

## **NOTE: FOR TOURISM, GO TO SECTION 2**

### **“Wind turbines don't make good neighbors”**

#### *Some Problems of Wind Power in the Berkshires*

Researched and written by Eleanor Tillinghast, Green Berkshires, Inc., May 14, 2004

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"Wind turbines don't make good neighbors."<sup>1</sup> So says John Zimmerman of Enxco, Inc.,<sup>2</sup> the company preparing to construct the 20-turbine Hoosac wind power plant in the towns of Florida and Monroe, in the northern part of Berkshire County, Massachusetts.

As has been demonstrated in other parts of the United States, and abroad, wind power plants can have significant negative impacts on visual aesthetics, tourism, property values, public roads, public safety, and quality of life for people living both close and at a distance from the developments. The financial benefits accrue to the individuals who lease or sell land for the plants, and in some cases to the towns that permit the plants, but the problems permeate the surrounding communities. The issue of whether or not we here in Berkshire County want wind power plants on our ridgelines is truly of regional concern.

Other than offshore siting,<sup>3</sup> the most suitable place for commercial-scale wind power plants in Massachusetts is here in the Berkshire and Taconic mountains of Berkshire County. That's because onshore coastal areas that have sufficient wind generally have dense populations which would be put at risk by proximity to massive wind turbines.<sup>4</sup> Otherwise, the strongest winds tend to be along the highest mountains, and those are out here.<sup>5</sup> Within New England, Massachusetts has a greater percentage of land suitable for wind power plants than any other state (CT 6%, ME 7%, MA 16%, NH 3%, RI 8%, VT 3%.) according to U.S. Department of Energy calculations.<sup>6</sup>

To achieve the renewable energy goals mandated by Massachusetts's 1997 electric utility restructuring act<sup>7</sup> will necessitate about 200 wind turbines installed along our ridgelines within the next five years -- and that number is predicated on the assumption that the 420-

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<sup>1</sup> Robin Smith, "Wind Towers Spark Debate," *Caledonian-Record*, 7/1/03,

[http://www.CaledonianRecord.com/pages/local\\_news/story/c2296e810](http://www.CaledonianRecord.com/pages/local_news/story/c2296e810)

<sup>2</sup> Hill Engineers, Architects, Planners, Inc., *Special Permit Application for enXco Incorporated: Hoosac Wind Project, Florida / Monroe, Mass.*, 10/6/03, p. 1; <http://www.enxco.com/east.html>

<sup>3</sup> <http://www.SaveOurSound.org>

<sup>4</sup> Comments of Steven Weisman, Green Power Program Director, Renewable Energy Trust, Massachusetts Technology Collaborative, Community Wind Collaborative public meeting, North Adams, MA, 9/19/03.

<sup>5</sup> <http://TrueWind.TeamCamelot.com/ne/>

<sup>6</sup> [http://www.epa.gov/region1/eco/energy/renewable\\_energy.html](http://www.epa.gov/region1/eco/energy/renewable_energy.html)

<sup>7</sup> Chapter 164 of the Acts of 1997, <http://www.state.ma.us/legis/laws/seslaw97/sl970164.htm>

megawatt [“MW”] Cape Wind project planned for Nantucket Sound<sup>8</sup> will be operational by 2009.

As of that date, 4% of our state’s energy sales must come from new construction of renewable energy sources.<sup>9</sup> The Massachusetts Technology Collaborative [“MTC”], deputized by the legislature to oversee this endeavor<sup>10</sup> has projected that meeting all the new capacity with wind power will require 908 MWs of new generation.<sup>11</sup> However, at a public meeting, the head of MTC’s Renewable Energy Trust said that, in fact, he expects 80% of the new capacity required by 2009 will be from wind power,<sup>12</sup> or 726.4 MW. Subtracting Cape Wind’s 420 MW means that 306.4 MW must be built additionally. If each wind turbine is 1.5 MW, the onshore standard today (and the size of the Hoosac turbines), that will mean 204 turbines. Using Hoosac as a prototype, with approximately 10 turbines per ridgeline, that will mean 20 mountains covered with turbines.

You may want to believe this can’t happen, well, it is happening all across countrysides here and abroad. Seven proposals are under consideration in Vermont.<sup>13</sup> 17 projects have been proposed in a 50-mile area at the junction of Virginia, Pennsylvania, and Maryland.<sup>14</sup> 87 wind power plants have been erected in the United Kingdom, with 1,101 turbines, for a total of 712.4 MW of power,<sup>15</sup> the output of one large natural-gas plant.

If you wonder why we here in the Berkshires are suddenly seeing a spate of public meetings on the wonders of wind power, it's because an alliance of political, business, and environmental interests is focused on winning our county's support for this massive alteration of our landscape in the name of larger goals like reducing global warming, pollution, dependence on fossil fuels, and energy consumption that, while worthy, will not be ameliorated one whit by the construction of these turbines on our mountains.

The need for Berkshire County residents to understand the impetus behind this new focus on wind power is all the more urgent since Secretary of Environmental Affairs Ellen Roy Herzfelder is preparing to open public lands for wind power development.<sup>16</sup> Furthermore,

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<sup>8</sup> Commonwealth of Massachusetts, Executive Office of Environmental Affairs, “Certificate of the Secretary of Environmental Affairs on the Environmental Notification Form,” EOE #12643, 4/22/02, p. 1, <http://www.nationalwind.org/events/offshore/020925/presentations/Wickersham.pdf>

<sup>9</sup> Enxco, Inc., *Hoosac Wind Power News*, Volume 1, Number 2, February 2003, p. 1, <http://www.HoosacWind.com/newsletter2.pdf>; Massachusetts Incentives for Renewable Energy, Renewable Portfolio Standard; [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=MA05R&state=MA&CurrentPageID=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MA05R&state=MA&CurrentPageID=1)

<sup>10</sup> <http://www.mtpc.org/RenewableEnergy/faq.htm>

<sup>11</sup> [http://www.mtpc.org/RenewableEnergy/green\\_power/rps\\_scenarios.pdf](http://www.mtpc.org/RenewableEnergy/green_power/rps_scenarios.pdf)

<sup>12</sup> Comments of Rob Pratt, Director, Renewable Energy Trust, Massachusetts Technology Collaborative, Community Wind Collaborative public meeting, North Adams, MA, 9/19/03.

<sup>13</sup> Robin Palmer, “Wrestling with the wind,” *Barre Montpelier Times Argus*, 12/12/03,

<http://www.timesargus.com/Archive/Articles/Article/75908>

<sup>14</sup> Map produced by D. Dan Boone, March 2003.

<sup>15</sup> <http://www.bwea.org>

<sup>16</sup> Commonwealth of Massachusetts, Executive Office of Environmental Affairs, “Certificate of the Secretary of Environmental Affairs on the Environmental Notification Form,” Princeton Wind Farm

she has already demonstrated with her certificates on the Hoosac, Brodie, and Princeton wind power projects that she will not demand substantive pre-construction environmental reviews.<sup>17</sup> Her boss and the governor's top aide, Chief of Commonwealth Development Douglas Foy, has made removing barriers to development of renewable energy facilities one of his priorities.<sup>18</sup> State Representative Dan Bosley and State Senator Andy Nuciforo have signaled their strong support for wind power.<sup>19</sup> Some of the most powerful corporations in the world, including General Electric,<sup>20</sup> are lining up to benefit from the massive subsidies, incentives, and tax breaks being offered at the state and federal levels.<sup>21</sup> The former director of the Massachusetts Environmental Policy Act ["MEPA"] office is a consultant to Enxco.<sup>22</sup> And Enxco's finance director is on the advisory Green Power Working Group of the MTC,<sup>23</sup> which is financing so much of this development thanks to monthly surcharges on our electric bills.<sup>24</sup> Environmental groups frustrated by years of disappointment in their efforts to reduce the impacts of energy consumption, see the advent of wind power plants as a tangible sign that we are finally willing to take responsibility for our toll on the environment, and they are pushing hard for wind power development.<sup>25</sup> The consequence of all these factors is that events are rushing faster than

Infrastructure Improvements, EOE #13229, 4/23/04, p. 7,

<http://www.state.ma.us/envir/mepa/pdf/certificates/13229pdfversion.pdf>

<sup>17</sup> Commonwealth of Massachusetts, Executive Office of Environmental Affairs, "Certificate of the Secretary of Environmental Affairs on the Environmental Notification Form," Hoosac Wind Project, EOE #13143, 12/26/03, <http://www.state.ma.us/envir/mepa/downloads/13143enfpdfversion.pdf>; Commonwealth of Massachusetts, Executive Office of Environmental Affairs, "Certificate of the Secretary of Environmental Affairs on the Notice of Project Change," Berkshire Wind Power Project, EOE #12532; Commonwealth of Massachusetts, Executive Office of Environmental Affairs, "Certificate of the Secretary of Environmental Affairs on the Environmental Notification Form," Princeton Wind Farm Infrastructure Improvements, EOE #13229,

<http://www.state.ma.us/envir/mepa/pdf/certificates/13229pdfversion.pdf>

<sup>18</sup> Press Release, "Romney Unveils Climate Protection Plan for Massachusetts," Commonwealth of Massachusetts, Executive Department, 5/6/04, [http://www.mass.gov/portal/govPR.jsp?gov\\_pr=gov\\_pr\\_040506\\_climate\\_action\\_plan.xml](http://www.mass.gov/portal/govPR.jsp?gov_pr=gov_pr_040506_climate_action_plan.xml); Press Release, "Massachusetts Electric Offers Customers New Green Energy Program," National Grid, 9/16/03, [http://www.nationalgridus.com/aboutus/newsreleases/2003\\_09\\_16a.asp](http://www.nationalgridus.com/aboutus/newsreleases/2003_09_16a.asp); "Key Committee Approves Renewable Energy Bill – CLF Expresses Strong Support," 4/22/03, <http://www.clf.org/hot/20030422.htm>; David Mehegan, "The evolution of Doug Foy," *Boston Globe*, 3/25/01,

[http://www.clf.org/hot/evolution\\_of\\_doug\\_foy.htm](http://www.clf.org/hot/evolution_of_doug_foy.htm)

<sup>19</sup> Susan Bush, "Legislature approves petition to boost enXco wind project," *Berkshire Eagle*, 12/14/03, <http://www.BerkshireEagle.com>

<sup>20</sup> "General Electric, Warren Buffett, Farmers Invest in Wind Power," *Bloomberg News*, 2/27/04, <http://quote.bloomberg.com/apps/news?pid=nifea&&sid=akd3Lss8Xvbk>; "Welsh wind power project moves ahead," *SolarAccess.com*, 4/29/04, <http://www.solaraccess.com/news/story?storyid=6627>

<sup>21</sup> Dave Wilson, "Shell buys the wind in Wyoming," *The Engineer*, 7/42/01, <http://www.e4engineering.com/story.aspx?uid=cc529e49-41be-4987-9b5d-e6c075b27664>; Don Hendershot, "Is wind the future for WNC?" *Smoky Mountain News*, 7/9/03, [http://www.smokymountainnews.com/issues/07\\_03/07\\_09\\_03/out\\_wind\\_future.html](http://www.smokymountainnews.com/issues/07_03/07_09_03/out_wind_future.html); "SIIF Energies Takes Over American Enxco," *European Report*, 6/5/02.

<sup>22</sup> Email from Jay Wickersham, Noble & Wickersham LLP, to Arthur Pugsley, MEPA, Subject: Air emissions avoidance estimates for Hoosac Wind project, Friday, December 19, 2003 2:41 PM.

<sup>23</sup> Massachusetts Technology Collaborative, *Harnessing the Power of Innovation: Annual Report Fiscal Year 2003*, p. 18, [http://www.mtpc.org/NewsandReports/annual\\_2003.pdf](http://www.mtpc.org/NewsandReports/annual_2003.pdf)

<sup>24</sup> <http://www.mtpc.org/RenewableEnergy/faq.htm>

<sup>25</sup> <http://www.cetonline.org>; <http://www.clf.org>

the education of many people who wish to protect our environment but haven't gotten much information from all sides of the issue.

