



Comments on the Draft Environmental Impact Statement for the Cape Wind Energy Project

Summary

The Beacon Hill Institute at Suffolk University has studied the Cape Wind proposal in considerable detail, and offers the following comments on the Draft Environmental Impact Statement (DEIS) Reference file no. NAE-2004-338-1:

1. **A systematic cost-benefit analysis – missing from the DEIS – shows that, with 90% confidence, the costs of the project outweigh the benefits by between \$83 million and \$333 million, with a mean measure of net cost of \$209 million (equivalent to 2.0 cents/kWh produced).** This breaks down as:
 - a. Cost of 9.06 cents/kWh (close to the DEIS estimate of 9.00 cents)
 - b. Benefit of 7.06 cents/kWh, of which the savings are: fuel (4.95), capital and operating costs, (0.98), improvements in public health (1.02) and greater energy independence (0.10).
The project is of interest to a private developer only because of subsidies of 4.04 cents/kWh, via accelerated depreciation allowances, Massachusetts “green credits,” and a possible Federal Production Tax Credit.
2. **The DEIS conclusion of “no adverse impacts to tourism and recreation” is not supported by the data.**
 - a. The only tourism study considered in the DEIS, from Scotland, used a biased sample and does not report the most relevant results (i.e. how many would be deterred, or attracted, by the windmills).
 - b. A Beacon Hill Institute survey of 497 randomly-selected tourists, undertaken in the relevant Cape Cod towns in summer of 2003, found that 5% would visit the Cape less, and 1% would visit more if the windmills were built. Using spending information, and an estimate of the number attracted to the Cape, the BHI study found a net loss in spending on the Cape of at least \$57 million annually.
3. **The DEIS conclusion that the project would not adversely affect property values is based on a flawed study, ignores other research, and is untenable.**
 - a. The DEIS discussion relies primarily on a study by the Renewable Energy Policy Project (whose goal is to “accelerate the use of renewable energy”) in 2003. Its conclusion that wind farms elsewhere in the United States did not harm property values relies on the use of an inappropriate counterfactual, and is largely based on much smaller projects.
 - b. Even if wind farms are associated with higher property values, this is likely attributable to increased tax payments and royalties to local communities and owners – which makes them not comparable to the Cape Wind case (no royalties, minor local tax payments).
4. **The DEIS estimates of the value of health improvements are greatly exaggerated (at \$53 million annually). Our own estimates show health improvements of \$7 million, and even this may be overstated.**
 - a. The DEIS assumes that the Cape Wind project would offset the dirtiest power plants in Massachusetts. This is incorrect, and it would be more appropriate to use the marginal emissions numbers from ISO-New England, which show avoided emissions that are one fifth as high for NO_x and one seventh as high for SO₂.
 - b. The DEIS uses outdated emissions data (from 2000 rather than 2002).
 - c. Even the \$7 million may overstate the health benefits. BHI assumed that all of the output of the Cape Wind project would offset fossil fuel generation and its associated air pollution. However, it has been argued, convincingly, that the caps imposed by law and regulation on SO₂ emissions would continue to be binding, and so the wind farm output would not lead to a reduction in SO₂ emissions overall.

Introduction

The Beacon Hill Institute (BHI) is submitting the following comments and suggestions to the Army Corps of Engineers regarding Reference file #NAE-2004-338-1, the Draft Environmental Impact Statement (EIS) for the proposed Cape Wind Associates, LLC Cape Wind Energy Project.

The comments support the following four conclusions:

1. A systematic cost-benefit analysis – missing from the DEIS – shows that the costs of the project outweigh the benefits by \$209 million (equivalent to 2.0 cents/kWh produced).
2. The DEIS conclusion of “no adverse impacts to tourism and recreation” is not supported by the data.
3. The DEIS conclusion that the project would not adversely affect property values is based on a flawed study, ignores other research, and is untenable.
4. The DEIS estimates of the value of health improvements are greatly exaggerated (at \$53 million annually). Our own estimates show health improvements of \$7 million, and even this may be overstated.

Proposition 1.

A systematic cost-benefit analysis – missing from the DEIS – shows that, with 90% confidence, the costs of the project outweigh the benefits by between \$83 million and \$333 million, with a mean measure of net cost of \$209 million (equivalent to 2.0 cents/kWh produced).

Presidential Executive Order 12866 of September 30, 1993 states that “each agency shall ... propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.” The Draft EIS itself notes (p. 2-2) that “the benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments.”

Although comments on costs and benefits are to be found scattered throughout the Draft EIS, the Army Corps does not directly address the bottom-line question: “Are the social benefits of the project greater than the costs?” More importantly, when one does ask this question, the answer turns out to be, “No”: The benefits do not, in fact, measure up to the costs.

