

LEE COUNTY AD HOC COMMITTEE

Ron Conderman, Chairman
Craig Buhrow
Mike Pratt
Gene Bothe
Tom Fassler

Keith Bolen
Alan Pfeifer
Mark Wagner
Chris Henkel, Zoning Officer
Alice Henkel, Clerk

The Lee County Ad Hoc Committee met on Thursday, January 6, 2011, at 7:00 p.m. in the Old Lee County Courthouse, Dixon, Illinois. Chairman Ron Conderman called the meeting to order and Clerk Alice Henkel called the roll. The following members were present: Craig Buhrow, Mike Pratt, Gene Bothe, Tom Fassler, Keith Bolen, and Mark Wagner. Alan Pfeifer was not present.

Chairman Conderman asked if there were any changes or corrections to the minutes from the December 2, 2010 meeting.

Mike Pratt made a motion to approve the minutes and Gene Bothe seconded it. All were in favor.

Chairman Conderman explained that the purpose of this meeting was to review the standing rules of the wind energy conversion system involving Number 4 under the additional conditions for Special Use and setback requirements.

Chairman Conderman introduced Lee County Highway Engineer Dave Anderson.

Chairman Conderman asked Mr. Anderson if there is anything in the present ordinance that he would want to see changed based on his experience.

Mr. Anderson explained that the County has a special condition that states the roads will be put back to the satisfaction of the County Engineer. He feels this is a general and broad regulation, which is fine, because all the details are worked out in the road agreement between the County and the developer that the County adopts.

Mr. Anderson did have one suggestion. He thinks that the Zoning Board of Appeals and/or the County Board should not approve the zoning until a satisfactory road agreement has been approved by the County Board.

Chairman Conderman asked Mr. Anderson if that had not been done in the past. Mr. Anderson explained that, typically, the developer receives approval for zoning prior to a road agreement being negotiated and approved by the County. He would recommend that the road agreement be approved by the County Board, along with zoning.

Chairman Conderman asked Mr. Anderson whether or not he oversees the township roads. Mr. Anderson stated that he has no statutory authority for township roadways and that this authority belongs to the township road commissioners. He does provide technical assistance to the townships, if requested.

Mr. Pratt wanted to know how the County would go about obtaining a road agreement prior to receiving the zoning. Mr. Anderson explained that in order for a developer to obtain a Special Use permit, the County Board must vote on it. He would like to see the County Board adopt the road agreement prior to the approval of the Special Use or at the same time.

Mr. Fassler asked if the townships have to vote on the road agreement prior to the County Board. Mr. Anderson stated that the County does not govern the townships and that he is referring only to the County's road agreement with the developer. The County can not dictate what agreements the township road commissioners may enter into or may not enter into.

Mr. Buhrow asked how long it takes to negotiate a road agreement. Mr. Anderson explained that it depends. The developers have to gather a fair amount of information and how long it takes them to gather the information determines how long it will take to develop the road agreement. He mentioned that it could take three or four months.

Mr. Fassler confirmed that Mr. Anderson is only referring to the County roads. He asked if the townships enter into a road agreement with the developers. Mr. Anderson said the townships do enter into their own road agreement concerning the township roads.

Mr. Fassler asked if the townships basically use the County's road agreement. Mr. Anderson explained that, in the past, the township's road agreement was very similar to the County's Road Agreement.

Mr. Bolen asked Mr. Henkel if the County knows where the placement of the turbines will be at the time the Special Use is petitioned. Mr. Henkel stated that the general locations are known; therefore, the developer should know what County roads will be used to bring in materials.

Mr. Anderson concurred. He explained that the County needs to approve entrance locations; therefore, he does not care where the turbines are located within a field, just where the entrance points onto the County highway are located.

Mr. Wagner asked Mr. Anderson if, as County Engineer, he has other responsibilities other than roads. Mr. Anderson replied that the majority of his responsibilities is roads.

Mr. Wagner asked Mr. Anderson if he has overseen County road agreements in the past. Mr. Anderson has overseen road agreements between the County and the GSG project, the Big Sky Wind project, and the NextEra project.

Mr. Wagner stated that he questions the township's level because of a previous statement made by a member of this Ad Hoc Committee that the "township road guys" don't show up to meeting and are disinterested. Since that statement was made, Mr. Wagner has questioned a couple of "township guys" about why they didn't show up and about what their role in this process is. The answer Mr. Wagner got from pretty much everyone he spoke with was they don't feel that when they come to the Courthouse with their

township concerns that their voices are heard. They, therefore, choose to stay out of it because they say it's not going to do any good. Mr. Wagner feels that the township road commissioners do not understand that they do have some control over what happens. Mr. Wagner said that he may be talking about the "township guys" who haven't had road agreements yet, perhaps, he was not sure.

Mr. Wagner thinks there is a problem here that the township guys don't really understand that they have a certain amount of authority. Mr. Wagner stated he does not know how to remedy this, but as a concerned citizen, he is pointing that out.

Mr. Wagner said that "we" keeps hearing the local politicians say that the roads will be better, as if this is some reason why "we" should bring wind turbines in. It's used as a selling point that the roads are going to be better after the turbines are built than before the turbines were here. He hopes that everyone is smart enough to understand that wind developers don't come in to give the County new roads and that is not their purpose. He further stated that they are going to destroy the roads, and because they are going to destroy the roads, they know that they are going to have to fix those roads. Because they have to fix those roads, they want to control the fixing of those roads. Mr. Wagner said he, himself, is not too happy with the way things are handled and according to the research he has done, all over the country, the roads are not being repaired correctly, and it always came down to the road agreement being inadequate. He went on to say that the wind companies wrote the road agreement and that they want to write the road agreement. They educate local officials in saying that the officials shouldn't spend their time writing a road agreement, that they, the developer, will do that because it is better left to the developer.

Mr. Wagner said that what he doesn't understand is that the County has an opportunity to enforce a so-called road agreement, so why doesn't the County have a standard, stock road agreement. He said that this is not a complicated thing. Mr. Wagner thinks that one road agreement, the way that the County is going to handle a wind project, should be something that the County can set down as a template, outlining what Lee County does, not the wind developer coming forward and writing the road agreement.

Mr. Anderson referred back to Mr. Wagner's first point regarding the township road commissioners, as he feels his experience may be different from the conversations Mr. Wagner had. Mr. Anderson stated the township commissioners he has worked with do recognize the authority they have. Mr. Anderson has been fairly impressed with the input they have provided.

With regards to the wind developers writing the road agreement, Mr. Anderson said that that may have happened elsewhere but that it does not happen in Lee County.

Mr. Wagner wanted to know if it has not happened in Lee County, then why were the members of this committee sent a road agreement from FPL which, from what he understood, was written by them.

Mr. Anderson said that Mr. Wagner has misunderstood. He thought the road agreement was sent by NextEra because NextEra was at the meeting Mr. Anderson initially attended and they heard the concerns this committee had. They sent the road agreement that they had entered into with the County to this committee to provide an example. This agreement was mailed to this committee by NextEra but it was not written by them.