In this paper, I want to focus on just a few wind power problems of special concern to Berkshire County. In order to avoid misrepresenting information, I've paraphrased or lifted language directly from research sources, almost all of which were found through internet searches. Rather than clutter the page with quote marks, I've footnoted every statement, with hyperlinks to the sources whenever possible.

## 1. Visual Aesthetics

A year from now, the third highest point in all of Massachusetts will be turbine #16 of the Hoosac wind power plant, with a blade tip height of 3,175' above sea level. Only Greylock (3,491') and Saddle Ball (3,238') of the Taconic Mountains will be taller.

It will be one of nine wind turbines covering the tallest of the Berkshire Hills,<sup>26</sup> Crum Hill.

Overall, at their full extension, seven Hoosac turbines will be among the 10 highest points in the state. Sixteen will be among the top 20. Eleven will be above 3,000'. Only three mountains in all of Massachusetts are taller than 3,000' (Fitch at 3,110' is the third mountain, also in the Taconics, and north of Greylock and Saddle Ball.)

Here are the ground elevations of the turbine locations, as shown in the plans accompanying the Environmental Notification Form for Hoosac, filed with MEPA by Enxco.<sup>27</sup> Full heights with the addition of the 340' turbines are also shown:

Bakke Mountain			Crum Hill		
Turbines	Elevations	w/340' turbines	Turbines	Elevations	w/340' turbines
<b>1</b>	2,568	2,908	<b>12</b>	2,748	<b>3,088</b>
<b>2</b>	2,609	2,949	<b>13</b>	2,829	<b>3,169</b>
<b>3</b>	2,666	<b>3,006</b>	<b>14</b>	2,772	<b>3,112</b>
<b>4</b>	2,758	<b>3,098</b>	<b>15</b>	2,809	<b>3,149</b>
<b>5</b>	2,751	<b>3,091</b>	<b>16</b>	2,835	<b>3,175</b>
<b>6</b>	2,696	<b>3,036</b>	<b>17</b>	2,805	<b>3,145</b>
<b>7</b>	2,662	<b>3,002</b>	<b>18</b>	2,574	2,914
<b>8</b>	2,644	2,984	<b>19</b>	2,539	2,879
<b>9</b>	2,610	2,950	<b>20</b>	2,559	2,899
<b>10</b>	2,574	2,914			
<b>11</b>	2,530	2,870			

To give you a sense of the extent to which these turbines will be visible to their

<sup>26</sup> Raymo, Chet, and Maureen E. Raymo. *Written In Stone: A Geological History of the Northeastern United States*, Hensonville NY: Black Dome Press Corp., 1989, 2001, p. 63.

<sup>27</sup> Enxco, Inc., *Environmental Notification Form*, EOE #13143.

immediate surroundings, consider this list of the tallest peaks in each of the neighboring state forests, based on the *DeLorme Massachusetts Atlas & Gazetteer*:

- Monroe State Forest - Spruce Mountain - 2,730'
- Savoy Mountain State Forest - Spruce Hill - 2,566'; Borden Mountain - 2,515'
- Mohawk Trail State Forest - Hawks Mountain - 1,880'.

Nearby Whitcomb Summit, the highest point on Route 2, is 2,240'.<sup>28</sup>

Once the wind power plant is built on Brodie Mountain,<sup>29</sup> and if Mark D. Smith with Michael A. Deep and Williams College go forward with plants in North Adams<sup>30</sup> and along the New York border,<sup>31</sup> respectively, visitors to the top of Mount Greylock Veterans War Memorial Tower will be partially encircled by miles of 340' turbines and perpetually flashing lights to the southwest, northwest, and northeast. And now the town of Lenox is considering installing one or two turbines along its major escarpment,<sup>32</sup> affecting views of people in parts of Richmond, Lenox, and Pittsfield.

From how far will all these turbines be visible? Enxco has tried to show that the Hoosac wind turbines will be relatively unobtrusive. However, in an interview with a reporter about an Enxco proposal in Vermont, Mr. Zimmerman was more candid about the towers' visibility. "Any place we are looking to be in, you can see from a long way away. There's no real hiding them."<sup>33</sup>

On a webpage of photos of the 1.5 MW<sup>34</sup> wind turbines in Montfort, Wisconsin, the photographer wrote: "Impressive or overbearing? When I was there, the latter predominated...As I drove into the area, these gangly Wisconsin towers dominated the horizon from more than six miles away."<sup>35</sup> A reporter noted simply that the Montfort Wind Farm "is visible for miles on the south side of U.S. Highway 18."<sup>36</sup> A contributor to an email thread on [www.Backpacker.com](http://www.Backpacker.com) described the effect more loquaciously: "There's a single row of such really tall and HUGE towers sitting along Highway 18 around the vicinity of Cobb, WI...maybe 45 minutes west of Madison. You see them

<sup>28</sup> [http://www.mohawktrail.com/html/body\\_florida.html](http://www.mohawktrail.com/html/body_florida.html)

<sup>29</sup> Press Release, "MTC Announces \$32 Million for Five New Clean Energy Projects," Massachusetts Technology Collaborative, 11/13/03, [http://www.mtpc.org/NewsandReports/press/pr\\_11\\_13\\_03\\_MGPP.htm](http://www.mtpc.org/NewsandReports/press/pr_11_13_03_MGPP.htm)

<sup>30</sup> Karen Gardner, "Planning Board delays approval for test tower," *North Adams Transcript*, 2/10/04, <http://www.TheTranscript.com>

<sup>31</sup> Jon Wiener, "Williams group studying N.Y. site for wind turbines," *Berkshire Eagle*, 10/1/02, corrected 10/2/02, <http://www.BerkshireEagle.com>

<sup>32</sup> "Lenox to host public meeting on wind power in Berkshires," *Berkshire Eagle*, 4/18/04, <http://www.BerkshireEagle.com>

<sup>33</sup> Robin Smith, "Wind Towers Spark Debate," *Caledonian-Record*, 7/1/03, [http://www.CaledonianRecord.com/pages/local\\_news/story/c2296e810](http://www.CaledonianRecord.com/pages/local_news/story/c2296e810)

<sup>34</sup> <sup>34</sup> <http://www.awea.org/projects/wisconsin.html>

<sup>35</sup> Montfort, Wisconsin Wind Turbines, <http://www.WorksAndWords.com/windt1.htm>

<sup>36</sup> Don Behm, "Wind farm dispute creates turbulence," *Milwaukee Journal Sentinel*, 11/22/01, <http://www.jsonline.com/news/ozwash/nov01/wind23112201a.asp>

from far away, lights and all. They are enormous, dwarfing silos and anything else near them. They stretch for two miles; I've clocked it."<sup>37</sup>

According to a brochure about the 1.5 MW<sup>38</sup> wind turbines in Fenner, New York: "The windmills of Fenner can be seen from the north shore of Oneida Lake, from vantage points in Onondaga County and from portions of the towns of Cazenovia, Lenox, Smithfield, Sullivan, Nelson and Madison. Their gigantic blades can be seen from as far away as Lowville in Lewis County, about 25 miles southeast of Watertown."<sup>39</sup>

The facilities of Montfort WI and Fenner NY are on relatively flat open land. The permitting handbook of the National Wind Coordinating Committee ["NWCC"], an industry collaborative, notes: "Where wind turbines are arrayed along ridgelines to capture wind flows over the ridges, the units are visible over greater distances."<sup>40</sup>

The Appalachian Trail Conference ["ATC"] has been opposing a wind power project in Maine that would entail an extensive line of wind turbines in direct view of one of the Trail's most scenic sections in the western part of that state. This is the ATC's description of the visual impact:

The towers—as high as a 40-story building—would be visible for about four days of hiking on the Trail between Saddleback and the Bigelow Preserve. They would appear to crawl across the ranges by day as the blades whirled and to be like little lightning strokes at night, as their strobe beacons alerted airplanes to their presence, destroying any illusion of remoteness.<sup>41</sup>

In the Berkshires, parts of the Appalachian Trail, Taconic Crest Trail, and the Mohawk Trail will be exposed to the sight of the Hoosac and Brodie wind power plants – as well as the two proposed by Messrs. Deep and Smith and Williams College, if those are built. In addition, there are numerous other trails, high points, and scenic overlooks throughout the Berkshires from which the 34-story turbines and lights will be visible.

Enxco has tried to argue that the Federal Aviation Administration ["FAA"] might permit it to reduce the number of lights on the turbines. That seems unlikely. The FAA requires lighting on all structures taller than 200 feet.<sup>42</sup> Two airports are nearby, in North Adams and Pittsfield, both of which about to be expanded, and an airport in Albany is not much farther away. These turbines will be among the highest points in the region. As Enxco

<sup>37</sup> lizs 01:34:59 PM 08/08/02, <http://www.thebackpacker.com/trailtalk/thread/15592,-1.php>

<sup>38</sup> <http://www.awea.org/projects/newyork.html>

<sup>39</sup> Carl Stone, "Winds of Change," *Fenner Windmills Brochure*, <http://MadisonCounty.org/PressRelease/Windmills.htm>

<sup>40</sup> National Wind Coordinating Committee, Siting Subcommittee, *Permitting of Wind Energy Facilities: A Handbook, Revised 2002*, August 2002, p. 28, <http://www.NationalWind.org/pubs/permit/permitting2002.pdf>

<sup>41</sup> Appalachian Trail Conference, "ATC Opposes Maine Wind Farm Project," <http://www.AppalachianTrail.org/protect/issues/redington.html>

<sup>42</sup> Berkshire Regional Planning Commission, *Permitting Wind Energy Facilities*, Berkshire Planning Tools, November 2003, p. 1.

acknowledged in its 10/6/03 special permit application to the towns of Florida and Monroe, the assumption should be that there will be two white simultaneously flashing L-865 lights during the day and two red simultaneously flashing L-864 lights during the night on each of the 20 turbines.<sup>43</sup>

This reality is reinforced by the comments made at a wind power siting workshop of the NWCC. A spokesperson for a Madison, New York wind power plant noted that the strobe system in place there is, unfortunately, very noticeable and commented that the FAA is fairly inflexible on its requirements.<sup>44</sup>

Enxco often points to the apparent local acceptance of the facility in Searsburg, Vermont,<sup>45</sup> the only commercial-scale wind power plant in New England, as an example of what to expect once Hoosac is constructed. However, the Searsburg turbines are shorter than 200', and so are not lit.<sup>46</sup>

Near wind power plants with turbines taller than 200', the effects, particularly at night, are a cause of persistent distress to neighbors.

Around wind turbines in Kewaunee County, Wisconsin, "some people complain that turbines...ruin the night sky with their flashing red lights," according to one newspaper article.<sup>47</sup> Arlin Monfils, a town official there, described "flashing red lights (FAA) interfering with nearby homes."<sup>48</sup>

In a recent letter to the *Berkshire Eagle*, Lou Orehek, a town official near the Waymart wind power plant in Pennsylvania, complained about "the multitude of red blinking aircraft warning lights that now trace across the ridge top at night."<sup>49</sup>

As far as I know, the only place in Massachusetts with 34-story buildings is Boston. Imagine structures of that height along our ridgelines. Think about the visual impact of even a few towers on our landscape, and on tourists driving around the Berkshires, and seeking out our trails and summits for a wilderness experience.

## 2. Tourism

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<sup>43</sup> Hill Engineers, Architects, Planners, Inc. *Special Permit Application for enXco Incorporated: Hoosac Wind Project, Florida / Monroe, Mass.*, 10/6/03, p. 9.