That they do not is made clear in a report submitted to the Army Corps on May 14 of last year by the Beacon Hill Institute at Suffolk University.¹

In the analysis, BHI estimates the economic costs of the project to be 9.06 cents per kWh of electricity produced, very close to the figure of 9.00 cents reported in the Draft EIS (p.3-307). This is expensive for factory-gate electricity.

But wind power has important virtues too. We estimate the economic benefits of electricity generated by Cape Wind to be 7.06 cents/kWh. This breaks down (with rounding) into:

- Savings in fuel of 4.95 cents/kWh. This figure takes into account the likelihood of periods of high energy prices in the future.
- Savings in capital and operating costs of 0.98 cents/kWh. This figure is low because backup generating capacity must still be available to offset most of the wind farm’s capacity, for times when the wind stops blowing (or blows too hard).
- Health savings due to reduced emissions, worth 1.02 cents/kWh. The Draft EIS overstates these benefits tenfold because it assumes, incorrectly, that electricity from Cape Wind would offset only the dirtiest power stations in New England; and that those power stations would not become cleaner over time.
- Greater energy independence, which we value at 0.10 cents/kWh. In this context, note that even when complete, the project would provide less than 1% of the electricity generated in New England.

The bottom line is that the economic costs exceed the economic benefits by 1.99 cents/kWh, or by \$209 million in present value terms (see Table 1). This is a large margin. One is left with the clear and powerful conclusion that the benefits of the intended regulation – which would allow Cape Wind to build the wind farm – do not justify its costs. This balance could change in the future, but at this point in time, this particular project is not a good one.

The key result – that economic costs exceed the economic benefits – is robust. It stands even if one ignores any aesthetic effects or makes the most pessimistic assumptions concerning the future price of oil; and it does not even

consider the effects of the project on tourism – which the Draft EIS believes, without evidence, would on balance be positive and which we, based on survey data, expect to be negative.

Table 1: Economic Costs and Benefits of the Nantucket Sound Wind Farm Project			
	Net Present Value (at 10%)		Cents/kWh
	Mean	90% confidence interval	
	<i>(\$ millions)</i>		
Benefits	744	638-859	7.06
<i>Of which:</i>			
Fuel saved	522	455 – 597	4.95
Capital and operating costs saved	104	85 – 122	0.98
Health benefits of emissions reduction	108	55 – 176	1.02
Greater energy independence	11	3 – 21	0.10
Costs	952	888 – 1,035	9.06
<i>Of which:</i>			
Project itself	888	824 – 969	8.45
Grid integration	26	23 – 28	0.24
Environmental effects (using royalty rates)	39	35 – 44	0.37
Benefits – Costs	(209)	(333) – (83)	(1.99)
Costs using expected property value	(1,520)	(1,647) – (1,392)	
Costs using willingness to pay measure	(173)	(300) – (46)	
<i>Note:</i> Figures are based on 10,000 drawings from underlying distributions of the variables determining costs and benefits. Totals may not add exactly, due to rounding errors. Also: The bounds of the 90% confidence interval for a total (e.g., 638-859 for benefits) will be tighter than the sum of the bounds of the components (e.g., 598-916 for benefits; note that 598 is 455 + 85 + 55 + 3 and 916 is 597 + 122 + 176 + 21). This statistical result occurs because the components are not perfectly correlated with each other.			
<i>Source:</i> Table 6 from Houghton <i>et al.</i> (2004).			

One puzzle remains: why would a private firm undertake an economically unattractive project? The answer is subsidies, in the form of

- accelerated depreciation allowances;
- a possible Federal production tax credit; and
- the sale of Massachusetts “green credits.”

Together, we expect these to bring Cape Wind 4.04 cents/kWh, or almost half of the 9.06 cents/kWh cost of production (see Table 2). While some amount of subsidy to wind power is appropriate, we find that subsidies on such a scale are excessive and go beyond what serves the public good.

Table 2: Reconciling Private and Economic Returns

	<i>Cents/kWh</i>	<i>PV, \$ millions</i>
Private return on equity	0.29	30
Plus external benefits:		
+ Capital and operating expenditures saved	0.99	104
+ Value of emissions abated	1.03	108
+ Value of greater energy independence	0.10	11
+ Taxes paid to Federal, State and Local governments, and royalties	0.39	41
Less external costs:		
– Cost of integrating wind power with New England grid	0.24	26
– Environmental/aesthetic costs	0.37	39
– Federal production tax credit	0.94	98
– Massachusetts green credits	2.55	267
– Accelerated depreciation for tax purposes	0.55	58
And technical adjustments		
+ For value of output (economic valuation – market valuation)*	0.28	29
– For loan effect (developer can use optimal loan financing)**	0.41	43
= Net Economic Benefits (from Table 1: Benefits – Costs)	(1.99)	(209)
Memo items:		
Actual subsidy (net of taxes)	3.65	382
Optimal subsidy	2.56	268
Therefore: excess subsidy	1.09	114

*The market valuation measures what Cape Wind receives from selling the electricity from the project; the economic valuation measures this as the value of energy saved (which is slightly higher than the market valuation).