Mr. Wagner wanted to know if Mr. Anderson was saying that the County does have a road agreement. Mr. Anderson said, yes, and referred to the road agreement that had been sent to this committee. Mr. Wagner asked if this is the road agreement the County would use as a template or a starting point. Mr. Anderson said it could be a possible starting point. Mr. Anderson explained that the County does not have a standard template because the County has learned things from past projects such as where the difficulties lie, where the County may not have been adequately covered or where things were unnecessary. This allows the County to make the road agreements better with each project. Mr. Anderson feels that having a stock agreement in ordinance form would limit the effectiveness of the agreement.

Mr. Wagner wanted to know if the County allows the use of any synthetic materials in any road construction or repairs, such as plastics, rubber or new technologies. Mr. Anderson asked Mr. Wagner to what he was specifically referring. Mr. Wagner said that the reason he was asking was because at the most-recent "Advancing Wind Energy in Illinois" conference, there was a presentation given by someone talking about the roads, and that person was encouraging those in the room, many of which were wind developers, to take advantage of new technologies that use synthetic road materials. Mr. Anderson asked Mr. Wagner if the speaker was talking about geogrids. Mr. Wagner thought geogrids had been mentioned. Mr. Anderson explained that geogrids are a fairly proven technology. Mr. Anderson feels that geogrids can be a "win-win" if they are used. Mr. Anderson wondered if maybe a lot of what that speaker was referring to was not for use in public roadways, but in the roadways that lead from the public highway to the turbine. Mr. Anderson explained that a geogrid has the ability to leave a barrier between the aggregate and the soil, thereby reducing the amount of aggregate that needs to be placed in order to achieve the same level of strength. Mr. Anderson thinks this may be the "pitch" Mr. Wagner heard.

Mr. Bolen stated that the speaker, in fact, was referring to the access roads on private property, and not to the public roadways.

Mr. Anderson said that if there was a soft spot on a township road, he would be agreeable to using that technology, so long as the township road commissioner was also agreeable.

Mr. Wagner said the point that was well-made by the speaker is that it is much less expensive to use this sort of technology. Mr. Wagner did not see anything in the agreement that would allow that technology to be used.

Mr. Wagner wanted to know, even though Mr. Anderson may have already answered this, if Mr. Anderson feels he has enough authority under the current ordinance. Mr. Anderson thinks he does, particularly if the County has a road agreement in place prior to

a zoning decision being made. Mr. Anderson said that from his position as County Engineer, that he has as much authority as the County Board will allow. He works for the County Board who, technically by statute, is the highway authority.

Mr. Wagner said that when he hears the term ordinance, that he does not know what that means. He wanted to know whether or not there is a codified County ordinance for road agreements. Mr. Anderson stated there is no road agreement that is codified in an ordinance. The road agreement is a product of what the County has currently and that it is a requirement that the County places on a wind developer to satisfy the County Engineer in repairing the road.

Mr. Wagner stated that he had recommendations after reading the entire road agreement between the County and FPL. He would reference certain sections of this agreement.

Mr. Wagner read that the FPL road agreement states, "FPL has provided to the County Engineer a preliminary site layout plan for the project." Mr. Wagner wanted to know at what point is the final site layout plan approved. Mr. Anderson responded that he did not know, and that the reason it is preliminary is to give him an idea of where the turbines will be located. Mr. Anderson feels that is good enough for a road agreement because it provides some indication as to where the turbines will be and what roads the developers will be using. Mr. Henkel stated that at the end of the project, the County gets a final drawing, or an "as-built" of the entire project.

Mr. Wagner read that the FPL road agreement states, "there will be no increase run-off or change in drainage patterns as a result of the wind company's use of, repairs to, and removal of materials from the County roads." Mr. Wagner wanted to know what would happen if this did occur. Mr. Anderson stated that while it could possibly occur, it would be pretty rare. If it does, the developers would have to adhere to standards of the Bureau of Local Roads Manual. This manual contains a catch-all phrase that states when these repairs are done, they must be done in accordance with the Illinois Department of Transportation specifications and the Bureau of Local Roads. Mr. Wagner then asked the committee if he could recommend that this phrase be added, that the developers would have to refer to the Bureau of Local Roads Manual. Chairman Conderman asked Mr. Anderson if that was an automatic. Mr. Anderson confirmed that it is and explained they apply on a general basis, and not necessarily referring to roads. Additionally, the MPDS permit for the project would dictate the Erosion Control Standards the developer is to follow.

Mr. Wagner read that the FPL road agreement states, "the wind company shall, upon request, provide copies to the County Engineer of any delivery ticket bound for or delivered to the project site so that the County Engineer may monitor the actual weights of construction vehicles which do not require permits for overweight loads. Delivery tickets should identify their destination by turbine number." Mr. Wagner asked Mr. Anderson if he felt the production of delivery tickets should be automatic, rather than upon request. Mr. Anderson said he does not because he does not want to see "9,000 delivery tickets," which he means literally. Mr. Anderson explained to Mr. Wagner that there are roads that are "heavy haul routes" that are used for the big turbine components.

Some roads are “general haul routes” that are used for the aggregate trucks and concrete trucks. The County wants to have the ability to stop a truck and pull a ticket so that the County can be sure the developer is complying. Mr. Anderson referred to it as a “safety mechanism” for the County.

Mr. Wagner read that the FPL road agreement states, “the wind company shall coordinate with the County Engineer the scheduling of project construction traffic and weekly scheduled meeting which meetings shall include all affected parties, it shall be held at the offices of the wind company. The County may, but shall not be obligated, to have representative participate in such meetings.” Mr. Wagner asked if the township road commissioner should be invited to those meeting. Mr. Anderson stated that would have to be in the township’s agreement. The agreement Mr. Wagner is reading from is between the County and the wind company. Mr. Wagner wanted to know with whom the township has another agreement and if it was with the wind company. Mr. Anderson told Mr. Wagner yes and that it is almost identical to what he is reading.

Mr. Fassler wanted to know if it had to be similar to the County’s. Mr. Anderson said that it does not have to be similar but typically it is.

Mr. Wagner asked who get the final say. Mr. Anderson said that the township road commissioner does.

Mr. Wagner read that the FPL road agreement states, “if the County roads degrade while construction of the project is ongoing due to construction activities or the volume of construction traffic, the wind company, at the request of the County Engineer, shall cause necessary remedies to be implemented to ensure safe passage of the motoring public within reasonable time, in any event, within eight (8) hours.” Mr. Wagner asked, “What about after construction?” Mr. Anderson explained that the balance of that agreement is about that, after that paragraph.

Mr. Wagner read that the FPL road agreement states, “the County Engineer may impose a fine of \$500 for each fifteen (15) minute increment that the approved road closure period is exceeded. Mr. Wagner asked if that amount was set by him, by Lee County. Mr. Anderson said it was.

Mr. Wagner read that the FPL road agreement states, “the wind company shall be obligated to repair any road damage resulting from improper use of County roads by FPLE Illinois Wind or FPLE Illinois Wind’s parties.” Mr. Wagner asked who determines that the road needs to be repaired do to such damage. Mr. Anderson told Mr. Wagner that in that agreement, that there are video and still photos taken before construction. After construction, the roads are assessed based on this media as to whether or not the roads have been damage.