<sup>44</sup> National Wind Coordinating Committee, "New England Wind Power Siting Workshop," Boston, MA, 10/24/01, p. 10, <http://www.NationalWind.org/events/regional/newengland/summary.pdf>

<sup>45</sup> Steve Blake, "Public discussion begins on Lowell wind project," *The Chronicle*, 9/24/03, [http://www.LowellWind.com/images/photos/lowell/Chronicle\\_092403.pdf](http://www.LowellWind.com/images/photos/lowell/Chronicle_092403.pdf)

<sup>46</sup> Robin Palmer, "Blowin' in the wind," *Barre Montpelier Times Argus*, 11/30/02, <http://TimesArgus.nybor.com/Leisure/SunMag/Story/56949.html>

<sup>47</sup> Associated Press, "Wind turbines draw complaints from some nearby neighbors," *Beloit Daily News*, 9/27/99, <http://www.BeloitDailyNews.com/999/3wis27.htm>

<sup>48</sup> Letter from Arlin Monfils, Chairperson, Town of Lincoln, Kewaunee County, Wisconsin, 2/1/00.

<sup>49</sup> Lou Orehek, "Wind farms have many drawbacks," *Berkshire Eagle*, 1/11/04, <http://www.BerkshireEagle.com>

Tourism is a \$250 million industry in Berkshire County, with some 2,250,000 visitors annually supporting about 11,000 jobs in cultural organizations and ancillary businesses, and paying \$13 million in state taxes and \$6.6 million in local taxes.<sup>50</sup> It is our primary economic generator,<sup>51</sup> and it shapes every aspect of our region.

In his comments at the 3/30/04 Regional Issues Committee meeting of the Berkshire Regional Planning Commission ["BRPC"], Bill Wilson of the Berkshire Visitors Bureau was clear about his opinion on whether or not wind turbines would attract visitors. I'm paraphrasing his comments here, based on my notes. He said his organization has done extensive studies of the Berkshire tourist, and has 20 years of experience. While there will always be someone willing to drive 150 miles to see a ball of twine, windmills will not put 'heads in beds.' The Berkshire type of tourist will not come here to see turbines.

The Bureau's extensive research shows that visitors to this area are looking for a premium cultural experience in a pastoral setting, such as is found nowhere else in America. The reason people come here is not to see industrial installations but for the scenic, rural, pastoral environment. Their sense of country is going back to a simpler time, a gentler time.

At one point, a BRPC staffer suggested that if tourists are already here, maybe they'll do a day trip to the town of Florida to see the Hoosac turbines. Mr. Wilson interjected "that's not supported by the research we've done."

He emphasized that anything degrading the pastoral experience risks the \$250 million tourism industry. He was clear that we cannot risk jeopardizing that essential component. Highly visible vistas shouldn't be damaged. Wind turbines will not be a major tourist attraction, period, he declared. There is no way, he said, that he will be convinced that wind turbines will be a tourist draw.<sup>52</sup>

Mr. Wilson's assessment is supported by tourism directors and studies done in places around the world with comparable scenic qualities and tourism-based economies.

In May of 2002, Scotland's National Tourism Board announced that it would conduct a survey of visitors to determine their attitudes toward wind farms in scenic areas. In response, the head of communications for the British Wind Energy Association -- which promotes the use of wind energy -- said: "We welcome this research, and we are looking forward to its findings. I should be very surprised if the research showed that windfarms are detrimental to tourism."<sup>53</sup>

In November of 2002, the study was released. 80% of the visitors surveyed said they went to Scotland for the beautiful scenery. 95% said they valued the chance to see

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<sup>50</sup> Editorial, "The industry of the future," *Berkshire Eagle*, 4/19/04, <http://www.BerkshireEagle.com>

<sup>51</sup> Karen Gardner, "Shift in tourism benefits county," *North Adams Transcript*, 4/10/03, [www.TheTranscript.com](http://www.TheTranscript.com)

<sup>52</sup> Berkshire Regional Planning Commission, Regional Issues Committee public meeting, 3/30/04.

<sup>53</sup> Murdo MacLeod, "Research examines the wind of change," *The Scotsman*, 5/12/02, <http://news.scotsman.com/topics.cfm?tid=605&id=514782002>

unspoiled nature. 58% agreed that wind-power sites spoiled the look of the countryside. 28% said they would avoid parts of the countryside with wind developments.<sup>54</sup> Tourism is Scotland's second largest income generator after agriculture.<sup>55</sup>

Cameron McNeish, president of Scotland's Ramblers Association, said more recently, "It seems that Scottish tourism and the Scottish landscape are being sacrificed to create more electricity for the big power users in the south of England. People come here because of the landscape quality of Scotland, because it's the last remaining wilderness on the edge of Europe and that would be very much threatened if all these proposals go ahead."<sup>56</sup>

In Australia, commenting about the Bay of Islands, an area that attracts more than 2.6 million overnight visitors and 130,000 international visitors annually, Adam Ruggero, Shipwreck Tourism Coast manager, noted that *Conde Nast Traveler* magazine had rated the coast's Great Ocean Road number one of its top 20 journeys of a lifetime. "The visitors come to see the pristine coastline and a windfarm would detract from that," he declared. "We support green energy without it detracting from the natural environment but we feel this would," he added.<sup>57</sup>

Roger Grant, chairman of Great Ocean Road Marketing, was similarly emphatic: "Wind farm promoters say they are a tourist attraction in themselves, which is nonsense...International tourists want to see our natural beauty, not wind turbine pylons."<sup>58</sup> He elaborated: "Certainly we know research tells us the reason people come to this part of the world is because of our natural attractions. When you start reducing our capacity to present natural attractions though the introduction of wind farms or industrial infrastructure...it's going to have a significant effect on the local economy. It should be rejected by the community, it should be rejected by the Government as inappropriate."<sup>59</sup>

Randall Bell, chairman of Australia's National Trust, has also been scathing about effects of the wind energy industry. He said wind turbines would deter tourists who come to Australia to experience 'reef, rock and road' - the Great Ocean Road. "It's going to absolutely crucify the greatest asset in the country. We are very emphatic in saying this is a no-go zone for this type of industrial activity."<sup>60</sup>

In Northern Ireland, plans for an offshore wind power plant along the north coast

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<sup>54</sup> Jeremy Watson, "Tourists blow ill wind on renewable energy," *The Scotsman*, 11/17/02, <http://news.scotsman.com/topics.cfm?tid=605&id=1278652002>

<sup>55</sup> Paul Miles, "Giant wind farm will keep tourists away, warn Scots operators," *Daily Telegraph*, 10/12/02, <http://www.telegraph.co.uk/travel/main.jhtml?xml=/travel/2002/10/12/etnewswind12.xml>

<sup>56</sup> Vidal, John, "An ill wind?" *The Guardian*, 5/7/04, <http://www.guardian.co.uk/renewable/Story/0,2763,1211314,00.html>

<sup>57</sup> Jaclyn Densley, "Windfarms slammed by tourist head," *Warrnambool Standard*, 2/4/03, <http://www.hotkey.net.au/~rayw1/pages/npa-standard.html#04-02-03>

<sup>58</sup> Geoff Strong, "Wind farm plan creates anger," *The Age*, 4/22/03, <http://www.theage.com.au/articles/2003/04/21/1050777212046.html>

<sup>59</sup> Krista Hamblin, "Ocean road tourism under threat: Grant," *Warrnambool Standard*, 4/21/03, <http://www.hotkey.net.au/~rayw1/pages/npa-standard.html#21-04-03d>

<sup>60</sup> Krista Hamblin, "Windfarm deterrent," *Warrnambool Standard*, 4/10/03, <http://www.hotkey.net.au/~rayw1/pages/npa-standard.html#10-04-03>

received a cool reception from the manager of the regional tourism organization, who said research has shown the outstanding natural beauty of the area is the prime draw for visitors. "Any development, not just this proposal for a wind farm, which poses a threat on the environment would give us some concern," said Don Wilmot, who manages the Causeway Coast and Glens Regional Tourism Organisation. He explained: "Tourism is a major earner for the region and generates some £100 million of revenue. Anything that would impact on us would give us serious cause for concern."<sup>61</sup>

Protesting plans for a wind power plant in Cumbria, England, John Hatt Firbank wrote a letter to the *Westmorland Gazette* last fall, drawing on his ten years as Travel Editor for *Harpers & Queen*, and visits to 92 countries. Here is an excerpt:

Having been in the travel business, I can also warn of long-term damage to tourism, which is hugely important to Britain, and most especially to Cumbria. Tourism is the largest business in the world, and it is often the most crucial source of revenue for many rural areas.

Nevertheless, as a travel writer I have learned that visitors will travel a long distance only for landscapes that are unique. The Cumbrian landscape is still unique (I can always recognise its subtle and individual beauty in any photograph, even if not captioned); but this uniqueness, and the indefinable magic that draws visitors, would be catastrophically diminished by the turbines.

I must also emphasise a more general point. Not one square-mile of new countryside is being created. Instead, it is being steadily diminished by urban incursions and clutter, including satellite masts, new roads, and windfarms...Once a bit of countryside is gone, it is gone forever.<sup>62</sup>

His stance was seconded by businesses warning the Lake District National Park Authority that the proposed wind power plant would have a "terrible impact" on tourism and the local economy.<sup>63</sup> As a result, the Authority agreed to lodge an objection to the scheme.<sup>64</sup> Eric Robson, chairman of the Cumbria Tourist Board has also been outspoken about his opposition to wind power plants.<sup>65</sup>

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<sup>61</sup> "Tourism fears over wind farm plan," *BBC News*, 2/14/02, [http://news.bbc.co.uk/1/hi/northern\\_ireland/1819985.stm](http://news.bbc.co.uk/1/hi/northern_ireland/1819985.stm)

<sup>62</sup> John Hatt Firbank, "Wind Farm: Keep Cumbria beautiful," *Westmorland Gazette*, 10/17/03, [http://www.thisisthelakedistrict.co.uk/search/display.var.424044.0.wind\\_farm\\_keep\\_cumbria\\_beautiful.php](http://www.thisisthelakedistrict.co.uk/search/display.var.424044.0.wind_farm_keep_cumbria_beautiful.php)

<sup>63</sup> "Glaring error' in windfarm document," *Westmorland Gazette*, 12/10/03, [http://www.thisisthelakedistrict.co.uk/search/display.var.440421.0.glaring\\_error\\_in\\_windfarm\\_document.php](http://www.thisisthelakedistrict.co.uk/search/display.var.440421.0.glaring_error_in_windfarm_document.php)

<sup>64</sup> Justin Hawkins, "Park Authority raises objection to wind farm," *Westmorland Gazette*, 1/9/04, [http://www.thisisthelakedistrict.co.uk/search/display.var.447629.0.park\\_authority\\_raises\\_objection\\_to\\_wind\\_farm.php](http://www.thisisthelakedistrict.co.uk/search/display.var.447629.0.park_authority_raises_objection_to_wind_farm.php)

<sup>65</sup> Jennie Dennett, "Windpower battle shifts to new front," *Westmorland Gazette*, 10/29/03, [http://www.thisisthelakedistrict.co.uk/search/display.var.427243.0.windpower\\_battle\\_shifts\\_to\\_new\\_front.php](http://www.thisisthelakedistrict.co.uk/search/display.var.427243.0.windpower_battle_shifts_to_new_front.php)

Germany produces more megawatts of energy from wind power than any other country in the world, and is often cited as an aspirational example. More than 100 university professors and scientists have signed the Darmstadt Manifesto against wind power plants in that country:

Our country is on the point of losing a precious asset...The industrial transformation of cultural landscapes which have evolved over centuries and even of whole regions is being allowed. Ecologically and economically useless wind generators, some of which stand as high as 120 metres and can be seen from many kilometres away, are not only destroying the characteristic landscape of our most valuable countryside and holiday areas, but are also having an equally radical alienating effect on the historical appearance of our towns and villages which until recently had churches, palaces and castles as their outstanding features.<sup>66</sup>

Last year, the Beacon Hill Institute at Suffolk University in Boston conducted an in-depth survey of 497 tourists to Cape Cod on the possible impacts of wind turbines in Nantucket Sound. Cape Cod and the Islands attract 6,000,000 visitors annually who directly account for 21% of the region's employment, and indirectly for 40%, and generate approximately \$84 million in state and local tax receipts.<sup>67</sup> The survey showed that very small changes in tourist behavior would have large economic impacts. 62% of the 497 tourists questioned said turbines would worsen the view slightly or a lot.<sup>68</sup> 3.2% said they would spend an average of 2.9 fewer days on the Cape, another 1.8% said they would not visit at all; 11% said they would pay less for lodging. The net effect was \$75.15 less spending on average per respondent per year. Grossed up to represent all tourists, this would represent a reduction in spending of between \$57 million and \$123 million annually, according to the study.<sup>69</sup>

### 3. Property Values

A British judge found that wind power plants can destroy the value of nearby homes. In 2001, District Judge Michael Buckley ruled that the noise, visual intrusion, and flickering of light through turbines blades 550 meters away reduced the value of a neighboring home by 20%. According to the *Times of London*, he said, "The effect is significant and it has a significant effect on the property. It is an incursion into the countryside. It ruins the peace."<sup>70</sup>

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<sup>66</sup> Press Release, "Darmstadt Manifesto," 9/1/98,

<http://www.windfarm.fsnet.co.uk/downloads/darmstadte.pdf>

<sup>67</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 10 of 53,

<http://www.BeaconHill.org/BHISTudies/BHIWindFarmStudy102803.pdf>

<sup>68</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 14 of 53,

<http://www.BeaconHill.org/BHISTudies/BHIWindFarmStudy102803.pdf>

<sup>69</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, pp. 3-4 of 53,

<http://www.BeaconHill.org/BHISTudies/BHIWindFarmStudy102803.pdf>

<sup>70</sup> Lewis Smith, "Wind farms ruin peace, says judge," *The Times*, 1/10/04, <http://www.timesonline.co.uk/>

His words are reflected in the sentiments of real estate agents in England and other countries where wind power plants have been proposed and constructed.