** The developer has recourse to loan financing, which raises the private return on equity since the interest rate on loans is lower than the discount rate of 10%.

Source: Table 7 from Houghton *et al.* (2004).

Accurately quantifying these benefits is important in the context of a true cost-benefit test to which this project should be subjected, given the substantial public investment required for this project (\$382 million by our estimation). The public deserves a better return on its massive investment and a better analysis of its benefits and costs.

Proposition 2.

The DEIS conclusion of “no adverse impacts to tourism and recreation” is not supported by the data.

Section 5.16.5 of the DEIS concludes that “no adverse impacts on tourism and recreation are expected from the Project.” In fact, the DEIS asserts that the project could have a positive net effect on tourism. We believe this to be an erroneous conclusion based on a flawed study and an incomplete analysis of the available information.

The only tourism study considered in the DEIS is a survey by Market & Opinion Research International (MORI) Scotland performed for the British Wind Energy Association (BWEA) and the Scottish Renewables Forum in 2002.²

Section 5.16.4.6 of the DEIS states:

The previously-referenced study completed in September 2002 for the BWEA and Scottish Renewables Forum titled, “Tourist Attitudes towards Wind Farms” (MORI Scotland, 2002), was conducted in Argyll and Bute, two towns in Scotland that are frequently visited due to their high landscape value. The area has the highest concentration of wind farms in Scotland. The study concluded that the wind farms have had a positive effect on visitor’s impressions of the local town, with 43% of those polled saying that the wind farms had either a completely positive effect or a generally positive effect and 43% saying that the wind farms made no difference. When asked if the wind farms would affect their likelihood to visit the town in the future, 91% said that it made no difference.

A Flawed Survey:

The MORI Scotland survey attempts to answer the central question of whether or not some tourists will avoid an area due to the presence of wind turbines by conducting a survey in the presence of wind turbines.

However, the survey is flawed because, in addition to some poorly framed questions, it suffers from *selection bias* and thus does not represent a truly random sample of tourists. This is because it surveyed tourists in the midst of the highest concentration of wind farms in Scotland. But the one specific group that this survey intends to test for (tourists with an aversion to wind turbines) would certainly not choose to vacation in this area and would thus be excluded from the sampling.

Instead of a truly random sample of tourists, MORI Scotland actually sampled a group of tourists that 1) have positive feelings towards wind turbines, 2) have no strong feelings either way, or 3) don't know the turbines exist. In fact, this third group is actually well represented. Despite the fact that this area has the highest concentration of wind farms in Scotland, sixty percent of respondents replied that they were not aware of any wind turbines in the area; only 20% of respondents to the survey had seen a wind turbine in the area.

Biased:

Section 5.16.4.6 of the DEIS states that:

wind farms have had a positive effect on visitor's [sic] impressions of the local town, with 43% of those polled saying that the wind farms had either a completely positive effect or a generally positive effect and 43% saying that the wind farms made no difference.

This is misleading. The question whether wind farms have had a positive effect on visitors' positive impressions was asked only of those who said they knew the turbines were in the area, regardless of whether or not they had even seen them. Among this group that were aware of, but may or may not have seen, the turbines, 8% stated that the wind farms had a generally or completely negative effect on their impression of the area; this statistic is not mentioned in the DEIS, but it is important because this is the group that might potentially scale back its tourist spending in an area with windmills.

If a similar number were applied to Cape Cod, it would suggest that 480,000 of the 6 million tourists who visit the Cape annually would have a negative effect; and if a fifth of these were to stay away, the loss in direct spending (at \$167 per tourist) would be \$16 million annually, or \$26 million if indirect and induced effects are included. These numbers are purely illustrative, but they show the potential importance of accurately measuring the size of the group that is turned off by windmills.

Suggestion:

In the summer of 2003, BHI surveyed 497 tourists in Cape Cod and Martha's Vineyard. Respondents were shown three pairs of photographs with different views of Nantucket Sound, first without, and then with, wind turbines on the horizon, and given a brief verbal explanation of the project. Once respondents had grasped the nature of the visual implications of the project, they were asked a series of questions about their willingness to visit the Cape.

The beauty of the region and Nantucket Sound in particular are clearly an important asset for the tourism industry on Cape Cod. Over 90% of respondents rated "The ocean views" as an important or very important reason for visiting the Cape.