Mr. Wagner read that the FPL road agreement states, “work during the construction phase of the project or the post-construction repair phase is suspended for an extended period due to seasonal conditions or otherwise, the wind company shall take such measures as laying additional gravel, installing barriers, posting signs, providing interim

repairs or protections as may be reasonably required to render roads safe for vehicular traffic during the period such work is suspended.” Mr. Wagner stated that “the term ‘reasonably required’ always turns out to be trouble when you want to challenge something like this.” He asked Mr. Anderson if he felt there should be a little more stated than “reasonably require.” Mr. Anderson said it could and explained that this paragraph refers to when a project is completed in the late fall and there is damage to the roads. The County is not going to allow them to begin permanent road work until the next spring. Instead, the wind company must repair the roads so they are safe for vehicular travel during the winter months; and the permanent repair work is to begin in the spring or summer. Mr. Anderson said that that language, perhaps, could be “hardened” a little.

Mr. Wagner read that the FPL road agreement states, “that the wind company shall hold harmless, indemnify, defend, pay cost of defense including attorney’s fees, and pay any and all claims or judgments which may hereafter accrue against the County, County Board, etc., their agents, arising out of any of the use of the County roads by the wind company and their parties, and their respective successors or assigns, etc., etc., in connection with the construction of the project and repair and reconstruction of the County roads and all roadway impertinences.” Mr. Wagner asked for what period of time does this apply and what will happen after this period of time. Mr. Anderson said that this refers to a situation where there is repair being done to the roadway by contractor who has been hired by wind company, and an accident occurs involving a member of the general public. This is a “catch-all paragraph” that states the inevitable litigation that is to follow will be defended and any defense will be paid for by the wind company.

Mr. Wagner read that the FPL road agreement mentions “keeping the road safe for vehicular traffic during the winter months” and making the road higher. Mr. Wagner said that it does not state how high they can make that road and the fall-off angle of maintaining the ditches. Mr. Wagner said that he read that this has occurred in other counties and states and the roads were made too high, making the angle of the ditch dangerous, especially during the winter. Mr. Wagner stated that this limitation is not addressed. Mr. Anderson said that it is up to the County to determine what repairs should be done and if this happens, it is an inappropriate fix. In order to reverse this ineffective repair, it should be dug out and replaced with good rock and then pave it over. Mr. Anderson said that it could happen but it is a foreseeable error that would be avoided prior to the repairs being done.

Mr. Wagner read that the FPL road agreement talks about “regular and emergency contact information” and communicating that. Mr. Wagner wanted to know if that information could be made available to the public, via the County’s website. Mr. Wagner wanted to know who he should contact if he is driving and he sees something that could be dangerous. Mr. Anderson explained that the public should dial 911 in cases of emergency. 911 will then contact Mr. Anderson and then the maintenance department of the County’s highways is dispersed to rectify the situation. The wind company is then charged for any overtime and/or expense incurred by the County for the repair.

Mr. Wagner read that the FPL road agreement states, “an independent, pre-project roadway conditions survey shall be undertaken prior to commencement of the work and shall record the condition of the affected roads.” Mr. Wagner wanted to know who hires the survey company and who pays for that survey. The County can hire the company or the wind company can hire them; however, the survey company would have to be approved by the County if it is hired by the wind company. The County reviews everything the company does. Also, the County knows the length of the roads, and the width of the roads. It also provides the company with the information concerning what is underneath the roads because the County has all of that information on file. Mr. Anderson said the wind farm pays for the work that is done.

Mr. Wagner read that the FPL road agreement states, “the wind company agrees that upon notice from the County Engineer at any time during or after construction of the project, it shall, at it’s expense, repair or cause to be repaired, any damage to County roads cause by the construction of the project.” Mr. Wagner wanted to know what happens to damage to the roads after construction of the project. He does not feel this is addressed. Also, he wanted to know who pays for the repairs of damage caused by maintenance, catastrophic failure, or turbine replacement. Mr. Anderson asked Mr. Wagner if he was referring to damage to the roads after the project has been completed; and he was. Mr. Anderson said that this issue is not specifically addressed in the agreement. Mr. Anderson said they will have to get overweight permits to do their work. It is unlikely that the volume of traffic will ever be as high as it was during construction. He was having a hard time visualizing such a scenario. Mr. Wagner said that if they have to, again, bring in their “heavy crane” to do work, it is going to do damage. Mr. Anderson said that they will have to get an overweight permit in order to do so. And while the cost of the permit will not cover the cost of repairs to the damage, it does hold the permit holder liable for the cost of the repairs. He further stated that overweight permits are given out all the time, and permit holders are not always wind companies. Mr. Wagner still wanted to know who would pay for the road repairs. He does not feel it is adequately addressed here. Mr. Anderson said that this is really for the construction of the wind project and after that, there is not anything that is ongoing, unless there would be a provision in there that states the developer would have to come back and get another agreement such as during decommissioning when there would be a lot of work involved.

Mr. Bolen, rephrasing what he had already asked Mr. Anderson at the November 18, 2010 meeting, asked if there are powers that Mr. Anderson feels he needs from the County Board or the Zoning Board recommending, that he does not have, and wishes he did have. He also asked if Mr. Anderson felt that he has failed to maintain the County’s roads because of these agreements or that these agreements have failed him or the County. Further, he asked if there is anything Mr. Anderson would like to see in these agreements. Mr. Anderson said that he has come across things that he wishes had been put in the agreement, but that they are added to the next agreement. Mr. Anderson explained that the most recent agreement is probably the most detailed and that he feels “pretty good” about that particular agreement. On that agreement, Mr. Anderson has not come across anything that he wishes he had done differently. He said that when the next agreement comes along, there will probably be things he will change once he has had a chance to review everything. In terms of power or authority, he feels that what is in the

most recent agreement gives the County Engineer a fair amount of leeway to do what he/she thinks is necessary to maintain the roads or to have the developer maintain the roads. As with any contract, they can be entered into and they can be broken. If a contract is broke, there are usually ramifications. Mr. Anderson feels that the County has done the best it can to protect itself, and in these agreements, the County protects itself with a letter of credit. The wind farm is committing to repairing roads they have damaged, and if they do not live up that commitment, the County can draw on the letter of credit to so that it can fix the roads itself.

Mr. Bolen asked if Mr. Anderson feels he has enough authority to address problems as they arise. Mr. Anderson feels he does.

Based on Mr. Wagner's statements, Mr. Bolen got the impression that Mr. Wagner does not think Mr. Anderson and/or the County has the ability to oversee this. Mr. Bolen asked Mr. Anderson if he feels that he has the expertise to oversee this. Mr. Anderson said that he does and that the real issue is not having enough manpower. He said there are times when the technical staff at the County Highway Department is busy during its own construction season. This agreement does provide for the County to hire an outside consultant, a technician or engineer for example, to come in and handle things for a certain period of time. Mr. Anderson said the County does have the ability to handle it itself if it has the time.

