

Public Opinion about Large Offshore Wind Power: Underlying Factors

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DRAFT, NOT FINAL VERSION, 11 Aug 05

To be presented at
Copenhagen Offshore Wind 2005
26-28 October 2005

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Introduction

Public opposition has derailed many land-based wind power projects (Righter 2002: 37). Recently, the first offshore wind proposal in North America, in Nantucket Sound (Massachusetts, USA) has generated a strong opposition movement, and a seemingly more modest movement of supporters. This paper addresses the factors underlying opposition and support. Is opposition based on well-reasoned judgments, about benefits versus negative environmental impacts (from bird kills to visual impact on the seascape)? Or is opposition short-sighted and selfish, “wealthy homeowners who only care about their coastal view”, as many in the wind power industry suggest?

It is important to understand the nature of that opposition. A better understanding is of practical import, and could guide strategy. For example, is the best reaction to opposition to invest in public relations to dispel myths and better convey the benefits of the project? Or to build further offshore, out of sight, at additional costs in cables and deeper piles during construction, plus greater hazard exposure to workers during the life of the facility? (We will argue from survey data that neither approach is optimal.) Unfortunately, decisions about siting are being made, some at considerable cost, based on an inadequate understanding of what the real sources of opposition are.

Opposition and support for this project is also of broader theoretical interest, as it addresses more general questions, about how to incorporate public opinion into policy decisions. Previous local environmental movements have often opposed polluting facilities that were being ignored by local officials (Freudenberg, 1984). There was a function for local groups to bring attention to decisions and to raise environmental issues that otherwise might not have been represented. Thus, there has been a tendency for many political analysts to see the local environmental groups as representing common

good in opposition to the pecuniary interests of the site developer. But in the case of opposition to offshore wind in Nantucket, each side makes environmental arguments (in addition to other arguments). And, the general public is about evenly split (more on this from our data). Understanding the support and opposition requires a more nuanced analysis.

In an earlier article on public opinion about this project, we reviewed studies of opposition to wind power, and presented evidence based on in-person qualitative interviews (Kempton et al 2005). In this paper, we report on a large survey of local residents to better understand the causes of support or opposition to offshore wind power.

The Setting and Proposed Project¹

The project site, in Nantucket Sound, is bounded by Cape Cod, and by the inhabited islands of Martha's Vineyard and Nantucket. The economy in this area is heavily based on tourism and fishing, which are dependent on the environmental health and natural beauty of the Nantucket sound. Demographically, residents are a mix of workers serving these industries and the supporting economy, plus wealthy beachfront property owners who may be permanent or seasonal residents of the area. All groups constitute a strong local constituency for protecting the area, and a number of independent environmental and land conservation organizations are scattered across the communities of this area.

A proposal has been submitted to the US Federal Government, and to the Commonwealth of Massachusetts, by a private company, Cape Wind Associates.² They propose to install 130 wind turbines in 62 Km² (24 square miles) of Nantucket Sound. It plans to use General Electric's 3.6s, designed exclusively for offshore use. Mounted, they would rise 128 meters from sea level to top blade tip (420 feet, or about 40 stories) and their nameplate electrical output is 3.6 MW. This development is projected to generate a peak power of 420 MW, adding up to 1,491,384 MW hours of electricity per year, which is about 3/4 the electrical needs of Cape Cod, or 1/10 of the demand of the entire state of Massachusetts (Cape Wind 2004a).³ The developer states that Nantucket Sound is a highly favorable site for wind development, arguably the best in the east coast (strong steady winds, close to power lines on shore, shallow water, protected from high waves, and minimal conflicts with transportation systems).

But this proposal has generated a vigorous local opposition movement, focused around the Alliance to Protect Nantucket Sound (an organization specifically created to oppose the development). The Alliance seems to have both popular support and a financially strong core. In 2003 it received \$1.7 million from 2,891 individuals, with just 56 of them giving \$1.3 million of that; the top four individuals gave over \$100,000 each, including a loan that was forgiven (Zindler 2004). A similar pattern with a small number of large and

¹ Parts of this section draw from Kempton et al (2005).