Kyle Blue, a real estate agent working near a planned wind power plant in Tebay, England, told a newspaper reporter, "To me, it is absolute common sense that if you put up huge industrial structures in an exceptionally beautiful area, property prices are going to suffer."

He then recounted that his agency had been "trying to sell a beautifully restored farmhouse for £340,000. We told one prospective buyer about the wind farm and he said: 'It doesn't bother me. My family and I are very green and supportive of this kind of energy.' Then he went away and visited wind farms all over the country. Three weeks later he came back to us and said he couldn't come to terms with the development after all. We had to take the property off the market and it remains unsold."<sup>71</sup>

In a vacation area near the Toora wind power plant in South Gippsland, Australia, a real estate agent told a news reporter that the 12 turbines were 'definitely' having an impact on values. "If they are near the property, buyers are staying away," Wesfarmers Landmark Leongatha agent Glen Wright said. "If I had to put a figure on it, I would say (a reduction of) 25 to 30 per cent on the going value."

Another real estate sales manager had major difficulties selling a property near the Toora plant. "I would have shown 50 or 60 people through that property and I would say half of those wouldn't even look at the place once they realize it's in the vicinity of wind turbines," Bruce Falk said. "And half of the other 50 per cent were concerned about resale so they offered 20 per cent less than the price the owners would accept."<sup>72</sup>

In another part of southwest Australia, John Denham, who had leased his farm for eight turbines, found that their presence hindered his efforts to find a buyer when ill health forced him to sell the land.<sup>73</sup>

In Denmark, Erwin Thorius, president of the National Association of Neighbours to Wind Turbines, said recently that people living near windmills found it impossible to sell their homes.<sup>74</sup> A study in Denmark about 10 years ago found that housing prices decreased

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<sup>71</sup> Ross Clark, "An ill wind blowing?" *The Telegraph*, 2/14/04, <http://www.telegraph.co.uk/property/main.jhtml?xml=/property/2004/02/14/pfarm14.xml>; Justin Hawkins, "Precedent fuels windfarm flight," *Westmorland Gazette*, 1/14/04, [http://www.thisisthelakedistrict.co.uk/search/display.var.448830.0.precedent\\_fuels\\_windfarm\\_flight.php](http://www.thisisthelakedistrict.co.uk/search/display.var.448830.0.precedent_fuels_windfarm_flight.php)

<sup>72</sup> Paul Sellars, "Turbines cast shadow over land values," *Weekly Times*, 4/6/03, <http://www.hotkey.net.au/~rayw1/>

<sup>73</sup> Adam Morton, "An ill wind blows down on the farm," *Warrnambool Standard*, 12/17/01, <http://www.hotkey.net.au/~rayw1/>

<sup>74</sup> Renee Mickelburgh, Tony Paterson, and Kim Willsher, "Huge protests by voters force the continent's governments to rethink so-called green energy," *The Telegraph*, 4/4/04, <http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2004/04/04/wwind04.xml&secureRefresh=true&requestid=1493>

near wind power plants, ranging from about US \$2,900 at that time for a one-turbine facility to US \$16,800 for a 12-turbine site.<sup>75</sup>

In a 1998 report about effects on property values, British estate agent FPD Savills concluded: "Generally, the higher the value of the property the greater the blight will be... As you go up the value scale, buyers become more discerning and the value of a farmhouse may be affected by as much as 30 per cent if it is in close proximity to the wind turbine."<sup>76</sup>

Here in the U.S., at a public meeting on Enxco's proposal for a wind power plant in Lowell, Vermont, a realtor trying to sell a farm near the site told Mr. Zimmerman that his claim that land values won't decrease is 'ludicrous.' Don Maclure said that when he tells people interested in buying the farm about the proposed project he never hears from them again.<sup>77</sup>

Other realtors are similarly skeptical. "They say there will be no effect on property values. That is absolutely incorrect," said real estate agent Roger Weaver of Kittitas County, Washington.<sup>78</sup> "There is no way wind farms won't affect property values in the Kittitas Valley. In a tremendously scenic area like the valley, the view is a major consideration in what people want."

Mr. Weaver explained that people from Puget Sound are purchasing country lands for homes while still working in Puget Sound. "They want a beautiful place to live and retire," he said. "Wind farms will have a real negative effect on the property values because the scenic views are a big deal, a real big deal to these people."<sup>79</sup>

As part of a study of the proposed Cape Wind project, 45 real estate professionals operating in towns around Nantucket Sound were contacted and asked about anticipated effects of the wind power project on property values.

49% of realtors expect property values within the region to fall if the Cape Wind power plant is erected.<sup>80</sup>

501 home owners in the six towns that would be most affected by the Cape Wind project

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<sup>75</sup> Tennessee Valley Authority, "20-MW Wind Farm and Associated Energy Storage Facility Environment Assessment, Appendix F: The Impact of Views on Property Values," April 2002, p. F-2, <http://www.tva.gov/environment/reports/windfarm/index.htm>

<sup>76</sup> Alexander Garrett, "Ugly side of clean power," *The Guardian*, 3/2/03, <http://observer.guardian.co.uk/cash/story/0,6903,905539,00.html>

<sup>77</sup> Steve Blake, "Public discussion begins on Lowell wind project," *The Chronicle*, 9/24/03, [http://www.LowellWind.com/images/photos/lowell/Chronicle\\_092403.pdf](http://www.LowellWind.com/images/photos/lowell/Chronicle_092403.pdf)

<sup>78</sup> Mike Johnston, "Will turbines hurt land value?" *Daily Record*, 1/21/04, <http://www.kynews.com/articles/2004/01/21/news/news01.txt>

<sup>79</sup> Mike Johnston, "Study of land value draws reactions," *Daily Record*, 7/1/03, <http://www.kynews.com/articles/2003/07/01/news/news02.txt>

<sup>80</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, pp. 16-17 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

were also surveyed. 68% said that the turbines would worsen the view over Nantucket Sound 'slightly' or 'a lot'.<sup>81</sup>

On average, they believed that Cape Wind would reduce property values by 4.0%. Those with waterfront property believed that it would lose 10.9% of its value. The study concluded that, based on the loss of property value expected by home owners, the total loss in property values resulting from the construction of Cape Wind would be \$1.35 billion, a sum substantially larger than the approximately \$800 million cost of the project itself.<sup>82</sup>

As the study noted, any reduction in property values would, in turn, lead to a fall in property tax collections in the affected towns; the drop in these tax collections would be \$8 million annually. If the tax rates were raised to maintain revenue, this would shift some of the property tax burden off waterfront residents (whose property values would fall the most) and on to the (less affluent) island residents.<sup>83</sup>

In the home owner survey, in response to the statement: It is important to protect an uninterrupted view of Nantucket Sound, 76% strongly agreed, 18% somewhat agreed, 3% were neutral, 2% somewhat disagreed, and 1% strongly disagreed.<sup>84</sup>

It's worth noting that of the home owners surveyed, 94% did not have homes with a view of the Sound.<sup>85</sup> 76% were not members of a conservation or environmental organization.<sup>86</sup> Regardless, their main reasons for living in the area were the 'beauty of the region,' 'the beaches,' and 'the ocean views.'<sup>87</sup>

Here in the Berkshires, according to a recent article about housing prices, realtor Paul Harsch said he'd noticed a trend of out-of-towners coming into the northern part of the

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<sup>81</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 14 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

<sup>82</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 4 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

<sup>83</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, pp. 4-5 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

<sup>84</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 28 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

<sup>85</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 32 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

<sup>86</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 34 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

<sup>87</sup> Jonathan Haughton, Douglas Giuffre, and John Barrett, *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*, Beacon Hill Institute at Suffolk University, October 2003, p. 31 of 53, <http://www.BeaconHill.org/BHISudies/BHIWindFarmStudy102803.pdf>

county, which he guessed was a result of the Massachusetts Museum of Contemporary Art in North Adams, and a growth in the arts.<sup>88</sup>

What will be the effect on second-home demand in towns around Hoosac and Brodie when 340' turbines with flashing lights are installed? What about primary residences? In particular, I wonder about the impacts on residents of Tilda Hill Road in the town of Florida, who might want to sell their houses after they've experienced the noise and light strobing of nearby turbines.

#### 4. Public Roads

At the 12/3/03 meeting of BRPC's Clearinghouse Review Committee, Enxco engineer Jason Krzanowski said that the longest vehicles transporting turbine components to the Hoosac wind power plant site will be 135', with a 120' turning radius, and a maximum turning grade of 1%. The heaviest vehicle weight will be 197,000 pounds.<sup>89</sup>

Engineers at the Massachusetts Highway Department have told me that the longest vehicle for which state roads are designed is 67', with a 45' turning radius. That length is half of the tractor-trailer employed for moving wind turbine blades. Apparently, the Department doesn't have any specifications for 135' vehicles.

In response to my request for the truck-turning template of the 135' vehicle to be used at Hoosac, Mr. Krzanowski said that such templates are not published.<sup>90</sup> However, I found one in documentation for another project.<sup>91</sup> It has diagrams showing specifications for a 135' or 139' tractor-trailer (the type is fuzzy) carrying a single 116' wind turbine blade. This is the same blade length noted in Enxco's 10/6/03 special permit application for Hoosac. The tractor-trailer's loaded height is 14', the number of axles is five, and the span between the two central axles is 98'. There is no driver at the rear, and the turning radius is 120' 7".

There are also specifications for the truck that will transport other large tower parts. The overall truck length is 112' with 11 axles, the loaded height is 15' 4", the width is 11' 6", and the gross weight is 197,000 pounds. The turning radius is 111' 3". The axles are grouped thusly, from front to back: one with a load of 12,000 pounds; three spaced 4.5' apart (axle to axle) for a maximum of 45,000 pounds; two at the same interval for a total of 40,000 pounds; three with the same intervals and a maximum of 60,000 pounds; and the rear two, same intervals, totaling 40,000 pounds.

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<sup>88</sup> Donna Roberts, "Realtors say home sales still booming," *North Adams Transcript*, 2/3/04, <http://www.TheTranscript.com>

<sup>89</sup> Berkshire Regional Planning Commission, Clearinghouse Review Committee public meeting, 12/3/03.

<sup>90</sup> Email from Jason Krzanowski, Hill Engineers, to Eleanor Tillinghast, Subject: Hoosac Wind Project RFI, 4/15/2004 12:52 PM.