Mr. Wagner read that the FPL road agreement states there is a "three-year period following the date of final acceptance where the wind company will make repairs at its own cost and expense and shall remain liable for any additional cost or expense incurred." Mr. Wagner wanted to know what happens after three years. Mr. Anderson explained that if road damage has been repaired but those repairs do not withstand the three-year period, the developer is obligated to make the repairs. Mr. Anderson feels comfortable with a three-year period and that it is an adequate amount of time. If a repair is made, any errors or omissions will become apparent within three (3) years.

Mr. Pratt asked if the County has issued any other road agreements for other types of projects. Mr. Anderson said that there are none that he has presided over but there could have been a long time ago. There are no others that he is aware of, and if there are, they would be for minor things.

Mr. Pratt wanted to know what would happen if Mr. Anderson was to leave Lee County, and how could the County be sure that the next person will take the same interest in these matters. Mr. Anderson feels the County Board is capable of selecting another County Engineer who will do the duties that are required of the position. Mr. Anderson said that there has been enough of these types of agreement that have been written around the State that the County Engineers Association would be able to provide a lot of resources to anyone who is new to the position.

Mr. Wagner provided a paragraph entitled, "Suggested Text for WECS Ordinance," that he drafted and that he recommended be added to and included in the ordinance. The paragraph is attached to these minutes as Exhibit A.

Mr. Fassler asked Mr. Anderson if the township votes on a road agreement separately from the County. Mr. Anderson said that there is no vote; it is simply signed by the road commissioner. He said the township agreement and the County agreement are very similar; however, there are things that can be found in both documents that may not be found in the other. For example, dust control is not included in the County's agreement because there are no County roadways that are gravel. The County might consider adding it if it finds out ahead of time that the developer plans to tear the road up and leave it that way for the duration of the project.

Chairman Conderman introduced Tim Trader from the Lee County Health Department.

Chairman Conderman asked Mr. Trader if there is anything in the current ordinance with regards to his area of expertise that he would like changed or that he would like added. Chairman Conderman explained that a question was raised at the last meeting concerning runoff and wells.

Mr. Trader stated that he was briefed that there were questions regarding contamination due to concrete or rebar.

Mr. Wagner stated that, generally, the point is that when the turbine is erected, there is a "gigantic" cement base with rebar in it. During decommissioning, whenever that may take place, only the top 48 inches of this base will be removed, and the remainder of the base will be covered with soil. Mr. Wagner said that a lot of what he has heard people talk about or he has read say that, over time, it could cause a problem. Mr. Wagner read from his notes that "these huge chunks of concrete adversely impact the filtering capability of the ground. Normally, runoff is filtered by vegetation and sedimentation on its way back to the aquifer. The concrete foundation prevents this filtration process and leaves the well aquifer subject to contamination. Housing and commercial developments require detention ponds to handle water that is no longer being absorbed due to the addition of foundations. Roads require ditching and other drainage facilities to filter and carry runoff water." Mr. Wagner said this is fairly new information and that he doubted Mr. Trader would be able to give the committee any type of answer.

Mr. Trader said that the hydraulics and the runoff are best left to an engineer to determine. In his practice, he does not find an issue with it. Mr. Trader wanted to know if the concrete and steel is the issue or is the hydrology the issue. He stated that the area in question is a relatively small area.

Mr. Wagner stated that it would not be a small area, but that it would be a very large area and there would be several of them spread out. Also, no one would really know what is under the ground.

Mr. Henkel tried to put the size of the base into perspective. The base is relatively a 100-foot radius that may be located on 80 acres. He feels it is a small area if thought about in those terms.

Mr. Wagner asked Mr. Henkel how one would know what is under the ground. He told Mr. Henkel that there could be a problem and that Mr. Henkel cannot guarantee there can't be a problem. Mr. Henkel said he was not trying to guarantee that. Mr. Wagner further stated that the concrete is not removed and it is left in the ground.

Mr. Trader asked if anyone knew how deep these foundations generally are. He was told 15 feet. He referenced the heavy agriculture in the area and explained that silos spread across the countryside. Each has a concrete foundation even though they aren't 15 feet deep. He feels they are "significant structures". Mr. Trader is not sure where the concern is.

Mr. Wagner asked Mr. Trader if he would be willing to meet, outside of the meeting, with Mr. Wagner and other citizens who have information available on this topic for further discussion. Mr. Trader said he would be more than happy to meet with them; however, he would like an opportunity to review the information before the meeting. Mr. Wagner was agreeable.

Mr. Pratt explained that one of the jobs of the Zoning Board is to protect public health. He asked Mr. Trader if this is going to hurt the water supply for the public.

Mr. Trader explained that when he was first asked to attend this meeting, his initial reaction was that he had never heard of this issue. His second reaction was to find out who has heard this concern before. He spoke with all the directors from his region; however, none of them had any information. He then spoke with the regional directors, State employees of the Department of Public Health, whose jobs have made careers out of dealing with private water and private wells. They, too, have never encountered this. He then went online and found only a mere "mention" of possible contamination due to concrete and rebar.

Mr. Trader stated what he always comes back to is in the Illinois Water Well Construction Code, it's required that neat cement or bentonite grout be used in the construction of the well. Municipal wells go down 2,000 feet and these wells are made of concrete and steel. He said that concrete and steel is routinely put in the ground.

Mr. Wagner said that, ultimately, the purpose of reviewing the ordinance is to get something in there for citizens who might have a problem. He wanted to know if he has to drill a well due to contamination, would he have to pay for it.

Mr. Trader said that if multiple foundations that are 15 feet deep are put in over so many acres, he can not fathom how that would affect an aquifer. Further, most of Lee County has overburden at 20-30 feet and it's not even past overburden.

Mr. Wagner felt it would be best to get a few people together to meet with him privately, in his office. Mr. Trader said that would be fine and again stated he would like to be able to review the material prior to the meeting so he has time to research it.

Mr. Pratt asked Mr. Trader if he had any recommendations to create a setback for pre-dug wells. Mr. Trader explained that based on geography, they would be well-beyond any State setback. Currently, 75 feet is required from a septic to a well and consideration should be given to the toxicity of the septic. To him, it was hard to envision anything being built as a water-capturing device that close.

Mr. Bothe referred to old farm tile. He said that his tile that has been buried for 15 years or better is 100 feet away from his well.

Mr. Wagner wanted to know if, when dealing with wind turbines, there is a “growing, world-wide concern with health issues and problems that folks are having related to wind turbines.” He asked if Mr. Trader would be willing to meet with him and some others to discuss these concerns. Mr. Trader explained that his jurisdiction on public health issues covers private water, semi-private water, non-community water, and private sewage.

Mr. Wagner asked if he would be willing to meet and go through all the information and if he would then come back to the committee to report his finding. Mr. Trader stated he would be willing to meet.

Chairman Conderman introduced Tom Dishno from Superior Environmental Corporation which is located in Rochelle, Illinois. Mr. Dishno was present to discuss the issues of noise and shadow flicker.

Mr. Fassler asked Mr. Dishno if his company is an independent firm. Mr. Dishno explained that his company is an independent environmental consulting firm.

Mr. Dishno commended the committee for taking the initiative. He feels the County is taking a pro-active stance which will allow it to head-off issues that could possibly arise.