² The permitting process is described in Firestone et al (2005).

³ The planned 130 machines at 3.6 MW each should be 469 MW. Here we use the developer's state total maximum output as 420 MW, rather than 469 MW. We use their stated 420 MW figure in our analysis.

very large donations was seen in 2002 (Zindler 2003). Opposition is also politically well-connected, with declared opponents including the Editorial page of the Cape Cod Times, US Sen. Ted Kennedy, U.S. Rep. William Delahunt, several state legislators, and the Massachusetts Governor and Attorney General.

The opposition comes primarily from those who consider themselves environmentalists. For example, the Alliance to Protect Nantucket Sound's web site says: "The Alliance is a 501(c)(3) nonprofit environmental organization dedicated to the long-term preservation of Nantucket Sound" (Alliance to Protect Nantucket Sound 2004). The various opponents mostly support wind power in general, and split on whether they oppose wind power anywhere in the ocean. Opposition from those who consider themselves environmentalists has been seen in other wind projects (Bosley and Bosley 1988; Walker 1995; Krohn and Damborg 1999; Wolsink 2000).

The Alliance to Protect Nantucket Sound and its allies have conducted a public campaign using television and radio spots as well as many guest editorials in the local newspaper, *The Cape Cod Times*. Signs against the project are seen in many yards and some storefronts. The Alliance also appears to be well financed. The wind industry, and even some analysts (e.g. Pasqualetti 2004: 35) have characterized the Alliance as being primarily concerned about the visual-esthetic impact. In our earlier article (Kempton et al 2005), based on our interviews, we considered this to be a deficient explanation, and suggested that a broader set of reasons, including the project's potential environmental impacts and perceived inadequacy of the permitting process may be equally important to opposition (by the Alliance and/or the public). This article will use our survey data to conduct a more thorough analysis of the public's reasons for opposition and support.

III. Cape Cod Survey Design and Implementation

Prior to undertaking the mail survey, we conducted two dozen in-depth, semi-structured interviews with identified opponents, identified proponents, and randomly selected Cape Cod residents (Kempton et al 2005). Those interviews led us to conclude that basic value questions and tradeoffs lie beneath the surface of the current debate over the development of offshore wind power in Nantucket Sound. These values include the notion the ocean is a special place that should not be intruded upon, the value of honoring the traditions of fishing and sailing in New England.

For example, the value of protecting the ocean and keeping it free from human intrusion; the value of cleaner air and less human infirmity and mortality; the value of traditions like sailing and fishing in New England; whether there is a right to a local seascape that residents assumed would be there forever; the trade off between proceeding now with an imperfect process to start a clean industry versus first establishing proper procedures, and more globally, whether Cape Cod and the Islands are willing to absorb the negatives of this wind development now, in order to

set an example for mitigating climate change, a potentially far larger threat but one they cannot solve alone (Ibid., pp. 146-47).

A number of other beliefs and values came up in the semi-structured interviews, leading to pro or con positions: potential environmental hazards from wind power, whether the ocean site was being proposed only because the developer wanted to avoid regulations and rental cost of a land site, the need for domestic energy, especially during a time of war in the middle east, pollution from oil and coal-generated electricity, and others. We were also surprised by the issues that did not come up in those interviews: Only one of the 24 interviewees mentioned climate change at all, no one mentioned that wind is the only non-polluting new energy source cost-competitive with fossil fuels, and both proponents and opponents focused on the single site, with no discussion of the increased negative impact (or potential for preventing global warming) by ramping up to the full potential of offshore wind along the US East Coast.

That prior work articulated many of the concerns, and the odd gaps in the debate, which had not previously been recognized. However, to quantitatively estimate their relative importance, and the causal relationships between them and support or opposition, a survey methodology was needed. Thus, based on the findings of the semi-structured interviews, a set of 62 survey questions were developed.