<sup>91</sup> Princeton Municipal Light Department, *Expanded Environmental Notification Form: Princeton Wind Farm Infrastructure Improvements, Princeton, MA*, EOE #13229, 3/1/04, Appendix A, Engineering Plan Sheets.

According to Enxco's *Hoosac Wind Power News*, delivery of components for each turbine requires approximately eight tractor-trailers.<sup>92</sup> That means 160 trips. I don't remember the number of vehicle trips expected with the 112', heavier, tractor-trailer, but the template I have shows the nacelle on it. This means 20 nacelles, and perhaps the 60 turbine tower parts (three to each turbine), for a possible total of 80 trips using that sized vehicle. The 135' tractor-trailer will be used to bring 60 blades, one blade to a trip. The 300-ton crane with a 301' 8" boom and 28.5' width will, I assume, be assembled on-site.

How will the narrow rural roads around Hoosac accommodate vehicles of these dimensions? Mr. Krzanowski said the hairpin turn on Route 2 from North Adams will exclude the 135' tractor-trailer, which needs a virtually flat (1%) turning surface. If I understood him correctly, there is at least one bridge from the east on Route 2 that can't support a 197,000-pound tractor-trailer.<sup>93</sup>

It's difficult to imagine vehicles like these being able to maneuver on country roads without significant clearing of roadside trees and stone walls near any turns, regrading of road elevations, especially at curves, and damage to road beds. Are there any underpasses that must be negotiated? Of course, roads will have to be closed to allow passage of these vehicles. And since all the loads won't arrive on one day, roads will have to be closed for parts of many days, inconveniencing residents, and potentially jeopardizing public safety.

## **5. Public Safety**

There are four public safety issues that I want to touch on briefly: ice throw; turbine damage; driver distraction; and television, telecommunication, and radar interference. I'm not going to devote a lot of space here to each of these because on ice throw and signal interference there has been so much research that each could fill a paper, turbine damage is best illustrated with photos, which I will post on [www.GreenBerkshires.org](http://www.GreenBerkshires.org) as soon as possible, and I haven't done a lot of research about the visual impact on passing drivers. Nonetheless, I want to give you some information for consideration.

### **A. Ice Throw**

Icing represents the most important threat to the integrity of wind turbines in cold weather. Based on the duration of inoperative wind measuring equipment at one surveyed mountain in western Massachusetts, it was determined that icing weather can occur as much as 15% of the time between the months of December and March (Kirchhoff, 1999).

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<sup>92</sup> Enxco, Inc., *Hoosac Wind Power News*, Volume 1, Number 2, February 2003, p. 9, <http://www.HoosacWind.com/newsletter2.pdf>

<sup>93</sup> Berkshire Regional Planning Commission, Clearinghouse Review Committee public meeting, 12/3/03.

That's from a paper on cold weather issues by the University of Massachusetts Renewable Energy Research Laboratory ["RERL"].<sup>94</sup> RERL has been deeply involved in promoting wind power in the Berkshires.

There are two kinds of ice most likely to coat wind turbines: glaze and rime. Glaze ice happens during ice storms, when water hits a frozen surface. It is hard and quite transparent. Rime ice occurs in freezing conditions when a surface is exposed to clouds or fog.<sup>95</sup>

Today's huge wind turbines on mountainous sites in northern climates, like Hoosac, can easily reach into lower clouds in the cold season, causing rime icing.<sup>96</sup>

During cold weather at altitudes above 2,300', rime ice can be expected approximately 10% of the time. Above 3,000', the figure doubles to 20%.<sup>97</sup> As noted earlier, 11 Hoosac turbines will reach above 3,000'.

According to Henry Seifert, an expert on the technical requirements of wind turbine blades operating in cold climates:

If a wind turbine operates in icing conditions...two types of risks may occur if the rotor blades collect ice. The fragments from the rotor are thrown off from the operating turbine due to aerodynamic and centrifugal forces or they fall down from the turbine when it is shut down or idling without power production."<sup>98</sup>

A lot of research has been done on the problems of icing and the dangers of ice throw.<sup>99</sup> Despite all that work, "A commercial...anti-icing or de-icing system has not yet been proved reliable over many years. Just the opposite is the case,"<sup>100</sup> according to Mr. Seifert. The Searsburg wind power plant proves his point: black blades were installed to

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<sup>94</sup> Lacroix, Antoine, and Dr. James F. Manwell, *Wind Energy: Cold Weather Issues*, University of Massachusetts at Amherst, Renewable Energy Research Laboratory, June 2000, p. 6, [http://www.ecs.umass.edu/mie/labs/rerl/research/Cold\\_Weather\\_White\\_Paper.pdf](http://www.ecs.umass.edu/mie/labs/rerl/research/Cold_Weather_White_Paper.pdf)

<sup>95</sup> Lacroix, Antoine, and Dr. James F. Manwell, *Wind Energy: Cold Weather Issues*, University of Massachusetts at Amherst, Renewable Energy Research Laboratory, June 2000, pp. 6-7, [http://www.ecs.umass.edu/mie/labs/rerl/research/Cold\\_Weather\\_White\\_Paper.pdf](http://www.ecs.umass.edu/mie/labs/rerl/research/Cold_Weather_White_Paper.pdf)

<sup>96</sup> Seifert, Henry, Annette Westerhellweg, and Jurgen Kroning, *Risk analysis of ice throw from wind turbines*, BOREAS VI, April 2003, pp. 1, 2, <http://www.msue.msu.edu/cdnr/icethrowseifertb.pdf>

<sup>97</sup> Lacroix, Antoine, and Dr. James F. Manwell, *Wind Energy: Cold Weather Issues*, University of Massachusetts at Amherst, Renewable Energy Research Laboratory, June 2000, p. 9, [http://www.ecs.umass.edu/mie/labs/rerl/research/Cold\\_Weather\\_White\\_Paper.pdf](http://www.ecs.umass.edu/mie/labs/rerl/research/Cold_Weather_White_Paper.pdf)

<sup>98</sup> Seifert, Henry, Annette Westerhellweg, and Jurgen Kroning, *Risk analysis of ice throw from wind turbines*, BOREAS VI, April 2003, pp. 1, 2, <http://www.msue.msu.edu/cdnr/icethrowseifertb.pdf>

<sup>99</sup> Wind Energy in Cold Climates, <http://www.vtt.fi/virtual/arcticwind/publications.htm>; Seifert, Henry, *Technical Requirements for Rotor Blades Operating in Cold Climate*, 2003, [http://www.dewi.de/dewi/themen/bibli/pdf/seifert\\_boreas6.pdf](http://www.dewi.de/dewi/themen/bibli/pdf/seifert_boreas6.pdf); Lacroix, Antoine, and Dr. James F. Manwell, *Wind Energy: Cold Weather Issues*, University of Massachusetts at Amherst, Renewable Energy Research Laboratory, June 2000,

[http://www.ecs.umass.edu/mie/labs/rerl/research/Cold\\_Weather\\_White\\_Paper.pdf](http://www.ecs.umass.edu/mie/labs/rerl/research/Cold_Weather_White_Paper.pdf)

<sup>100</sup> Seifert, Henry, *Technical Requirements for Rotor Blades Operating in Cold Climate*, 2003, p. 1, [http://www.dewi.de/dewi/themen/bibli/pdf/seifert\\_boreas6.pdf](http://www.dewi.de/dewi/themen/bibli/pdf/seifert_boreas6.pdf)

prevent ice accumulation, yet as a photo in the RERL paper shows, ice still accretes on the blades.<sup>101</sup>

Enxco's Mr. Zimmerman has certainly acknowledged the risks.

As noted at the beginning of this paper, Mr. Zimmerman told a reporter: "Wind turbines don't make good neighbors." He added: "That's why ski areas are poor places to put big wind turbines. There must be a safety radius of 750 to 1,000 feet around the wind turbine, because they may fling ice off in winter."<sup>102</sup>

Three years earlier, he averred that a much larger safety radius was necessary, and his conclusion then was based on experience with Searsburg's turbines, which are considerably smaller than is now the norm. Here is a reprint of an email he wrote to an American Wind Energy Association listserv in 2000:

I've watched over the wind turbines GMP has had installed in Vermont over the last 10 years and have several thoughts that be useful to this discussion.

Here in Vermont, and elsewhere in the northeastern US, the winds blow strongest at the mountain tops, where it is also the most icy. A common first question to wind developers in this region is 'why don't you put the wind turbines at the ski areas (where there already is human development)?' The answer is because of the danger to public safety due to ice throws. Ski areas are not a good place for wind turbines.

Back in the mid 1980s one of the windy areas that was being considered for wind development was near to ski trails. Boeing and/or Hamilton Standard did some work to determine how far we must stay away from the ski trails to be safe from ice being thrown from their turbines (the MOD 5b was the boeing machine at the time). Without going back to dig up those papers, and if I remember correctly, the distance was between .25 and .5 miles away, downwind. It's a function of blade tip speed, so applicable to present day turbines too.

While the Boeing study was academic, the danger from ice being release from rotor blades overhead is real – and a hard hat is not going to provide you with much comfort. I have stood near the turbines GMP had on Mt. Equinox in the early 1990s and more recently the Zond 500 KW turbines in Searsburg Vt during and after icing events. When there is heavy rime ice build up on the blades and the machines are running you instinctually want to stay away. They roar loudly and sound scary. Probably you would feel safe within the .5 mile danger zone however.

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<sup>101</sup> Lacroix, Antoine, and Dr. James F. Manwell, *Wind Energy: Cold Weather Issues*, University of Massachusetts at Amherst, Renewable Energy Research Laboratory, June 2000, p. 12,

[http://www.ecs.umass.edu/mie/labs/rerl/research/Cold\\_Weather\\_White\\_Paper.pdf](http://www.ecs.umass.edu/mie/labs/rerl/research/Cold_Weather_White_Paper.pdf)

<sup>102</sup> Robin Smith, "Wind Towers Spark Debate," *Caledonian-Record*, 7/1/03,

[http://www.CaledonianRecord.com/pages/local\\_news/story/c2296e810](http://www.CaledonianRecord.com/pages/local_news/story/c2296e810)

One time we found a piece near the base of the turbines that was pretty impressive. Three adults jumping on it couldn't break. It looked to be 5 or 6 inches thick, 3 feet wide and about 5 feet long. Probably weighed several hundred pounds. We couldn't lift it. There were a couple of other pieces nearby but we wondered where the rest of the pieces went.

In the winter, icing is a real danger and GMP therefore restricts public access to the site(s). Maintenance workers have developed a protocol for working on turbines during icing conditions, though I am not familiar with the details. I'll 'dig into it' if you want.<sup>103</sup>

That's the entire email. I don't know if Mr. Zimmerman's memory served him correctly as to the exact distance for safety, but the maximum blade tip speed of the Searsburg turbines is 136.65915 mph, and that of the Hoosac turbines will be 180.64142 mph.

I've read that Brian Fairbank no longer offers skiing at Brodie Mountain, but does promote other winter activities. Also, at one point, he was considering condominiums there.<sup>104</sup> I don't know the distance between his property and the turbines proposed along the ridgeline, but I do know that the telecommunication towers and abandoned fire tower up there are near the upper ski lift drop-off. Since the wind blows more or less from the west, the ski area may be downwind of the wind turbines.

As for the Hoosac wind turbines, they will be near a popular snowmobile route. With approximately four miles of new roads constructed for the project,<sup>105</sup> and no fencing around the property, there is a potential for injury, especially to teenagers who might not respond cautiously to danger and trespass warning signs.

In any case, Mr. Zimmerman's email explains the public safety hazard from icing of any turbines that might be near hiking trails, snowmobile routes, or other public uses.

## **B. Turbine Damage**

Falling or flung parts of broken turbines would be another public safety concern. I hadn't thought to do any research on this possibility, but found a passage in an article which made me think more investigation needs to be done.

Wind power proponents discount the problems of broken turbines, but I have seen photos to the contrary,<sup>106</sup> and will have to go back through my records to retrieve them. I'll post them on [www.GreenBerkshires.org](http://www.GreenBerkshires.org).