Mr. Pratt asked Mr. Dishno what kind of experience his company has with regards to wind farms. Mr. Dishno explained that his company’s corporate office is located in Michigan. The corporate office handles quite a few wind farms. Michigan is involved in a lot of energy production, including pipelines and wind farms.

In July of 2010, Mr. Dishno personally gave a presentation to the Lee County Zoning Board of Appeals concerning an environmental assessment that Sauk Valley Community College asked him to write with regards to a wind turbine that is to be located on the school’s campus. These assessments cover many of the factors that are being considered by this committee. His company was asked to review each of the factors that are given from the national standards to determine whether or not the proposed site of the wind turbine is appropriate. It would also determine if the site falls within or has any problems with the national standards.

Mr. Dishno explained that his presentation tonight would be based on facts, not on opinion.

As a resident of Stephenson County, Mr. Dishno has watched the development of a wind farm located 10 miles from his home. He has witnessed all aspects of the project, from construction of the project to the operation of the wind farm.

Mr. Dishno wanted to caution this committee on, from his experience in writing site assessment for wind turbines, is there are very specific “thumbs-up and thumbs-down” parameters given by the federal regulations. Federal regulations have been trumping state and local regulations. He warned the committee that it can create regulations that can cause disputes with which the County will not want to be involved.

With regards to shadow flicker, Mr. Dishno provided a general definition for flicker. Flicker is defined to be “a repeating cycle of changing light intensity.” Flicker exists all around us and most are not even aware that it is taking place. Turbine shadow flicker “occurs when shadows of the rotating blades pass over an object or across a window.”

He stated that the shadow that is cast is very predictable. The location of the flickering shadow can be predicted based on the location of the turbine. He told the committee that it can keep conflict and contention down if it does not allow siting locations to be near residences. He feels this is a key part in avoiding possible conflict.

Mr. Dishno explained that the height of the hub determines the length of the shadow that would be produced throughout the course of the day, the course of a season, or the course of the year.

Examples of sources of flicker were provided, as well as their flicker rate. Florescent lights are flickering at a rate of approximately 120 Hz (Hz or Hertz means the number of times per second). Some people do not like compact florescent light bulbs because they are flickering at a rate of about 120 times per second. Non-florescent lights provide a steady glow and do not flicker.

Computer screens that have the cathode ray-type tube have a flicker rate of about 75 Hz and some are adjustable. This can cause some people to get headaches as a result of this flicker.

Televisions that have the cathode ray-type tube have a flicker rate of approximately 60 Hz.

These three examples flicker so fast that our mind can not perceive the flicker. We do not even realize it is taking place.

A vehicle’s turn signal has a flicker rate of about 1 – 3 Hz, or one to three times per second. A wind turbine has a flicker rate of approximately 0.50 – 1.25 Hz, or one-half times to one-and-a- quarter times per second.

He stated that people in general will not notice flicker that has a flicker rate of over 50 Hz or 50 times per second. Unless the flicker is really bright, it will not be perceivable.

Flicker that occurs at a rate of 10 – 25 times per second, or 10 – 25 Hz, is likely to cause problems such as eye strain, headaches, nausea, and/or seizures. These effects vary with prominence or distinctness of the shadow, the distance, and the color.

Color has been related to photosensitive epilepsy. Mr. Dishno explained that epilepsy affects more than 2 ½ million Americans. Flashing lights can trigger seizures in about 5% of this 2 ½ million Americans (or 100,000 people). Flicker that occurs at a rate between 5 and 30 Hz are most likely to trigger seizures.

He reiterated that the flicker rate of a wind turbine is 0.50 – 1.25 Hz. This rate does not fall between the range of 5 and 30 Hz which is likely to trigger seizures.

Mr. Dishno referenced a 1998 Pokemon cartoon episode that aired in Japan that triggered epileptic seizures in 685 people, most of whom were children. Many of the affected had never experienced a seizure prior to this incident. The seizures were triggered by a 5 second clip of the cartoon that had red and blue flashes that occurred at a rate of 12 Hz. As a result, the Japanese put out new guidelines for cartoons that included the prohibiting of flicker over a rate of 3 Hz, as well as prohibiting a flicker over 2 seconds.

Turbine shadow flicker occurs when the turbine is between the sun and the viewer; or when the rotor (or blades) is perpendicular to the line between the sun and the viewer. No flicker will occur at night or when the sun is obscured by clouds. Flicker will be visible on days that are clear and sunny.

Mr. Dishno explained that shadow flicker is a problem for wind turbine owners/operators; for neighbors of the wind farm; for local authorities who hear the complaints from the neighbors; for state authorities; and for national authorities.

When neighbors of the wind farms are affected, they go to the local authorities. Because this happens, local authorities will respond by setting up regulations that keep the local authorities out of problems. This can get the local authorities in trouble with the state and national authorities because they are “overdoing” it for both the state and national authorities. This often leaves the local authorities “stuck” between its citizens and the state/national authorities.

Mr. Dishno stated that it is easy to predict shadows and in order to do so, the following factors must be known: turbine locations; potential receptor locations (locations where people will be affected, such as businesses or residences); sun’s movement; hub height; rotor diameter; wind direction frequency distribution; and sunshine hours (monthly averages). He highly recommended computer software known as WindPro which costs approximately \$20,000 to \$25,000; however, knowing the above-stated factors can also produce the same results for free.

By knowing these factors, the location of the shadows can be determined, as well as the estimated time the receptors (business and/or residence) will be affected by flicker; however, what is considered to be acceptable exposure time per year is debatable. The

County will have to determine what amount of exposure is acceptable and what amount is not.

Mr. Dishno showed an illustration of a flicker zone that is known as a “butterfly” in his industry. It showed the dimensions and the angles of distribution for anywhere in latitude in which Lee County is located. Any receptor located within a flicker zone may be adversely affected by shadow flicker. Any receptor located outside of this zone will experience flicker that is “diminished and a limited amount of time.” It would not be as prominent as what a receptor within the flicker zone would experience.

The known angles of declination of the sun are as follows:

- December 21 67.17 degrees;
- March 20 90 degrees;
- June 21 112.81 degrees; and
- September 22 90 degrees.

For the Sauk site assessment, he took an aerial view of the site and investigated everything found with 1,000 meters of the proposed site to make sure nothing within the actual butterfly zone was overlooked.

Mr. Dishno proceeded with the noise portion of his presentation. He stated that noise power levels create the real issue, not just noise levels. He defined noise as “a linear transmission of energy.” Noise generally travels in a straight line; it can only be slightly bent under certain circumstances.

Because noise is energy, it can be absorbed, reflected, or dissipated. Because it is energy it follows the very same physical principles of any other energy type.