In late October 2004 the survey questions were pre-tested locally (in Newark, Delaware) for clarity and question comprehension, then revised. Next, the survey was piloted by mailing to residents of Cape Cod. Letters were sent to one hundred names and addresses randomly chosen from the telephone book of Barnstable County (Cape Cod). Of the 100 sent out, 14 were returned as undeliverable and 31 completed surveys were returned, for a response rate of 36 percent. Analysis of the completed surveys led to further modifications of the survey instrument to address ambiguous language. The revised survey was then printed in booklet form. The cover had a picture of a coastline and lighthouse with the words "What will the future hold?", intended to engage the recipient, without bias for or against the subject matter, to open it and to begin. Based on these mail responses, minor improvements and clarifications were made to the instrument.

For the full survey, we obtained a random sample of names and addresses for residents of Cape Cod, Martha's Vineyard, and Nantucket Island.⁴ On January 21, 2005, 1500 pre-survey letters were sent out on College of Marine Studies, University of Delaware letterhead. The letter told the sample that they would receive a survey, and on January 26, 2005, 1500 survey packets were mailed. Each survey packet included a cover letter, the survey instrument, and a return envelope. One week later, 1500 postcard reminders were sent to the households. Of the 1500 mailings, 191 were returned as undeliverable and, over the next few months, 504 completed surveys were returned,⁵ a response rate of 38.5%. A survey was considered to be "completed," and was entered

Kommentar [jff1]: When it comes to a journal article, I think we could cut this paragraph is space becomes an issue.

⁴ From public records, but compiled and cross-checked by a firm providing this service, Survey Sampling International.

⁵ An additional three completed surveys were returned months later, after that statistical analysis was undertaken. They are not included here.

into the data base if survey questions 2 and 3 (identifying support or opposition toward the wind project) were answered.

Returned, completed surveys were assigned an identification number in the approximate order in which they were received. Fifty questionnaires were cross-checked by another coder, and all 504 were checked for valid codes. These checks yielded about 25 errors, under 0.1% (of the 62 questions * 50 fully cross-checked surveys). (One coder inconsistency was also discovered; this was corrected in all that coder's entries.)

The survey instrument sought information on (a) whether the respondent supported or opposed the project; (b) their beliefs about the project's impact; (c) factors that might cause them to change their mind; (d) whether a respondent would support a different or alternative project (e.g., if it were out of sight); and (e) demographic data.

Comparing our sample to the demographics of this area, we found that individuals who responded to our survey were somewhat more likely to be older, wealthier, and to be male, than the population as a whole. These response biases are common in survey research. In order to correct for this bias, we weighted our sample to bring it in line with the demographics of the area. Unless otherwise noted, all results reported have been weighted by income, sex, age, and county of residence; after our weighting, the sample demographics are very close to the population demographics. (Other studies of public opinion on this project have not used weighting to correct for the demographics of response bias.)

IV. Support or opposition

Whether or not this project is permitted will be determined by the administrative criteria of the federal and state agencies reviewing the applications, not by a vote of nearby residents on land. Nevertheless, there is a great deal of discussion about whether or not "people" support or oppose the project. Thus we begin with analysis of that question. This will also form the basis of our subsequent analysis of the causes of that support or opposition.

The survey began with a two-sentence description of the project and asked if respondents had heard of it. 99.8% had (503 of the 504 respondents)⁶. Next, they were asked: "Have you formed an opinion about the proposed Cape Cod offshore wind project?" 42.4 percent opposed the project, 24.6 percent supported it, and 33 percent answered with our third choice "I have not yet made up my mind". The high number of "not yet decided" is consistent with previous surveys about this project (e.g., DeSantis & Reid 2004 got 20% refusing to answer when given a binary choice). The difference between opposition and support was significant at the 1 percent level.