After observing the visual simulations of the wind energy project, the majority (52%) of tourists believed that the turbines worsened the view either slightly or a lot. In the eyes of these respondents, the presence of a 130 turbine wind energy project lessened the area's appeal as a vacation destination. The survey found that 3.2% of tourists said they would spend approximately 3 fewer days on Cape Cod if the project were built. Another 2% said they would not visit at all. As the DEIS points out, however, there would likely be some eco-tourism as a result of the project. The BHI study estimates 1% of tourists would visit more often as a result of the project and another 0.6% would visit solely to see the turbines.

It is interesting to point out that in the BHI survey, 94% of tourists stated that the presence of wind turbines would not affect the likelihood of their returning to Cape Cod. This compares favorably to the 91% figure found in the MORI survey. Yet when we consider the impact of the small minority that is affected, the net result is an overall loss in tourism spending between \$57 and \$123 million annually.

While the preponderance of evidence (in both European surveys and the BHI survey) suggests that most tourists will be unaffected by the presence of wind turbines, it is wrong to assume that there will be no impact on the regional tourism industry. And while only the most pessimistic opponent of the project would argue that the presence of wind turbines would cripple the tourism industry on Cape Cod, a conservative estimate of \$57 million is not negligible.

**Proposition 3.
The DEIS conclusion that the project would not adversely affect property values is based on a flawed study, ignores other research, and is untenable.**

The DEIS concludes that the wind energy project is not expected to adversely affect property values within the region.

Section 5.16.5 of the DEIS states:

Based on recent studies conducted in the United States and in Europe, property and real estate values are generally not affected, or actually increase in areas near wind farm development. Based on these studies, the Project is not expected to adversely affect property values.

This conclusion relies primarily on an inappropriate extrapolation from a flawed study conducted by the Renewable Energy Policy Project (REPP) in 2003.³ Furthermore, the Corps appears to have cherry picked studies which support the applicant's viewpoint rather than include a true review of the literature. The DEIS makes no mention of two studies (referenced in the REPP report) that report potentially negative impacts on property values.

A 1996 quantitative analysis from Denmark, which employed hedonic regression analysis, found that homes close to a wind turbine or turbines ranged in value from approximately \$2,900 to \$16,800 less than homes further away.⁴ The study's methodology is not clearly discussed, so the results should be treated with caution, but not necessarily dismissed as the Corps has done. Another study, performed by Sinclair Knight Mertz, concluded that while properties with wind turbines on them may increase in value, other properties may be adversely affected if within sight or audible distance of the wind turbines.⁵

REPP Study

The REPP, whose goal is to "accelerate the use of renewable energy," claims to have found that wind farm development has had little negative effect on property values in the U.S. since 1998; indeed the report found that property values actually increased faster in some areas with wind turbines. This unexpected result received much attention when the study was released in May 2003. Unfortunately, the authors provide no explanation or interpretation for these results, and say they have "no idea" whether the wind farms were the reason for the increased value.⁶ This is because the REPP relied on an oversimplified and imprecise model that lacked the ability to truly model the housing market.

REPP Methodology

The REPP considered property sales data around wind energy projects that came on-line after 1998 but before 2001. They employed three approaches to identifying property value impacts within the case study regions:

1. They compared the sale price of homes within five miles of wind turbines (the "view shed," whether there was a view or not) with the sale price in a comparable region between 1996 and 2002.⁷ According to the authors, "If wind farms have a negative effect, we would expect to see prices increase slower (or decrease faster) in the view shed than in the comparable."
2. They compared the sale price of properties within the view shed before and after major wind energy projects came on-line. "If wind farms have a negative effect, we would expect to see prices increase slower (or decrease faster) in the view shed after the wind farm went on-line than before."
3. They considered the sale price of properties in both the view shed and comparable community after the wind energy projects came on-line.

The first problem, which is immediately apparent, involves the inclusion of Case 1 in the analysis. The report states that, in some areas, property values actually increased faster in the view shed than in the comparable area over the entire time period. For example, in Site Report 1: Riverside County, California, prices in the view shed increased by \$905 more each month than in the comparable area from 1996 through 2002. But when one considers that the project came on-line in 1999, what exactly does this tell us? Without any knowledge of the conditions in both areas prior to the development, how can we make any judgment on the impact of the wind turbines?

The authors anticipated this criticism of their methodology, and hoped to answer the concerns by pointing out that Case 2 and Case 3 often produce similar results and thus support the Case 1 analysis.

This matters little, as will be shown below.

What is absent from the report is a satisfactory baseline rate of change in property values – a counterfactual – from which to make comparisons. Without knowing what is happening to property values in both areas prior to the development, it is not possible to discern any significant change. An example will help to clarify the criticism:

Consider Site Report 1: Riverside County, California. Below is a reproduction of Table 1.4 from the REPP report. It summarizes the regression results and compares the rate of change in average monthly sales prices for each Case.