Mr. Dishno provided typical sound pressure levels, in decibels (dB), for various sources. “A-weighted sound level” does not have the ultra-high or ultra-low levels of frequencies that can be produced. A-weighted sound levels are within the range that people can hear. The following “Typical Sound Pressure Levels” table was provided:

Source	A-weighted Sound Level (dB)	Quantitative
Carrier deck jet operation	140 dB	
	130 dB	Pain threshold
Jet take-off	120 dB	
Auto horn (3 feet)	110 dB	Maximum vocal effect
Jet take-off (1,000 feet); Shout (0.5 feet)	100 dB	
NY subway station	90 dB	Very annoying; Hearing damage (8-hour exposure)
Pneumatic drill (50 feet)	80 dB	Annoying
Freight train (50 feet); Freeway traffic (50 feet)	70 to 80 dB	

	70 dB	Intrusive (telephone use difficult)
Air conditioning unit (20 feet)	60 dB	
Light auto traffic (50 feet)	50 dB	Quiet
Living Room/Bedroom	40 dB	
Library/Soft whisper	30 dB	Very quiet
Broadcasting/Recording studio	20 dB	
	10 dB	Just audible

Any source that is over 70 A-weighted decibels is going to make communications difficult. Acceptable noise levels can be found between 45 and 70 A-weighted decibels.

With regards to acceptable noise levels, Mr. Dishno stated that 24-hour exposure to an average of 70 decibels or less will prevent measurable hearing lost over a lifetime. Noise that is 55 decibels is outside the acceptable range at which people are not annoyed or are not troubled. Further, 45 decibels inside of a residence will prevent any kind of annoyance. He reminded the committee that these are averages of acoustic energy over a period of time, such as 24 hours. These numbers are not the levels of a single event or “peak” levels.

With regards to noise power levels and distance, sound levels will decrease as distance from the noise source increases. Because sound is energy, it follows a logarithmic decrease according to distance.

A receptor that is right next to a wind turbine will experience approximately 100 A-weighted decibels of sound energy. An acceptable level of sound energy for a receptor is in the 45 – 55 decibel range.

At a distance of approximately 350 meters, or 1,150 feet, sound from wind turbines will fall in the range of 35 – 45 A-weighted decibels.

Mr. Dishno reminded the committee that if a residence falls within 750 meters of a wind turbine, it will experience shadow flicker that is bothersome; and if a residence falls within 350 meters of a wind turbine, it will experience sound levels that are bothersome.

Mr. Dishno advised the committee to stay outside of these ranges. These are appropriate ranges that are given by the state and federal authorities as parameters to be used for regulation. He warned against going beyond these parameters, as litigation is likely to ensue.

Any kind of barriers can affect noise levels. Natural effectors of noise include elevations such as hills; interferences such as trees, vegetation or buildings; reflectors such as trees, buildings and barriers; and directors such as wind. If any of these natural effectors are located between the sound producer and the receptor, the sound level is diminished to some extent.

Mr. Fassler asked if the wind will carry sound or slow it down. Mr. Dishno said it can, that it would change the sound's frequency which will affect the sound level.

Mr. Dishno then addressed the questions of the committee.

In reference to Mr. Dishno's statement that at a distance of approximately 350 meters, or 1,150 feet, sound from wind turbines will fall in the range of 35 – 45 A-weighted decibels, Mr. Pratt asked if this is in a controlled environment. Mr. Dishno said that this statement takes into consideration normal, natural effects such as vegetation, and the normal dissipation of the energy as it is leaving its source. He feels it is a conservative range.

Mr. Wagner stated that he disagrees with that. He said that in his rural home, if he all-of-a-sudden had a 35, 45, or 55 decibel sound, he would not be very happy with that and that is not okay. Mr. Wagner told Mr. Dishno that the way he presents this information makes it seem like it is "okay" for zoning authorities. Further, he said it is "not okay" to add a new sound in a quiet, rural area that can happen "24/7" and affect the people who live in the home.

Mr. Wagner pointed out to Mr. Dishno that the phrase he "didn't use, but should have used, to explain the Hertz is simply something called 'the persistence of vision.'" He further stated that "our brains get 'tricked' into not seeing the flicker," and that "our brain is working to hide that 60 Hz symbol.

Mr. Dishno stated that while our perception may become dull, our ability to perceive anything much above 50 Hz is limited.

Mr. Wagner went on to state that his point is that shadow flicker has nothing to do with that type of flicker. Mr. Dishno explained that those are areas that people can understand based on the surroundings we are used to. He said that he used that for as a means of perception that it is within a range that we can see. The shadow flicker from a turbine is within a range that is perceivable compared to the florescent lights that are within a range that we cannot see.

Mr. Wagner again stated that it is not that same kind of flicker and that he personally does not use that type of a term. Mr. Wagner said he would use the term, "moving shadows."

Mr. Dishno explained that flicker is a term that is an understood term. Mr. Wagner told Mr. Dishno that he can give his presentation that way but that it does not relate to him to wind turbines. Mr. Wagner went on to say that wind turbines have "gigantic, rotating blades that cast moving shadows." He said he would not be happy if someone installed a wind turbine near his property that would cast a "moving shadow" onto his property. If he was driving down the road and there were "moving shadows" from a wind turbine, he thinks that distracting. If Mr. Wagner was in his house and there were "moving shadow" going across his window, he said it would be "extremely disturbing." Mr. Wagner said

he does not like relating it to the “persistence of vision” issues and “the notion that it is okay to experience that.”

Mr. Wagner again stated that the flicker is “moving shadows” and that a lot of people get confused by the use of the term “flicker.”

Mr. Dishno explained to Mr. Wagner that he was simply using the technical term that is used for this. He understands that there are differences but that this is the term that is provided not only as a technical term, but as a reference term that is used for standards. He further explained that the standards that he referenced have been established. He was trying to provide an objective presentation using the terms of reference that are given from the site assessment.

Mr. Wagner told Mr. Dishno that with regards to the responsible siting of wind turbines, he thinks the problem is that the contracts allow the use of new technologies which may make the tower higher or the blades bigger, resulting in shadow flicker in a location where it once was not. Mr. Wagner thinks this needs to be taken into consideration somewhere.

Mr. Dishno explained that the standards he gave were based on a hub height of the wind turbine model that is typically being used. This creates a footprint, or flicker zone, that should be avoided. It is up to this committee to decide what is an acceptable amount of time for exposure to shadow flicker, whether it be 10, 20, 50 or 100 hours per year. Mr. Wagner stated that what is acceptable for him is 0 hours.

Mr. Fassler told Mr. Wagner that that is his opinion, and that Mr. Dishno is not really stating an opinion. Mr. Fassler said that Mr. Dishno was invited to this meeting to explain these issues and that he felt he did a nice job. He disagreed with Mr. Wagner trying to “pick him apart.”

Mr. Wagner said that he did not think Mr. Dishno said anything wrong but that he is pointing out to the members of this committee other things to consider, in case the committee is not able to discuss noise again. Mr. Wagner said that noise is on the agenda and that he would discuss these things during that moment, but that Mr. Dishno was not on the agenda, Mr. Wagner confused.

Mr. Henkel explained to Mr. Wagner that, at the last meeting, members of this committee asked that Mr. Dishno be present.

Mr. Bolen asked Mr. Wagner to clarify the meaning of the term, “moving shadow.” Mr. Wagner responded that it is “a shadow that is moving.” Mr. Bolen asked him if this is a bad thing. Mr. Wagner said it is if it falls on his property, he would be disturbed by it like a lot of other people are, especially if he could see it inside his house.