The respondents who had not made up their mind were then asked whether they were leaning one way or another. Of those who were undecided, only four did not

⁶ The near-universality of respondents having heard of the project indicates the very high degree of local publicity and informal local discussion of the project, as noted in the prior section. However, it also may indicate some bias of those having heard about the project being more likely to complete and return the survey form.

indicate a direction in which they were leaning. When individuals who are leaning one way or the other are added to supporters and opponents, the picture changes somewhat, as leaners are more likely to be supporters than opponents. Thus, overall (including both those who said they had formed an opinion and those leaning), 55.5 percent opposed the project, 43.8 percent supported the project, and only 0.7 percent remained undecided. Given the margin of error in the survey, the difference between supporters and opponents is now significant only at the 10 percent level ($p < .1$). Unless otherwise noted, our subsequent analysis of support and opposition includes both those who had formed a definite opinion and those who were leaning.

Later in the survey, we separately posed ten “counterfactuals” and asked if each would affect support for or opposition to the project. The specifics of that question will be discussed later, but the point regarding support or opposition is that, after these the ten counterfactuals, respondents were asked to check whether, “Regardless of the above, I would not change my mind.” About a third checked this, that is, two-thirds of respondents, by not checking, indicated they might change their mind based on this information. Dividing by position on the project, 26.6 percent of supporters and 38.0 percent of opponents marked that they would not change their minds, a difference significant (at $p < .05$).⁷ So, as with the comparison of those decided versus leaners, we again see that the opponents are more sure of their opinion, and opponents more often say they will not change their opinion even in the face of new information.

These three questions give indicators of both the degree of opposition, and the hardness of those positions, as summarized in Table 2. The first column gives answers to question 2, “Have you formed an opinion.” The second column adds those “leaning” (question 3) to those with a formed opinion. The third column shows what proportion of opponents and supporters who subsequently answered that they would not change their mind.

Table 2. Support or opposition to the project: Three measures of support and opposition, and the degree to which those positions are fixed.

	Formed opinion (Q 2)	Formed opinion + leaning (Q 2 + Q 3)	I would not change (Q 6)
Oppose project	42.4	55.5	38.0
Support project	24.6	43.8	26.6
Not made up mind	32.3	0.7	

We also considered overall support and opposition as a function of demographic variables. Men and Women opposed the project in equal numbers (54.7% to 54.6%),⁸ while those individuals who were employed tend to support the project more than those

⁷ We may be overestimating those willing to change based on this question, because of the way this question was posed. It was a check-off if they “would not change my mind”, rather than a yes-no. Thus some individuals, who did not check and thus appeared willing to change their mind, may have skipped the question.

⁸ Those who did not identify their sex were more likely to oppose.

who were not employed (which could include the statistical unemployed, those of working age, but out of the paid workforce, and those retired). Homeowners and renters opposed the project in almost identical numbers as did those whose residence on Cape Cod and the Islands was their primary residence and those for whom it was not their primary residence. Those individuals who believed they would be able to see the project from their homes or from their daily travel routines each opposed the project by a 4:1 margin as compared to about half of those who respectively will not be able to see the project from their homes or routines. These differences are statistically significant. At first blush, this provides some support for a NIMBY hypothesis; however, as we develop later, more in-depth analysis of the data we will see that other factors appear to be more predominant. Finally, those individuals who voted for the Democratic Presidential candidate John Kerry were more likely to oppose the project than voters for President George Bush (56.2% to 50.7%), although the difference was not statistically significant.

Analysis of Support and Opposition

In this section we consider (1) local residents' understandings and beliefs of the positive and negative impacts of the project (2) which characteristics and factors affect support and opposition (e.g., age, education, concern over property values); and (3) which factors, if true, would affect support and opposition (e.g., if you knew the project would improve Cape Cod air quality).

1. Believed impacts

We asked separately about what respondents believed to be the positive or negative impacts, and then which items had the most effect on their support.

Believed impacts are shown in Table 3, sorted by impacts most widely believed to be negative (not the order given on the survey). More than half think that the project will have negative impacts on aesthetics (72%), community harmony (62%), the local fishing industry (54%), and recreational boating (including fishing and yachting) (54%). In addition, substantial percentages (over 40%) believe the project will have negative impacts on property values, bird life, marine life, and tourism.