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<sup>103</sup> Email from John Zimmerman, VERA, to [listsaver-egroups-awea-windnet@egroups.com](mailto:listsaver-egroups-awea-windnet@egroups.com), Thu, 20 Jan 2000 10:51:43 -0500.

<sup>104</sup> John Hitchcock, "Blustery season blew away ski area profits," *The Advocate*, 4/7/04, <http://www.iberkshires.com/advocate/story13976.html>

<sup>105</sup> Enxco, Inc., *Environmental Notification Form*, EOE #13143, p. 11.

<sup>106</sup> <http://www.misplacedwindpower.org/archives/windrad.jpg>

The article about the 1.5 MW General Electric turbines at the Waymart wind power plant in Pennsylvania is worth noting because those turbines are the same as will be installed at Hoosac:

According to Klaus Obel, Waymart Operations Manager, the wind turbines there are shut down when the temperature hovers around zero degrees Fahrenheit and lower. He said the 115' fiberglass blades can become brittle so the turbines are not operated at such temperatures.<sup>107</sup>

### **C. Driver Distraction**

Construction of the Fenner NY wind power plant generated significant traffic. At the time, Fenner town supervisor Russell Cary said, "It's nothing to see 25 to 30 cars alongside the road watching the construction."<sup>108</sup>

In England, a decision by local officials to vote down a wind power plan was backed up by a government inspector who found that wind turbines would have a potentially "adverse effect" on highway safety.<sup>109</sup>

Undoubtedly, local and state highway employees will develop traffic control plans for cars stopping along Route 2 to watch construction of the Hoosac towers. But, after the turbines start operating, what will be the safety measures for drivers along Route 2, the major east-west artery from Williamstown to Boston, who suddenly encounter the visual impact of 34-story structures looming near the highway? From the vantage of Whitcomb Summit, the highest point on Route 2, the tallest Hoosac turbine blade tip will, at full extension, be more than 900 feet higher. As anyone driving south along Vermont's Route 8 knows, when you come up over the rise just north of the Searsburg towers, the visual effect is stunning. Luckily, there is a pull-out next to the road. The Hoosac towers are almost half again as tall as those at Searsburg, and Route 2 is a much busier route. No one I spoke with at the state highway department knew if a study has been done of the safety and mitigation issues.

### **D. Television, Telecommunication, and Radar Interference**

#### **1.) Television reception interference**

During the permitting phase of wind power plants, developers routinely say television reception is not affected by wind turbines. Just as routinely, nearby residents complain of

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<sup>107</sup> Peter Becker, "TV Tower To Fix Wind Farm Woe," *Wayne Independent*, 1/26/04, <http://www.WayneIndependent.com/>

<sup>108</sup> Mike Bilodeau, "Fenner windmills attract a crowd," *Oneida Dispatch*, 10/4/01, [http://www.OneidaDispatch.com/site/news.cfm?newsid=2448508&BRD=1709&PAG=461&dept\\_id=68808&rfti=8](http://www.OneidaDispatch.com/site/news.cfm?newsid=2448508&BRD=1709&PAG=461&dept_id=68808&rfti=8)

<sup>109</sup> "Inquiry rules out wind farm," *BBC News*, 7/22/03, <http://news.bbc.co.uk/1/hi/england/tyne/3087471.stm>

the problem once the turbines are built. (The exceptions, I should add, are the landowners leasing lands for the turbines.)

Last year, the developer and operator of the Top of Iowa Wind Farm, announced that it would offer free cable TV service to 145 residents in and around the project near Mason City, Iowa, because of signal interference created by the towers and whirling generator blades.<sup>110</sup> An article described the problem:

Mike Kelly, director of operations at the Top of Iowa Wind Farm, said the 89-tower project was in full operation at the end of November 2001. The wind farm is in the midst of farm country spread over a 5,200-acre area. The towers are atop a gradually sloping hill 100 feet high.

"As operations geared up, we started getting complaints," Kelly said. "We never have gotten complaints like this before from other projects, and it was new. It was a combination of factors unique to the Top of Iowa project."

He said broadcast television signals come from TV transmission towers staggered at 25 to 60 miles away. The distance and the hill downgrades the signals, he said, and many people were not getting a perfect signal to begin with.

Out of about 350 homes within and around the project area, 175 complaints came to Zilkha, Kelly said. People with complaints indicated further downgrading of signals they received that involved a ghosting or shadow effect on screens.

He said the signals bounce off towers and whirling blades and create a second signal that comes to television sets moments behind the initial signal. This creates ghosts and reduced signal strength.

"It had nothing to do with electromagnetic fields," Kelly said. "It was a physical interference issue or a momentary interruption of the signal."

Most new televisions filter out the ghosting effect, but older sets don't, he said.

Many rural or isolated areas where wind farms are located, he said, have residents who get television by cable or satellite signal, which are not affected by the towers.<sup>111</sup>

During a ceremony at which the Secretary of Pennsylvania's Department of Environmental Protection handed a permit to the British developer of the Waymart wind

<sup>110</sup> Mike Johnston, "Got TV?" *Daily Record*, 4/5/03, <http://www.kvnews.com/articles/2003/04/05/news/news02.txt>

<sup>111</sup> Mike Johnston, "Got TV?" *Daily Record*, 4/5/03, <http://www.kvnews.com/articles/2003/04/05/news/news02.txt>

power plant, the company's representative affirmed that there is evidence turbines can interfere with radio and television reception.<sup>112</sup>

Residents near Waymart do complain about television reception. Ray Vogt said that since the plant began operating, he can actually see the interference move as the blades go around. Several other people said their TVs have also been affected.<sup>113</sup> Some have been using a UHF antenna and others have cable service.<sup>114</sup>

Satellite service could also be affected. Here are two excerpts from an environmental impact statement for a wind power project in Kittitas Valley WA:

Other potential forms of television interference generated during turbine operations are signal reflection (ghosting) and signal blocking caused by the relative locations of the turbine structures and the receiving antenna with respect to the incoming television signal. Television signals that operate at higher frequencies, such as satellite receivers, are not affected by corona-generated television interference. However, because they are line-of-sight systems, physical interference from the turbine towers or blades is a possibility.

Based on a turbine blade radius of approximately 130 feet, the study concluded that 12 proposed turbines could potentially obstruct five existing microwave paths in the project area.<sup>115</sup>

## 2.) Radar and telecommunications interference

In the Berkshires, as noted earlier, there are airports in Pittsfield and North Adams, and an airport in nearby Albany, New York. There is also the Westover Air Reserve Base in Chicopee MA. I have not done much research on the topic of radar interference, but an article in the British *Guardian* encapsulates the problem:

Put simply, one piece of fast-moving metal looks pretty much like another to a radar operator, whether it's the rotating blades of a wind turbine or the approach of an...aircraft."<sup>116</sup>

Consequently, in Britain and Norway, the military has objected to some plans for wind power plants along coastal sites, saying those can disturb telecommunications and produce false radar echoes.

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<sup>112</sup> Peter Becker, "Wind Farm Approved," *Wayne Independent*, 1/29/02, <http://www.WayneIndependent.com/>

<sup>113</sup> Peter Becker, "Impact of windmills addressed at public forum," *Wayne Independent*, 11/20/03, <http://www.WayneIndependent.com/>; Thomas M. Di-Stasio, "Windmills blamed for bad TV reception," *Wayne Independent*, 10/03/03, <http://www.WayneIndependent.com/>

<sup>114</sup> Peter Becker, "TV Tower To Fix Wind Farm Woe," *Wayne Independent*, 1/26/04, <http://www.WayneIndependent.com/>

<sup>115</sup> *Kittitas Valley Wind Power Project Draft EIS*, Section 3.10 Transportation, December 2003, p. 3.13-15.

<sup>116</sup> David Adam, "Why do wind turbines confuse military radar?" *The Guardian*, 3/4/04, <http://www.guardian.co.uk/life/thisweek/story/0,12977,1161090,00.html>

The British Ministry of Defense has opposed numerous preliminary applications for wind power plant construction: 48% in 2003, up from 34% in 2002. “There are genuine concerns over how wind turbines can interfere with our radar systems,” said a Ministry spokesman.<sup>117</sup>

In 2002, the owner of the Glasgow airport in Scotland objected to a wind power plant proposed 15 miles away, saying the turbines would create a “snowstorm” of false blips on its radar, making it almost impossible to pick out aircraft coming in to land. The turbines would pose a “serious threat to the safe operation of the airport’s airspace.”<sup>118</sup>

In 2002, an effort to construct a wind power plant near the U.S. Air Force’s Nevada Test and Training Range was canceled due to concerns of Nellis Air Force Base officials that the wind turbine blades would interfere with radar.<sup>119</sup>

A study done in 2003 for the British Department of Trade and Industry on *Wind Farms Impact on Radar Aviation Interests* provides more explanation. Here are a few excerpts (each paragraph from different parts of the report):

However, it is safe to say that the materials used in the manufacture of a wind turbine will affect the wind turbine’s RCS value. In particular, metals and other electrically conducted materials, such as carbon fibre, are reflective to radar and, therefore, will contribute to increasing the RCS signature.

The turbine rotor is very important in considering the effect of wind turbines on radar. As it is spinning a proportion of the blades (depending on yaw angle and RPM) will be traveling fast enough to be unsuppressed by most radar stationary clutter filters. Hence, unless these returns are below the radar threshold then the turbine will appear as a target on the radar PPI display.

Current procedures have put a lot of emphasis on the range of the wind farm from the radar. This has led to an impression that the further from the radar the farm is placed the smaller the interference. The situation is not that simple. A greater range is only better because it will increase the chances of intervening terrain and the earth’s curvature obscuring the radar LoS to the turbines. Due to the magnitude of scattering from a wind turbine, if the wind farm is within the operating range of the radar and the LoS exists then the radar will receive clutter signals from the turbines.

Wind farms can create a detectable radar return even when not in direct LoS of

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<sup>117</sup> David Adam, “Why do wind turbines confuse military radar?” *The Guardian*, 3/4/04, <http://www.guardian.co.uk/life/thisweek/story/0,12977,1161090,00.html>

<sup>118</sup> Frank Hurley, “Windfarm plan hits turbulence,” *Scotsman*, 5/26/02, <http://news.scotsman.com/topics.cfm?tid=605&id=571152002>

<sup>119</sup> Dave Wilson, “US wind power: Illinois: 1, Nevada: 0,” *e4engineering.com*, 7/22/02, <http://www.e4engineering.com/story.aspx?uid=b22ec991-ff31-47a1-9ca6-aa8a3df01f6b>

the radar. This is due to diffraction over the intervening ground between the radar and wind farm. The level of detectability of the wind farm is dependent on frequency of radar and the distance from the wind farm to the point of diffraction and the distance below the LoS horizon where the wind farm is located.

The diffraction effects mentioned above and the design of wind turbines, mean that wind turbines individually create ‘radar shadows’. Any shadow that does exist behind wind turbine decreases in intensity with distance (e.g.) for a 3GHz radar, the shadow extends hundreds of metres behind a typical wind turbine.

All radar contain filtering systems that are designed to extract out information that is of use for the particular radar purpose and to reject all other information (perceived as clutter). As already discussed above, operating wind turbines exhibit many of the characteristics associated with aircraft i.e. relatively large RCS with a strong Doppler shift. As current generation radar systems are not designed for the removal, by filtering, of clutter from wind turbines, we have a situation where wind turbines can cause clutter and false tracks on radar displays.<sup>120</sup>

## 6. Quality of Life

In addition to television interference, there are other issues directly affecting the quality of life for people living near wind power plants. Two, in particular, are noise and strobing light.

### A. Noise

”Wind farms ‘make people sick who live up to a mile away.’”

That's the title of an article that appeared in the British *Daily Telegraph* earlier this year. Here is an excerpt:

Onshore wind farms are a health hazard to people living near them because of the low-frequency noise that they emit, according to new medical studies. Doctors say that the turbines - some of which are taller than Big Ben - can cause headaches and depression among residents living up to a mile away.