Mr. Bolen asked Mr. Wagner his comment made about “moving shadows” as he is going down a road. Mr. Wagner stated that if someone is driving down a road at a certain time

of day, like he has seen in Ohio (IL), and he/she sees all of these shadows moving across the road, it could be distracting.

Mr. Bolen explained that on his way to the meeting, he was traveling north along Route 40, the telephone poles that were located between him and the sun were causing a moving shadow that was hitting him in the eye about every second. He said that nobody talks about doing away with telephone poles and he feels there are certain situations in everyday life that people experience moving shadows.

Mr. Wagner said that the shadow Mr. Bolen experienced while driving is not a moving shadow because the telephone poles don't move. Mr. Bolen said that it was moving because his windshield was moving at a rate of 60 mph. He pointed out that the State knowingly puts trees along highways knowing that shadows will occur.

Mr. Bolen asked Mr. Dishno about his mention of the word, "ambient." He asked Mr. Dishno to re-explain that. Mr. Dishno explained that sound decreases significantly with distance from the source. Sound pressure at 25 feet from a wind turbine drops by a factor of four (4) at 50 feet. The same sound pressure at 100 feet from a wind turbine would drop by a factor of 16. The point he was trying to make was that sound is not a constant but rather it is expressed in a logarithmic form. The ambient sound he expressed, which may not have been the best term, was in a sound pressure level comparable to a living room/bedroom or library/soft whisper. This would be in the range of 35 to 55 decibels.

Mr. Bolen asked if that is an acceptable level by the standards of the Illinois Pollution Control Board. Mr. Dishno said that the Illinois Pollution Control Board has provided a standard level. The standards that are given are of comfort because if the sound pressure levels exceed 70 A-weighted decibels, 24 hours a day, people will not only experience discomfort, but they are also going to experience hearing loss. This then would become a matter for the Public Health Department, as well as other State agencies.

Mr. Bolen asked how Illinois rates in comparison to other states. He has been told that Illinois is one of the toughest. With regards to noise, Mr. Dishno was not sure. He would consider Illinois to be "fairly tough" based on his knowledge.

Mr. Henkel asked Mr. Dishno to explain a statement he had made earlier that the County does not want to go "too far" when setting regulations. Mr. Dishno explained that the commercial wind industry knows what the federal and state regulations are, and there is a tendency to react in a local department to make it impossible to site any wind turbines. It's sort of the NIMBY idea, or the "Not In My Back Yard" idea. He understands that no one wants changes in their "pristine environment" but if the County tries to create local regulations to prevent the siting of turbines, and these local regulations exceed the federal regulations, the County will be opening itself up to litigation to defend these local regulations.

Mr. Wagner interjected that it has been done successfully elsewhere. Mr. Dishno said that it has. He asked the committee to what extent does the County want to exceed the

regulations that have been established. The County may end up in litigation and litigation costs a lot of the County's money.

With regards to shadow flicker, he is looking as someone else's ordinance that allows 30 hours of flicker per calendar year. After doing the math, it turns out to be 5 minutes per day. He did not think that 5 minutes could be very strong. Mr. Dishno explained that that figure is an average. A person may experience 1 hour of flicker for a 30-day period and no for the remainder of a year.

Mr. Pratt asked him if he had seen any other ordinance with time standards in effect. Mr. Dishno has not.

With regards to sound levels, Mr. Pratt wanted to know if the equipment used to measure and develop acceptable sound level is available. Mr. Dishno explained that this should be a part of the site assessment that should be complete at each proposed turbine sited to see how it may affect nearby residences. The equipment is relatively inexpensive and it really only requires some time.

Mr. Pratt said that they have heard complaints that sound levels are affected during different times of the day; by the way the blades are turned; by different pressure levels of the air; and by humidity. There are numerous things that can affect the sound levels.

Mr. Dishno agreed. He explained that each turbine manufacturer is required to produce what the maximum sound levels at each location. Those figures are what his company uses to do its assessments. He referenced the Sauk Valley Community College assessment. Since a turbine model had not yet been selected, his company used the tallest model, that had the greatest rotor diameter, and that made the most sound. His company looked at all the models available and it used the most extreme one to do its assessment. That particular model produced a maximum sound of 106 dB during its normal operation. Working from that, they were able to extrapolate it down.

Mr. Wagner told Mr. Dishno that he did not address the sub-frequency sounds and those are the ones that seem to be the most important to the health community and their affects on people. Mr. Dishno said that they can be easily measured but the reason his industry uses A-weighted level is because they are tangible and can be proven.

The next meeting was scheduled for Tuesday, January 25, 2011, at 7:00 p.m. Real estate valuation will be discussed at that time and County's Chief Assessment Officer Wendy Ryerson will be present.

On the motion of Mike Pratt, and seconded by Gene Bothe, the meeting was adjourned at 9:03 p.m.

Respectfully submitted,

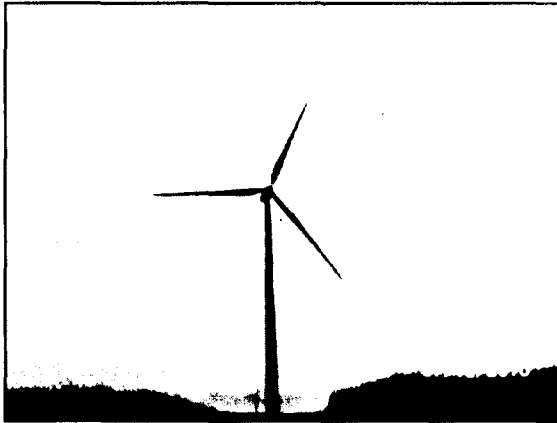
Alice Henkel

By: _____

1/6/11
Suggested for Ordinance

Exhibit-A-

Roads: All routes on either county or township roads that will be used for the construction, maintenance, and transportation of supplies for the WECS purposes shall be identified on the site plan. All routes for either egress or ingress need to be shown. The routing shall be subject to the approval of the Lee County Highway Engineer in coordination with the township road commissioners. The developer shall provide and complete a preconstruction baseline survey to determine existing road conditions for assessing potential future damage due to development related traffic. The applicant shall provide a road repair plan to ameliorate any and all damage, installation or replacement of roads that might be required subject to the approval of the County Engineer. If the Lee County Highway Engineer determines at any time that the road construction or repairs have not been completed to recognized standards, the Applicant will be responsible for correcting the work to the satisfaction of the Lee County Highway Engineer to be in compliance with such recognized standards. The Applicant shall provide cash or escrow account in an amount and form approved by the highway/roadway official(s) and approved by the County Board sufficient to cover all potential future damage. If any vehicle will exceed the maximum allowable weight limit to a roadway such will only be permitted upon the entry of a "road use agreement" recommended by the County Engineer and approved by the County Board.