Examining believed improvements (positive impacts), respondents believe that the project will have a positive impact on electricity rates, job creation, and aesthetics. However, much smaller percentages state this belief, under 40%, with larger numbers in the "no impact" and "not sure" columns for these potentially positive impacts. To put it another way, even though those supporting and those opposing the project are similar, there are eight negative impacts expected by 40% or more of the population, and no positive ones expected by 40% of the population.

Thus, overall, the community appears to expect more negative impacts than positive ones, and to be more sure of the negative ones. Although more of the questions we asked involved negative impacts, based on our semi-structured interviews and prior surveys, the list of perceived negative impacts does seem to be longer than the list of positives. Table 3 shows that percentages of negatives are also higher than of positives.

One might even expect, from the believed impacts in Table 3, that the community would be even more opposed to the project than it is at present. When we divide the believed impacts by supporters and opponents of the project (not shown here), we find that supporters are much more likely than opponents to believe that the project will have positive impacts on electricity rates and job creation, while opponents are much more likely than supporters to see the project as having negative impacts on the local fishing industry, recreational boating, property values, bird life, and marine life.⁹ Finally, although there are differences between supporters and opponents on almost all measures, there appears to some commonality between the two on the view that the project will have a negative impact on aesthetics and community harmony. The two groups are also similar in the proportion believing it will have a positive impact on air quality, although this is a minority view among both groups (see Table 3).

Table 3. Believed negative and positive impacts of the project.

Items	Negative impact	Improve	No impact	Not sure
Aesthetics of the ocean view	72	3	17	8
Community harmony	62	2	17	19
Local fishing industry	54	4	26	17
Yachting/recreational boating and fishing	54	2	31	13
Property values	48	3	33	16
Bird life	48	2	22	28
Marine life	44	6	20	29
Tourism and related business	42	8	42	8
Job creation	8	37	28	27
Electricity rates	7	37	37	19
Air quality	6	24	52	18

A separate question asked about impacts of wider scale implementation. The specific question was: “Looking at the broader picture, if this project were to be successful and it led to other offshore wind projects being developed along the Atlantic coast, what kind of impacts do you think all of these projects taken together would have on the following?” The three impacts they were asked to judge are shown in Table 4. While 60 percent of respondents believe that larger-scale implementation would have a positive impact on U.S. energy independence, only 29 percent believe that they will help to stabilize climate change, and fewer still (14 percent) foresee military savings. These considerations

⁹ It must be noted that it is not clear whether these considerations lead to support or opposition or whether supporters and opponents meld their views of the impacts to fit their overall view of the project or whether some combination of the two is occurring.

nonetheless may contribute to support for the project, as 92, 51, and 24 percent of supporters believe a larger set of offshore wind projects would cause these improvements, respectively.¹⁰ Note that one might logically expect these three to cause either improvements or no effect, and correspondingly, only a few answered that they would be negative effects.

Table 4. Expected impacts of wider implementation.

Items	Improve	Negative impact	No impact	Not sure
U.S. independence from foreign energy sources	60	2	23	15
Stabilize global climate change	29	3	41	28
Costs of U.S. military presence overseas	14	2	54	29

The main difference between the question used for Table 3 and that for Table 4 is in the scope of wind implementation. Thus, for example, Table 4 shows that 60% would expect more wind installations to make the US more independent of foreign energy, a greater percentage expressing a positive expectation than any positive impact from this one site in Table 3. Consider the related questions on air emissions (air quality and climate change). Electricity in this area is generated primarily by fossil fuels, and there is a large oil-burning electric plant on Cape Cod, not far from the proposed wind farm. Thus, some analysts might find it strange that, in Table 3, 52% of respondents thought the facility would have “no impact” on air quality. Only 24% thought it would have a positive impact. Perhaps this is because respondents are thinking it is only one plant and do not realize it would produce enough electricity for three-fourths of Cape Cod), or perhaps they think the power would go elsewhere (which it may), not resulting in local pollution improvements. That is, perhaps they mean “no (significant) improvement (locally)”.