- Case 1 is the entire time period of the sample, January 1996 through November 2002. As stated above, the view shed rate of change exceeds the comparable by \$905. The authors recognize that this tells us little, so they hope to support it with Cases 2 & 3.
- In Case 2, they show that prices increased faster in the view shed after the project came on-line than before. Again the authors are careful not to suggest that the turbines caused this increase.
- Finally, Case 3 illustrates that after the project came on-line prices increased faster in the view shed than in the comparable area.

This seems to suggest that the turbines have had little effect on prices, and may have actually increased them to some extent. But what is missing? Notice that the authors have not included a rate of change in prices in the comparable area prior to the development. How can we compare a change in prices if we have no baseline?

The authors tell us that the rate of change in the view shed, after the development, is 63% greater than the rate of change in the comparable area, after development (See Table 1.4). But this again tells us very little; the price inflation in the view shed may historically have been much higher than the comparable area. We have no way of knowing whether or not the price inflation in the view shed had been even faster than in the comparable area prior to the development. If this were the case, 63% would imply a negative impact on prices.

We can, however, perform a simple test, by comparing the ratio of the change in prices after the development to the change in prices for the entire period. Certainly this is not an ideal comparison, but without any knowledge of the rate in the comparable area before the development or the raw data it is the best we can do.

TABLE 1.4 RIVERSIDE COUNTY, CALIFORNIA: REGRESSION RESULTS

Projects: Cabazon, Enron, Energy Unlimited, Mountain View Power Partners I & II, Westwind

Model	Dataset	Dates	Rate of Change (\$/month)	Model Fit (R2)	Result
Case 1	View shed, all data	Jan 96 - Nov 02	\$1,719.65	0.92	The rate of change in average view shed sales price is 2.1 times greater than the rate of change of the comparable over the study period.
	Comparable, all data	Jan 96 - Nov 02	\$814.17	0.81	
Case 2	View shed, before	Jan 96 - Apr 99	\$1,062.83	0.68	The rate of change in average view shed sales price is 86% greater after the on-line date than the rate of change before the on-line date.
	View shed, after	May 99 - Nov 02	\$1,978.88	0.81	
Case 3	View shed, after	May 99 - Nov 02	\$1,978.88	0.81	The rate of change in average view shed sales price after the on-line date is 63% greater than the rate of change of the comparable after the on-line date.
	Comparable, after	May 99 - Nov 02	\$1,212.14	0.74	

In the view shed, the rate of change in prices over the entire period is \$1,719.65 per month. In the period following the project, the rate of change was \$1,978.88. Thus, the rate is 15% higher in the post-project period. As the post-project period is embedded in the overall rate of change (thus pulling the overall rate higher), we know that the previous rate of change was lower than \$1,791.65. Although we have no standard errors from which to work, it is clear that the spread in prices is not very large. It seems there is not much volatility in the view shed prices.

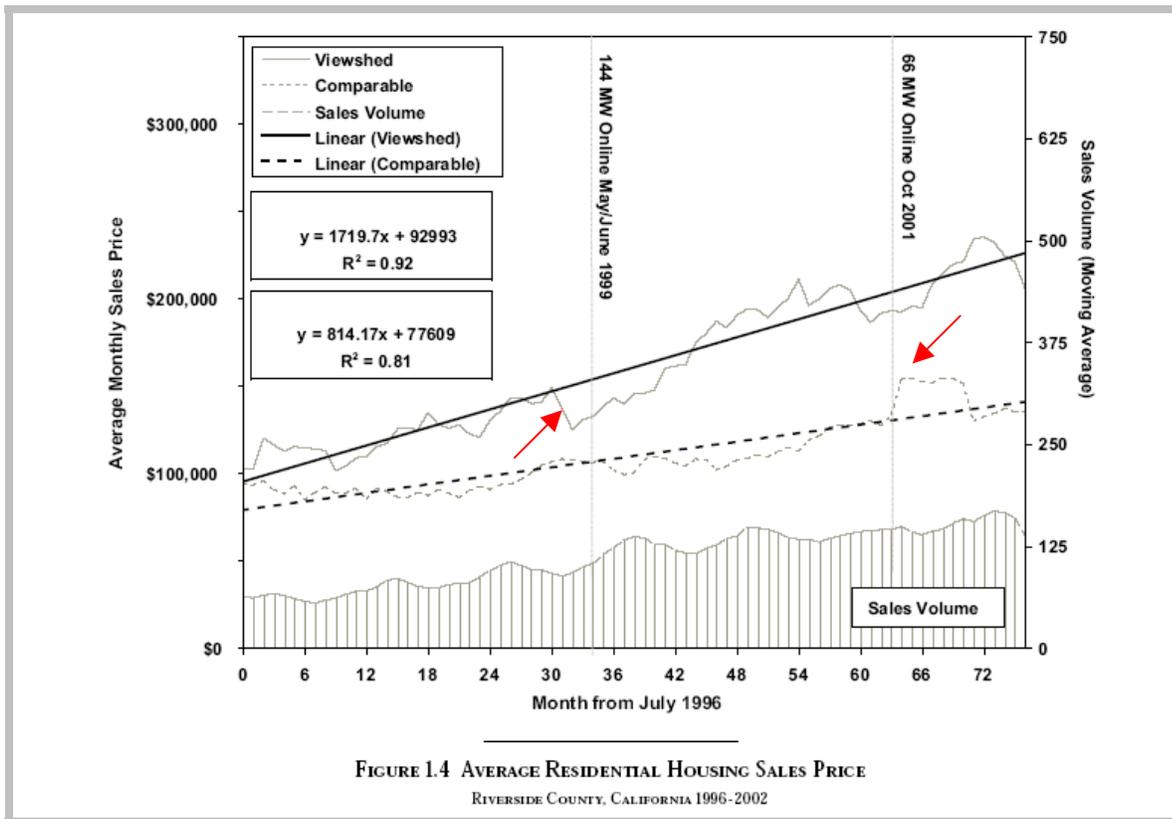
In the comparable area, the overall rate of change is \$814.17 per month, but jumps to \$1,212.14 after the project comes on-line. The rate of change in the post-project period is 49% higher than the overall rate. This implies a very low rate of price inflation in the comparable area before the project, possibly in the range of \$400 per month.