One survey found that all but one of 14 people living near the Bears Down wind farm at Padstow, Cornwall, where 16 turbines were put up two years ago, had experienced increased numbers of headaches, and 10 said that they had problems sleeping and suffered from anxiety.

Dr Amanda Harry, a local GP who did the research, said: “People demonstrated a range of symptoms from headaches, migraines, nausea, dizziness, palpitations and

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<sup>120</sup> Poupart, Gavin J., *Wind Farms Impact on Radar Aviation Interest – Final Report*, Prepared for the Department of Trade and Industry, September 2003, pp. 6-8, <http://www.bwea.com/aviation/QinetiQ-Radar-Study-part1.pdf>

tinnitus to sleep disturbance, stress, anxiety and depression. These symptoms had a knock-on effect in their daily lives, causing poor concentration, irritability and an inability to cope.”

Dr Harry said that low-frequency noise - which was used as an instrument of torture by the Germans during the Second World War because it induced headaches and anxiety attacks - could disturb rest and sleep at even very low levels.

“It travels further than audible noise, is ground-borne and is felt through vibrations,” she said. “Some people are having to leave their homes to get away from the nuisance. Yet, despite their obvious suffering, little is being done to relieve the situation and they feel that their plight is ignored.”

Similar problems have been found by Dr Bridget Osborne, a doctor in Moel Maelogan, a village in North Wales, where three turbines were erected in 2002. She has presented a paper to the Royal College of General Practitioners detailing a ‘marked’ increase in depression among local people.

“There is a public perception that wind power is ‘green’ and has no detrimental effect on the environment,” said Dr Osborne. “However, these turbines make low-frequency noises that can be as damaging as high-frequency noises. When wind farm developers do surveys to assess the suitability of a site they measure the audible range of noise but never the infrasound measurement - the low-frequency noise that causes vibrations that you can feel through your feet and chest. This frequency resonates with the human body - their effect being dependent on body shape. There are those on whom there is virtually no effect, but others for whom it is incredibly disturbing.”<sup>121</sup>

The *Wall Street Journal Europe* reported on one woman’s experience in Germany:

Diana Hutchinson used to like the sound of the wind blowing past her small-country house, near the German village of Kamscheid. Now she prays for calm weather because when the wind blows her once-tranquil life is shattered. Mrs. Hutchinson lives 250 meters from a state-of-the-art windmill.

Known as an Enercon E40 wind turbine, the windmill stands 85 meters high and has a wingspan of 40 meters. It was installed two years ago and the incessant noise of the spinning blades has made the Hutchinsons’ life unbearable. “The noise of the revolving blades echoes throughout the house, and all thought of sleep, or even of having a quiet conversation, is lost,” says Mrs. Hutchinson. “When the wind blows the people nearby stay indoors and shut their windows,

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<sup>121</sup> Catherine Milner, “Wind farms ‘make people sick who live up to a mile away,’” *Daily Telegraph*, 1/25/04, <http://www.telegraph.co.uk/news/main.jhtml?xml=%2Fnews%2F2004%2F01%2F25%2Fwind25.xml>

even on a hot summer day. Life would be more pleasant if we lived right next to a motorway."<sup>122</sup>

Shortly after wind turbines were installed in Kewaunee County, Wisconsin, in 1999, a local newspaper ran a story headlined, "Wind turbines draw complaints from some nearby neighbors." According to the story: "Artist Ken Loeber said he liked the concept until he started hearing turbine noise at his log home. 'It's more like we are living in an industrial park,' said Loeber, 51, who moved into a rural area of Kewaunee County, seeking peace and quiet, in the early 1970s. 'It's so noisy that some nights we can't open our windows.'"

The article then went on to quote Lincoln town chairman Arlin Monfils of Kewaunee County: "There's problems. There's more noise than people expected. And the problem is that it's almost constant."<sup>123</sup>

Mr. Monfils subsequently wrote a letter describing "wind turbine NOISE which interferes with neighbors' sleep and their mental health." For towns considering wind power plants, he warned: "Once the turbines are up and operating the wind turbine noise will be there. It will not be constant and it may not be above the decibel level that they establish as a maximum, but it will be irritating, at any time of day or night and will vary in its intensity with the wind direction and speed."<sup>124</sup>

A year later, Kewaunee neighbors were still distressed. One woman was quoted in a newspaper: "They are very noisy," Darlene Martin said, likening the sound to a farmer's silo unloader that runs constantly. "It is worse at night when a person is trying to sleep. It is just a steady kind of humming and sometimes you hear the wind, 'Swoosh, swoosh.'"<sup>125</sup>

In 2002, neighbors there were still complaining. As reported by the *Chicago Tribune*: "Across the fields of corn and soybeans, where [Nancy] Larson and her husband, Mike Washachek, have a clear view of all 14 wind turbines, the initial enthusiasm over embracing clean, renewable energy has been overwhelmed by the unexpected. A strobe effect flashes their home at sundown as the sun hits the turning rotors. There also is television signal interference. And noise. 'I wake up some nights and think I left the dryer on with a tennis shoe in it,' Larson said. 'We were used to the beautiful quiet nights, and now that's gone.'"<sup>126</sup>

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<sup>122</sup> Brian O'Connell, "The Answer Is Not Blowing in the Wind," *Wall Street Journal Europe*, [http://www.junkscience.com/mar01/wsje\\_OCONNELL.htm](http://www.junkscience.com/mar01/wsje_OCONNELL.htm)

<sup>123</sup> Associated Press, "Wind turbines draw complaints from some nearby neighbors," *Beloit Daily News*, 9/27/99, <http://www.BeloitDailyNews.com/999/3wis27.htm>

<sup>124</sup> Letter from Arlin Monfils, Chairperson, Town of Lincoln, Kewaunee County, Wisconsin, 2/1/00.

<sup>125</sup> Associated Press, "Wind generators keep popping up," *Beloit Daily News*, 12/11/00, <http://www.BeloitDailyNews.com/1200/6wis11.htm>

<sup>126</sup> Tim Jones, "Rush to wind farms has noisy price," *Chicago Tribune*, 7/24/02, <http://www.GlebeMountainGroup.org/Newslist.htm>

Shortly after the Waymart wind power plant in Pennsylvania was constructed last fall, residents began complaining of noise there. One man who lives about 1,500 feet from one turbine said the rotors are so loud they keep him awake at night. "It sounds like an airport...my peace is gone forever," he lamented.<sup>127</sup> Those are 1.5 MW<sup>128</sup> General Electric turbines,<sup>129</sup> just like the ones planned for Hoosac.

In a January 2004 letter to the *Berkshire Eagle*, Lou Orehek, the PA town official mentioned earlier, wrote of the Waymart wind power plant: "The windmills have been described as 'running refrigerator' quiet. During the day the noise they generate is not above the level of background noise. It is in the quiet hours during the night when members of my family have found a distinct problem. Although studies are pending, it is the opinion of members of my family that the windmills generate a low frequency 'grind' from the turbine inside and this noise travels more than 7,000 feet. The noise is further amplified by multiple windmills."<sup>130</sup>

In May 2004, frustrations of residents near the Waymart facility came to a head. They appealed to the county commissioners for help in their dealings with the wind power plant owner, FPL Energy. "After seven months, the only thing I got was aggravation. You write a letter to them you get no response," said David Pevec. "Now my property will be hard to sell. I love it there. I hate the noise. You go to bed at night and it's there." The company spokesperson said she couldn't release the noise standard data sought by the residents from General Electric, the turbine manufacturer. The county commissioners had no remedies for the neighbors, except a suggestion to call the state department of environmental protection.<sup>131</sup>

In Australia, the farmer who leased his property for eight turbines, some as close as 600 meters to his house, said they sounded 'like a braking semi-trailer' on windy days. "If you are the landholder receiving lease payments, you can put up with it but we can understand why neighbors who get no direct benefit from the windfarm would find the noise objectionable," he wrote.<sup>132</sup>

Of another Australian wind power plant: A couple told a reporter that the noise from the Toora wind turbines is sometimes so loud they cannot sleep. They live less than 800 meters away from the 12-turbine wind farm and are planning to move to a new property they have bought elsewhere in the district. The turbines are not always noisy, they said,

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<sup>127</sup> Peter Becker, "Impact of windmills addressed at public forum," *Wayne Independent*, 11/20/03, <http://www.WayneIndependent.com/>

<sup>128</sup> Peter Becker, "Heavy winds won't disturb turbines," *Wayne Independent*, 9/19/03, <http://www.WayneIndependent.com/>

<sup>129</sup> Lori Gabriele, "Winds Blow Different Ways On Turbine Issues," *Wayne Independent*, 5/5/04, <http://www.WayneIndependent.com/>

<sup>130</sup> Lou Orehek, "Wind farms have many drawbacks," *Berkshire Eagle*, 1/11/04, <http://www.BerkshireEagle.com>

<sup>131</sup> Lori Gabriele, "Winds Blow Different Ways On Turbine Issues," *Wayne Independent*, 5/5/04, <http://www.WayneIndependent.com/>

<sup>132</sup> Adam Morton, "An ill wind blows down on the farm," *Warrnambool Standard*, 12/17/01, <http://www.hotkey.net.au/~rayw1/>

but "we can't walk out on our porch without hearing it 90 per cent of the time."<sup>133</sup>

And they are not the only complainants.

That article went on to describe the experience of another resident there: A nearby landowner, who asked not to be named, said he had initially supported the wind farm, but his view changed dramatically after the turbines were erected in 2002. "Since those turbines have been put up, I lose sleep and when I go outside I get migraine headaches," he said.<sup>134</sup>

People elsewhere in Australia were particularly outraged when a wind energy company said its turbines would be too noisy for a spa proposed near the 120-turbine facility it was preparing to build. This assertion was made in an appeal by the company of a planning permit granted to the spa developer. It claimed the spa would be incompatible with the wind turbines by reason of potential noise and nuisance during construction and normal operations of the wind power plant over at least 25 years.

During the earlier hearing for its own project, the company had insisted that noise from its wind power plant would not be an issue and that its turbines complied with 'exacting standards'. A consultant for the company had also said modern turbines were not noisy.<sup>135</sup>

In Holland, a community distressed by the noise generated by a wind power plant just over the border in Germany hired an acoustician, Frits van den Berg, to measure the aural effects of the wind turbines, particularly at night, during which the residents experienced the most disturbance. He was intrigued that other communities in the Netherlands were also complaining about annoying turbine sound at distances where they were not even expected to be able to hear the sound. Consequently, he did two studies that explain the phenomena experienced by so many people living around wind power plants.

First, he described the complaint, and then explained two aspects of the problem, which I will summarize here.

In his words, there is a distinct audible difference between daytime and nighttime wind sound at some distance from the turbines. On a summer's day in a moderate or even strong wind the turbines may only be heard within a few hundred meters. However, on quiet nights, they can be heard at distances of up to several kilometers when they rotate at high speed. On these nights, certainly at distances between 500 and 1000 meters from the wind power plant, one can hear a low pitched thumping sound with a repetition rate of about once a second (coinciding with the frequency of blades passing a turbine mast), not unlike distant pile driving, superimposed on a constant broadband 'noisy' sound. A

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<sup>133</sup> Paul Sellars, "Wind farm whips up a noise problem," *Weekly Times*, 4/6/03, <http://www.hotkey.net.au/~rayw1/>

<sup>134</sup> Paul Sellars, "Wind farm whips up a noise problem," *Weekly Times*, 4/6/03, <http://www.hotkey.net.au/~rayw1/>

<sup>135</sup> Paul Sellars, "Noise factor now an issue," *Weekly Times*, 11/6/02, <http://www.hotkey.net.au/~rayw1/>

resident living at 1.5 kilometers from the wind power plant described the sound as ‘an endless train’. In daytime, these pulses are not clearly audible, and the sound is less intrusive or even inaudible (especially in strong wind because of the consequent high ambient sound level.)

