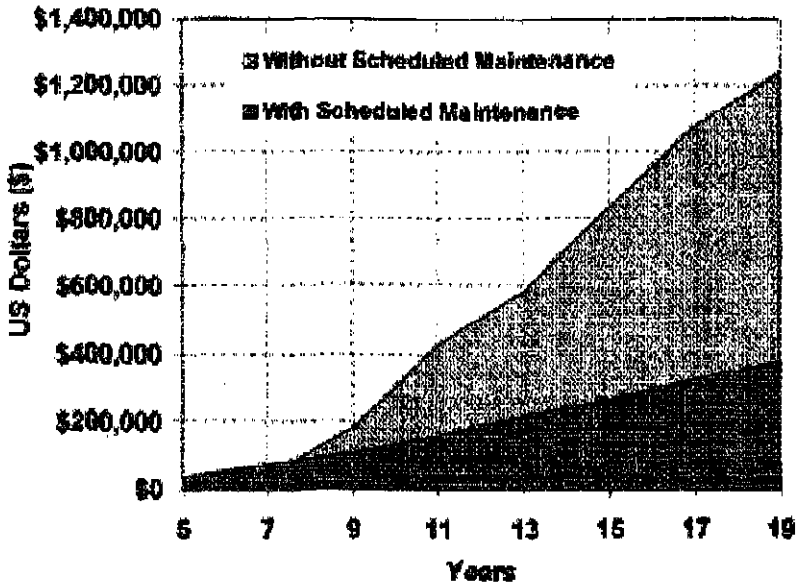

Figure 20 Cost comparison timeline

5.0 SUMMARY

Wind blades are a component of a wind turbine that need attention the same as any other part. The way blades are maintained is by inspections and observations that detect problems early. If these problems are repaired in a timely manner, large more costly repairs are avoided. The inspections and small repairs should be scheduled during the calm season avoiding loss of production. When these small problems are left unattended, larger damage occurs. Not only are these repairs much more costly, but since they normally occur during the windy season, loss of production adds to the cost. Some damage that is left unattended will result in blade failure. Not only is the blade costly, it may not be readily available. The loss of production is then multiplied.

With reasonable care, wind blades can last as long as any other part of the turbine.