Table 3: Ratio of Price Inflation, After-to-Overall

Dataset	Rate of Change(\$/month)		Ratio After-to-Overall
	Overall	After	
View shed	1719.65	1978.88	15.1%
Comparable	814.17	1212.14	48.9%

What does this experiment tell us? The ratio of the rate of change after the project to the rate overall is much greater in the comparable area. In other words, prices increased at a much faster rate in the comparable area (compared to its baseline), than in the view shed, following the project's on-line date. Something has occurred to rapidly increase the growth in prices in the comparable area. Without a true baseline growth rate, we cannot be sure, but this result certainly stands in stark contrast to that found by the authors.

Finally, although not conclusive, an interesting point can be made by examining the authors' graph of average residential sales prices in both the view shed and comparable areas of Riverside County (reproduced below). Recall that the authors concluded that prices increased faster in the view shed than in the comparable area in Riverside.



In months leading up to the on-line date of May 1999, prices in the view shed area began to fall (this is indicated by an arrow in Figure 1.4). Eventually, normal market pressures lead to a general rise in the price level and the view shed prices begin to climb again, but from a reduced base. The same fall in prices can be seen prior to the October 2001 project coming on-line. This suggests that the introduction of the windmills was associated with a drop in property values, although this could be verified only with the estimation of a true hedonic model. Finally, notice the substantial spike in prices in the comparable region immediately following the project in October 2001.

Why Property Values Might Increase

As was mentioned above there is an explanation for why prices might increase when a new wind energy project is constructed. To help explain this phenomenon, consider the town of Martinsburg in Lewis County, New York. This small town of 1,249 normally meets its local obligations with about \$400,000 in tax revenue. It is now, however, in line to receive payments of \$1.23 million a year for 10 years from a new wind energy project. In addition to these payments, the developers have negotiated lease and royalty payments with 92 landowners that will pay them about \$1.25 million a year. In total, the developers will contribute approximately \$10 million a year to the local economy.⁸ This enormous contribution will have a profound impact on this small, rural economy.

This is not atypical. In general, wind energy projects have a positive effect on rural communities. Beyond the revenue generated from lease payments (typically around \$5,000 per turbine), wind energy projects also have an impact on a larger scale. The net increase in funds to local jurisdictions help fund local schools, police and fire departments, and ease the tax burden on local property owners. In addition, small economies will greatly benefit from the employment effects of these projects. These positive impacts may offset any visual impact and make the region more desirable, and thereby increase property values for the entire community.

This will not be the case on Cape Cod. Coastal properties derive a significant portion of their value from their view of Nantucket Sound. To the extent that it is diminished, they can expect to lose some value. Where this amenity value may not exist in rural property markets, or its diminished value is overshadowed by the economic benefits of a wind farm, the aesthetic effects of a wind farm are negligible. On Cape Cod, the economic benefits of the wind farm will be small relative to the economic base of the region. Homeowners on the Cape, particularly owners of coastal properties, have legitimate concerns about their property values.

Project-Scale is Important

In addition to the REPP report, the DEIS includes communications between the applicant and assessors in communities adjacent to four wind turbine facilities in the Northeast. Although only anecdotal, the DEIS provides a summary of each communication. According to these sources, no negative impact on property values has been observed.