Within the wind power plant itself, the turbines are audible for most of the (day and night) time, but the thumping is not evident, although a ‘swishing’ sound – a regular variation in sound level caused by the pressure variation when a blade passes a turbine mast – is readily discernible. Sometimes a rumbling sound can be heard, but it is difficult to assign it, by ear, to a specific turbine or to assess its direction. Mr. van den Berg’s studies show that the sound levels near the wind plant at night are much higher than expected from measurements performed during the day. Due to radiation cooling at the ground level at night, wind slows down near the ground but the same degree of cooling is not happening at the height of a turbine hub. With little wind at the ground surface, and therefore little wind-induced background sound, the sound from the blades at hub height is more audible. He established that the sound level can be up to 15 dB higher than the maximum expected sound level at 400 meters from the plant, and 18 dB higher than expected at 1,500 meters. He stressed that these maximums can occur not only at high wind speeds but also at low wind speeds along the ground surface.

In addition, the sound from the turbines has what he termed an “impulsive” character. When the blades rotate past the turbine mast, pressure is created between the blade and the turbine, which creates a swishing sound. When several turbines operate nearly synchronously, the pulses may occur in phase. Two pulses double the effect (+3dB), three triple it (+5dB.) Several low magnitude pulses thus cause an unexpected sound when they synchronize, which resembles in the words of that resident, ‘an endless train.’ The faster the rotational speed of the blades, the more frequent the repetitive thump. These sounds are not heard near the turbines, but at some distance. In fact, he said, the impulsiveness cannot be heard within the wind power plant.<sup>136</sup>

It’s clear that audible and low-frequency noise from wind power plants, regardless of turbine size, is a real problem for people living in their vicinity. University of Massachusetts’s RERL has acknowledged as much: “A major consideration and possible barrier to the installation of wind turbines in Massachusetts is noise. Recently, one wind turbine has been dismantled because of the perceived noise.”<sup>137</sup>

## **B. Strobing Light and Shadows**

“When the sun is setting it shines through the blades, causing severe flashing in our house.”

<sup>136</sup> van den Berg, Frits G.P., “Wind turbines at night: acoustical practice and sound research,” Science Shop for Physics, University of Groningen, the Netherlands, 2003, pp. 1-2,

<http://www.nowap.co.uk/docs/EURONOISE2003ID160.PDF>; van den Berg, G.P., “Effects of the wind profile at night on wind turbine sound,” *Journal of Sound and Vibration*, 9/22/03, pp. 1-2,

<http://landskapsskydd.nu/windnoise.pdf>

<sup>137</sup> <http://www.ecs.umass.edu/mie/labs/rerl/research/noise.html>

"In the morning through the south bay window the blades can be watched on the walls."

"On sunny mornings the strobe lighting comes in the windows even with the blinds down."

"On sunny days we get shadows from blades."

"Very hard to watch TV or do any work in the kitchen, as the shadows are distracting."

"We get a 'strobe effect' throughout our house and over our entire property (40 acres)."

"In the spring and fall there is a strobe effect inside the house and in our yard."

"In fall I get a shadow."

"Shadows are cast over the ground and affect my balance."

"Shadows from the blades sweep over our house and yard and ruin our quality of life."

Those are some of the comments made in response to a 2001 community survey of the residents living near the wind turbines in Kewaunee County WI.<sup>138</sup>

According to an Associated Press article about the problems there:

From the back deck of Tyler Yunk's home, blades from three towers spin just over the treetops. Yunk, 18, said the whirling blades sometimes combine with the setting sun to produce a strobe-light effect on the house. "It is like a flashlight and then a shadow and then a flashlight," he said. "There are times you got to get up and go outside and get out of the house. Your eyes can't take it."<sup>139</sup>

Wisconsin Public Service responded to complaints from home owners with curtains, shades, awnings and, in some cases, replacing broadcast television antennas with satellite TV. The utility also offered to buy out and relocate a half-dozen homes.<sup>140</sup>

Mr. Monfils cautioned other towns facing wind power plant proposals that rotating

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<sup>138</sup> Kabes, David E., and Crystal Smith, "Comments for the Lincoln Township Wind Turbine Survey," *Lincoln Township Wind Turbine Survey*, Agricultural Resource Center, University of Wisconsin-River Falls, 5/15/01

<sup>139</sup> Associated Press, "Wind generators keep popping up," *Beloit Daily News*, 12/11/00, <http://www.BeloitDailyNews.com/1200/6wis11.htm>

<sup>140</sup> Tim Jones, "Rush to wind farms has noisy price," *Chicago Tribune*, 7/24/02, <http://www.GlebeMountainGroup.org/Newslist.htm>

shadows in nearby homes were “problems that we had warned the utilities about but were assured that they would not occur.”<sup>141</sup>

Regarding a wind power plant proposed in Addison County, Wisconsin, the developer, FPL Energy, obliquely acknowledged the potential problem in a permit application: “Some WTGs can cause reflective glare produced by the reflecting of sunlight or other external source of light from the blades, generator casing, or tower. No relevant government standards have been identified establishing hazardous exposure levels for glare.”<sup>142</sup>

For a project proposed in Kittitas County WA, the company promised: “Potential shadow-flicker impacts from the three proposed wind power projects would be limited to the immediate vicinity (approximately 2,000 feet) of the wind turbines within each respective project area.”<sup>143</sup>

For a plant in Iowa, Northern Iowa Windpower took the extra step of offering ‘neighbor agreements’ to people living within 1,200 feet of a turbine. According to a case study, the agreements allow the wind power plant to cast a shadow caused by the towers and blades across the respective land. The agreements also permit the plant to emit audible noise in excess of 50 dBA across the land. Sound levels at the outer walls of existing, occupied homes are kept at or below 50 dBA.<sup>144</sup>

## Conclusion

Last month the British newspaper *The Telegraph* ran a story titled, "Huge protests by voters force the continent's governments to rethink so-called green energy." It began:

They introduced the world to "environmentally friendly" energy, but now some of Europe's "greenest" countries are under pressure to backtrack on wind farms in the face of public anger over their impact on the countryside.

Voters are outraged by the unsightly turbines, the loud, low-frequency humming noise that they create and the stroboscopic effects of blades rotating in sunshine.

Opponents are dismayed at the proliferation of the turbines in some of the most beautiful areas of the continent. Conservationists complain that hundreds of birds are killed each month by the rotating blades.

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<sup>141</sup> Letter from Arlin Monfils, Chairperson, Town of Lincoln, Kewaunee County, Wisconsin, 2/1/00.

<sup>142</sup> FPL Energy, “Application for a Conditional Use Permit for The Addison Wind Farm,” 10/11/00, p. 11-10, see in Memo from Catherine M. Lawton to Town of Addison Plan Commission, 12/15/00, p. 36.

<sup>143</sup> Kittitas Valley Wind Power Project Draft EIS, Section 3.10 Transportation, December 2003, p. 3.14.12, <http://www.efsec.wa.gov/kittitaswind/deis/3.10%20Transportation.pdf>

<sup>144</sup> *Top of Iowa Wind Farm Case Study*, p. 6,

<http://www.state.ia.us/dnr/energy/main/programs/wind/documents/topofIAWindFarmCaseStudy.pdf>

"The dream of environmentally friendly energy has turned into highly subsidised destruction of the countryside," Germany's influential magazine *Der Spiegel* pronounced last week.<sup>145</sup>

The rest of the article recounts backlashes in Germany, France, Denmark, Holland, and Britain.

In a poll last fall, readers of British magazine *Country Life* voted wind power plants the number one eyesore of that country.<sup>146</sup> The sentiment was so strong that the magazine has launched a petition against the plants.<sup>147</sup> More than 60 national and local groups, led by some of the country's most prominent conservationists, have been fighting against proposed wind power facilities there.<sup>148</sup>

In Scotland, opponents to wind power have founded a new political party, called Scottish Wind Watch, to support at least one candidate to the European elections under the slogan "Save our Hills."<sup>149</sup>

Here in the United States, newspapers are beginning to print articles and editorials questioning the value of wind power. At least one newspaper, the *Caledonian-Record* in Vermont's Northeast Kingdom, has switched from favoring to opposing wind power.<sup>150</sup> Last year, 29 environmental groups, including the Massachusetts Audubon Society, sent a letter to the federal Fish & Wildlife Service asking for more research into turbine impacts on wildlife.<sup>151</sup> This year, the Massachusetts Fisheries & Wildlife Board has asked its federal counterpart for more pre-construction study.<sup>152</sup> In Vermont, multiple groups have galvanized against projects there,<sup>153</sup> the Public Service Board recently delayed permitting

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<sup>145</sup> Renee Mickelburgh, Tony Paterson, and Kim Willsher, "Huge protests by voters force the continent's governments to rethink so-called green energy" *The Telegraph*, 4/4/04, <http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2004/04/04/wwind04.xml&secureRefresh=true&requestid=1493>

<sup>146</sup> Mary Miers, "The 10 Most Hated Eyesores Voted by Country Life Readers," *Country Life*, 11/13/03, [http://www.countrylife.co.uk/countrysideconcerns/news/eyesore\\_results.php](http://www.countrylife.co.uk/countrysideconcerns/news/eyesore_results.php)

<sup>147</sup> Country Life Wind-Farm Campaign, "Petition Against Windfarms," *Country Life*, [http://www.countrylife.co.uk/turbinedebate\\_form.php](http://www.countrylife.co.uk/turbinedebate_form.php)

<sup>148</sup> Vidal, John, "An ill wind?" *The Guardian*, 5/7/04, <http://www.guardian.co.uk/renewable/Story/0,2763,1211314,00.html>

<sup>149</sup> Frank Urquhart, "Wind-power opponents form political party," *The Scotsman*, 5/1/04, <http://news.scotsman.com/topics.cfm?tid=605&id=494132004&20040509134713>

<sup>150</sup> Editorial, "Wind Power In The Northeast Kingdom," *Caledonian-Record*, 12/17/01, <http://www.CaledonianRecord.com/pages/editorials/story/8ddcc20d3>; Editorial, "Keep Wind Towers Our Of The Kingdom," *Caledonian-Record*, 8/9/03, <http://www.CaledonianRecord.com/pages/editorials/story/cef8a53c2>

<sup>151</sup> Letter from Meyer & Glitzenstein to Gale Norton, Secretary, Department of the Interior, et al., 6/24/03, <http://www.FriendsOfTheAlleghenyFront.org/62403LettertoFWS.pdf>

<sup>152</sup> Associated Press, "Berkshire wind farm contested," *Cape Cod Times*, 3/2/04, <http://www.CapeCodOnline.com/special/windfarm/berkshirerwind2.htm>

<sup>153</sup> <http://www.GlebeMountainGroup.org>; <http://www.KingdomCommonsGroup.org>

one plan, asking for more study before proceeding,<sup>154</sup> and the governor just said he will not support any new proposals until a study by the legislature is completed.<sup>155</sup> Projects are being opposed in Maine, too.<sup>156</sup> This is not NIMBYism. I, for example, live about two hours away from the Hoosac site. Many people have many serious concerns about the many costs of wind power plants. Berkshire County as a whole seems to have accepted their value without much information from any perspective other than that of proponents. I hope this memo will cause people to investigate in more depth the probable impacts of wind power plants on the rural character, quality of life, and economic base of our region.

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<sup>154</sup> Darren M. Allen, "Study on birds, bees may scuttle N.E. Kingdom wind project," *Barre Montpelier Times Argus*, 4/14/04, <http://TimesArgus.com/Archive/Articles/Article/82107>; Paul Lefebvre, "Birds delay PSB decision," *Barton Chronicle*, 3/24/04, <http://www.BartonChronicle.com>

<sup>155</sup> Darren M. Allen, "Douglas wants to wait for mandated wind study," *Barre Montpelier Times Argus*, 5/12/04, <http://www.TimesArgus.com/04/Story/83562.html>

<sup>156</sup> Appalachian Trail Conference, "ATC Opposes Maine Wind Farm Project," <http://www.AppalachianTrail.org/protect/issues/redington.html>