Shadow Flicker and Noise from Wind Turbines

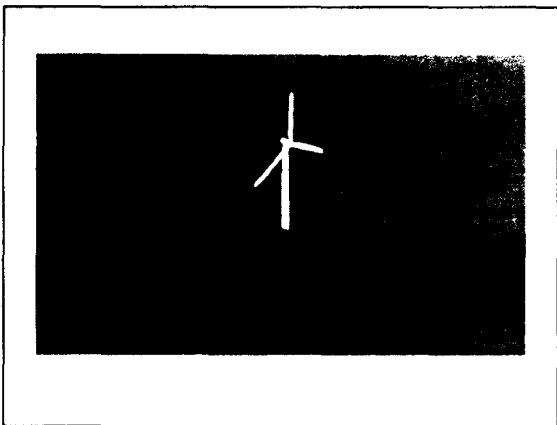
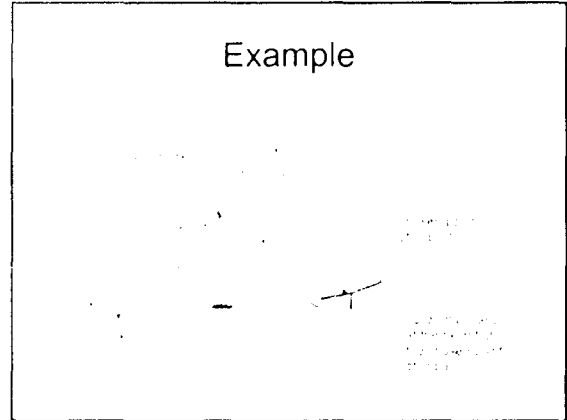
Lee County, Illinois

Definition

Flicker A repeating cycle of
 changing light intensity

**Turbine
Shadow
Flicker** Occurs when shadows of the
 rotating blades pass over an
 object or across a window.

Example



Sources of Flicker

<u>Source</u>	<u>Flicker Rate</u>
Florescent lights	120 Hz
Computer Screens	75 Hz (frequency adjustable)
Televisions	60 Hz (intensity)
Vehicle Turn Signal	1 -3 Hz
Wind Turbine Shadow	.5 – 1.25 Hz

Flicker Facts

- People will notice flicker up to about 50 Hz (varies with intensity)
- Above 50 Hz brain response to the flash lasts longer than the flash itself
- 10 – 25 Hz cause problems
 - Eye strain, headaches, nausea, seizures
- Effects vary with
 - Prominence
 - Distance
 - Color

Photosensitive Epilepsy

- Epilepsy affects more than 2.5 million Americans
- Flashing lights can trigger seizures in approximately 5 percent (100,000)
- Flicker between 5 and 30 Hz are most likely to trigger seizures

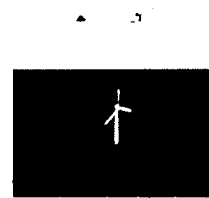
Infamous Pokémon Cartoon



- Episode #38 in 1998 triggered seizures in 685 people
 - Most were children
 - Many had NO previous seizures
- Red and Blue flashes at 12 Hz for 5 seconds
- Japanese Response
 - New Guidelines
 - 3 Hz max
 - 2 seconds max duration

Turbine Shadow Flicker

- Occurs when:
 - The Turbine is between the sun and the viewer
 - The rotor (blades) are perpendicular to the line between the sun and the viewer
- No flicker occurs at night or when the sun is obscured



Is Shadow Flicker a Problem?

- Who has the problem?
 - Wind Turbine Owner/Operator
 - Neighbors
 - Local Authorities
 - State Authorities
 - National Authorities

WIND P10 #25000

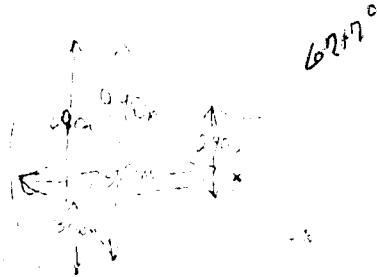
Predicting Shadows

- Computer Inputs
 - Turbine Locations
 - Potential Receptor Locations
 - Sun's Movement
 - Hub Height
 - Rotor Diameter
 - Wind Direction Frequency Distribution
 - Sunshine Hours (monthly averages)

Predicting Shadows

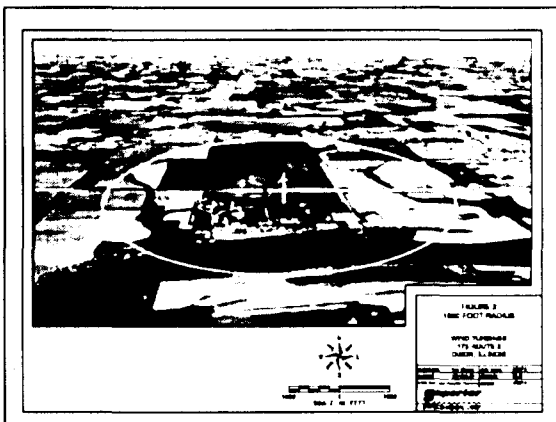
- Computer Outputs
 - Areas in Shadow
 - Estimated Time Receptor will be Affected by Flicker
 - What is an acceptable time for exposure?
 - 10 hours/ year
 - 20 hours/ year
 - 30 hours/ year
 - 40 hours/ year
 - 50 hours/ year

Flicker Zone



Angle of Declination of the Sun

- December 21 67.17°
- March 20 90°
- June 21 112.81°
- September 22 90°



45-110 A

Noise Power Levels

Noise is a linear transmission of Energy

TRAVELS IN A STRAIGHT LINE

Noise

- Absorbed
- Reflected
- Dissipated

Typical Sound Pressure Levels

Source	A-Weighted Sound Level (db)	Qualitative
Warmer Disk Jet - Landing	110	
Jet Takeoff	120	Very Annoying
Auto Horn (3 feet)	110	Maximum Tolerable Effect
Jet Takeoff (1000 feet)	100	
about 10 feet		
N.Y. Subway Station	85	Very Annoying
Refrigerator (3 feet)	55	Maximum Tolerable Effect
Refrigerator (10 feet)	45	
Refrigerator (100 feet)	35	
Air conditioning (100 feet)	45	Very Annoying
Light Auto Traffic (5 feet)	55	
Living Room - Bed Room	45	
Library - Soft Whisper	35	Very Quiet
Broadcasting Microphone (300 ft)	120	ATA 120

Acceptable Noise Levels

- 24 hour exposure of 70 dB level will prevent measurable hearing loss over a lifetime.
- 55 dB outside to prevent activity interference and annoyance
- 45 dB inside to prevent activity interference and annoyance
- These are not single events or "peak" levels. They are averages of acoustic energy over periods of time such as 8 hours or 24 hours

Noise Power Level - Distance

Sound decreases significantly with distance from the source

- Sound pressure at 25 feet from a wind turbine drops by a factor of four (4) at 50 feet
- Sound pressure at 25 feet from a wind turbine drops by a factor of 16 at 100 feet
- In the logarithmic scale of decibels, this equates to a drop of approximately 6 dBA for each doubling of the distance from point sound source
- At a distance of approximately 350 meters (about 1,150 feet), sound from wind turbines is in the range of 35 to 45 A-weighted decibels

Natural Effecters of Noise

- Elevations – Hills
- Interference – trees, vegetation, buildings
- Reflectors – trees, buildings, barriers
- Directors - wind