The same caution must be applied in extrapolating from these experiences, however. Consider the projects about which the applicant obtained information:

1. Hull, Massachusetts (1 turbine),
2. Madison County, NY (Two projects, 25 turbines & 7 turbines): Included in the REPP report and projects pay substantial royalties and payments to town and landowners,
3. Searsburg, VT (11 turbines),
4. Princeton, MA (8 turbines).

None of these projects approach the massive scale of the Cape Wind project. A number of studies have confirmed that the negative visual effect of turbines increases with the scale of the project.⁹ An offshore wind energy project consisting of ten turbines may have no discernable impact on coastal property values, but the same might not be said of a 130 turbine project.

Proposition 4:

The DEIS estimates of the value of health improvements are greatly exaggerated (at \$53 million annually). Our own estimates show health improvements of \$7 million, and even this may be overstated.

The Army Corps Draft Environmental Impact Statement (DEIS) concludes that the Cape Wind Project could have a “cumulative beneficial effect on public health, and result in a related reduction in the costs of adverse health impacts from existing power plant emissions....The yearly monetary savings associated with these reductions in adverse public health impacts is estimated at approximately \$53 million dollars.”

This estimation is based on a flawed extrapolation from the findings of a Harvard Public Health study, which focused on improving emissions at two of the nation’s worst polluting power stations. This estimate largely overstates the annual monetary savings; we find the expected savings to be in the range of \$7 million annually. The difference arises from the assumption, made originally by Cape Clean Air and reproduced by the Army Corps, that the wind park will offset production at either the Salem Harbor or Brayton Point power stations. This assumption, which we believe to be erroneous, is not supported by any evidence.

The Army Corps’ Estimates

Below is a reproduction of Army Corps’ Table 5.16-4. The table reports the estimated amount of pollutant reductions attributable to the wind park, assuming the wind park output offset production at a) the marginal producer in New England, based on an ISO-NE marginal emissions analysis, or b) each of the selected power plants on a one-for-one basis.

Note that the (average) marginal producer in New England is much cleaner than any of the selected power plants. This point is made clearer by observing the implicit emission rates of each source compared against the emission rate of the marginal producer in New England. Table 4 below illustrates these emission rates.

Table 5.16-4 – Army Corps of Engineers Measures of Emission Reductions using Wind Park Average Contributions (Tons/Year)

Reference	CO ₂	SO ₂	NO _x	PM	CO	VOC
ISO NE Marginal Emission Rates	1,108,039	4,606	1,415	N/A	N/A	N/A
Salem Harbor	N/A	9,800	2,600	11	N/A	N/A
Brayton Point	N/A	11,200	2,460	68	N/A	N/A
Canal Plant	1,426,886	8,098	2,152	353	1,396	44
Average of Salem, Brayton, Canal	1,426,886	9,699	2,404	177	1,396	44
Number used in Analysis	1,108,039	4,606	1,415	177	1,396	44

Source: U.S. Army Corps of Engineers. Draft Environmental Impact Statement for the Cape Wind Energy Project, Nantucket Sound, Massachusetts. <http://www.nae.usace.army.mil/projects/ma/ccwf/deis.htm>

As the table illustrates, the 2000 ISO-NE marginal emission rates are dramatically lower than the emission rates at the selected power plants. Lower still are the 2002 ISO-NE marginal emission rates which, although available since December 2003, have not been incorporated into the Corps' analysis. As the data illustrate, emission rates have fallen considerably over the past few years. This is a result of an increase in natural gas-fired marginal generation coupled with a decrease in coal-fired marginal generation.¹⁰

Estimating Health Effect Offsets and Monetary Values

Although the Army Corps reports ISO-NE marginal emission rates in its Table 5.16-4, it does not use these numbers when calculating the health effects and monetary values. Instead, the Army Corps' methodology is to 1) assume a one-for-one offset at either Salem Harbor or Brayton Point, 2) average the emission reductions between the two, and 3) attach a monetary value based on this average. The result of this estimation is an annual savings of \$53.1 million.

This result is incorrect, for the following reasons:

1. Health effects and monetary value estimates are derived by assuming that the wind park's output will offset either Salem Harbor or Brayton Point power stations – two of the region's worst polluters. This assumption is flawed, and does not correspond to the way that ISO-New England distributes the marginal load across power plants. The emission rates from the marginal producers in 2000, the plants that would be offset by Cape Wind Energy, are 2-3 times lower than both Salem and Brayton Point, as Table 4 shows.
2. Where the ISO-NE marginal emission rates are used, the Army Corps relies on outdated information. The ISO-NE numbers are based on 2000 data. Since this time, cleaner power sources have come on-line and marginal emission rates have continued their considerable downward trend. Updated numbers were available in January 2003 and again in December 2003.

Table 4. Implicit Average Emission Rates (lbs/MWh)

Emission Rates	CO ₂	SO ₂	NO _x	PM	CO	VOC
ISO-NE Marginal Emission Rates, 2000	1,488.1	6.2	1.9	N/A	N/A	N/A
ISO-NE Marginal Emission Rates, 2002	1,337.8	3.3	1.1	N/A	N/A	N/A
ISO-NE Marginal Emission Rates, 2003	1,179.0	2.0	0.7	N/A	N/A	N/A
Salem Harbor, 2000	N/A	13.2	3.5	0.0	N/A	N/A
Brayton Point, 2000	N/A	15.0	3.3	0.1	N/A	N/A
Canal Plant, 2000	1,916.3	10.9	2.9	0.5	1.9	0.1

When we use the more appropriate assumptions about marginal emission rates – i.e. the 2003 ISO-NE marginal emission rates rather than the average of the Salem Harbor and Brayton Point plants – the value of annual health savings, based on the same assumptions about the value of lives saved as used by the Army Corps, falls from \$53.1 million to \$8.0 million.

An alternative approach is to use estimates of public health impacts per unit of emission (\$/ton) derived by the authors of the Harvard Public Health studies. This allows a monetary savings estimate to be derived using a credible, published estimate of unit health costs, combined with the ISO-NE Marginal Emission numbers, which reliably simulate the regional energy market.

Table 5 illustrates the public health costs per unit of emission derived in “Development of a New Damage Function Model for Power Plants: Methodology and Applications,” by Jonathan Levy *et al.* of the Harvard School of Public Health (1999). The values have been updated here to 2004 dollars using the Bureau of Labor Statistics Consumer Price Index.

Pollutant	\$ (2004 prices)	\$ (1997 prices)
SO ₂	940	790
NO ₂	916	770
CO ₂	4.04	3.40

These values per unit of pollutant can be used to estimate the savings attributable to the wind park’s production. The savings are summarized in Table 6 below, using 2002 emissions data (as was done in the BHI cost-benefit analysis published in 2004). Almost all of the health impacts are associated with SO₂ and NO_x, so the absence of information on carbon monoxide (CO) and volatile organic compounds (VOC) is unlikely to have much significance. The key result is the findings that the health savings due to the Cape Wind project, using this approach, would be \$7.1 million, again well below the Army Corps estimate of \$53.1 million.

Reference	CO₂	SO₂	NO_x	PM	CO	VOC	Total Savings
ISO-NE Marginal Emission Rates, 2002	4,024,349	2,308,840	750,128	N/A	NA	NA	\$7,083,317



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Endnotes

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- ² Mori Scotland, *Tourist Attitudes Towards Wind Farms- Final Report*. Prepared for Scottish Renewables Forum and the British Wind Energy Association. September 2002; available from <http://www.scottishrenewables.com/data/reports/Tourist%20Attitudes%20full%20report.PDF>; Internet; accessed on February 18, 2005.
- ³ George Sterzinger, Fredric Beck and Damian Kostiuk. *The Effect of Wind Development on Local Property Values*. (Washington, D.C.: Renewable Energy Policy Project, May 2003).
- ⁴ Jørgen Jordal-Jørgensen, *Social Assessment of Wind Power: Visual Effect and Noise from Windmills—Quantifying and Evaluation*. Institute of Local Government Studies, Denmark. April 1996; available from <http://www.akf.dk/eng/wind0.htm>; Internet; accessed February 18, 2005.
- ⁵ See Sinclair Knight Mertz. *Social Economics and Tourism*. Environmental Effects Statement Supplement for the Pacific Hydro Limited Portland Wind Energy Project, Volume C. 2001. Cited in Sterzinger *et al.*
- ⁶ John Leaning, “Study: Wind farms don’t erode value,” *Cape Cod Times*, June 20, 2003; available from <http://www.capecodonline.com/special/windfarm/studywind20.htm>; Internet; accessed February 22, 2005.
- ⁷ The timeline for individual projects vary slightly depending on available data. Some project timelines span 1997-2003, for instance.
- ⁸ Tim Knauss, “A Mighty Profitable Wind; Towns, School Districts Cash in on Renewable-Energy Project,” *The Post-Standard*, March 21, 2004.
- ⁹ See for instance, NFO System Three, *Investigation into the Potential Impact of Wind Farms on Tourism in Scotland*. Prepared for Visit Scotland. 2002; available from <http://www.scotexchange.net/KnowYourMarket/kym-windfarm-report.htm>; Internet; accessed February 18, 2005.
- ¹⁰ ISO New England, “2003 NEPOOL Marginal Emission Rate Analysis,” December 2004; available from http://www.iso-ne.com/Planning_Reports/Emissions/Marginal_Emissions_Analysis_2003.pdf; Internet; accessed February 22, 2005.