We designed the next question, “...if this project...led to other offshore wind projects being developed along the Atlantic coast...” to address the question of scope and local effects. We reasoned that building wind power along the US Atlantic coast would more likely respondents to expect a difference in emissions, and we asked about a global phenomenon, climate change, to eliminate the question of whether emission benefits were nearby or far. Yet, Table 4 shows that only 29% of respondents expected it to “improve” stabilization of climate change, and 41% expected no impact. In fact, analysts in both the EU and US see wind as a major component of climate control (e.g. Pacala and Socolow 2005, other REFs?), and the US Atlantic continental shelf appears to have more wind power than all fossil fuel power production on the US Eastern coastal states (Kempton et al 2005; Butterfield, Musial, and Laxson. 2004). There appears to be a very substantial gap here between analysts’ and the public’s perception of the potential for wind power to reduce emissions, whether those affecting local air quality or those causing and forestall climate change (we return to this issue later). This may be an

¹⁰ See supra note 9.

underlying cause of opposition—if people believe that offshore wind won’t have much benefit, why accept the environmental costs?

2. Effects of believed impacts on support or opposition

The above questions give which impacts are expected, but not the degree to which they affected support. After the above impacts were rated, respondents were asked “In deciding whether you support or oppose ... please write in the three issues you consider to be the most important, ranked in order...” (emphasis in original survey question) Three blanks were provided. Thus, respondents could fill in any answer and we categorized their answers. Since an issue can be rated first, second or third, we sum the responses to give a higher score to higher ranked issues.¹¹ The ranking of issues is presented in Table 5, ordered with the most important factors first (not the order in the survey). Notice that this question only asks about the importance of the issue, it does not repeat the prior questions about whether it is expected to be a positive or negative effect.

The issue said to most affect one’s decision was the project’s anticipated environmental effects, including its effect on marine life (38%), followed by aesthetics and electricity (each at 22%), and fishing impacts/boating safety (19%)¹². Given the lower percentages associated with property values (6%) and tourism (7%), the NIMBY phenomena, that is, concern about impacts on one’s personal property or job, appears to explain little of the opposition. That is, although Table 3 shows that the largest majority expects the project to have a negative impact on aesthetics of the ocean, Table 5 shows that most people do not consider this among the three issues most important in their decision of whether to support or oppose the project.

Table 5. Factors reported to most affect prior decision to support or oppose (free listing, three responses weighted by list order).

Issue	Weighted Percent
Marine Life/Environmental Impacts	38%
Electricity Rates	22%
Aesthetics	22%
Fishing Impacts/Boating Safety	19%
Foreign Oil Dependence	13%
Alternative/Renewable Energy	11%
Air Quality	7%
Tourism	7%
Private Use of Public Lands	7%
Property Values	6%

¹¹ We weighted the most important issue (1/1); the second most important issue (1/2); and the third most important issue (1/3), and then summed. This results in a sum of 183% for the three questions, rather than 300% or 100%.

¹² “Other” appears in Table 5 to be the second most commonly mentioned, but unlike the named categories it is actually a collection of single-digit percent answers that were not separately categorized by the coders

Jobs/Economic Concerns	4%
Global Warming/Climate Stability	2%
Other	27%

We rearranged the “most important effect on decision” data in Table 5 to compare supporters with opponents. For simplicity, we tabulated only the first-ranked issue and eliminated “other”, as shown in Table 6. [JEREMY: Why did we do Table 5 differently from Table 6? Seems harder to compare. We can discuss; There may be some advantage to presenting both views Willett, perhaps we can make changes in final draft after discussion] Supporters ranked electricity rates as having the most effect on their decision, followed by environmental effects, and renewable energy. Opponents ranked the most important issue as environmental effects, followed by aesthetics, and fishing and boating impacts. (Even opponents ranked property values low (tied for seventh), again contrary to the prior NIMBY stereotype of opponents.) Some of the largest splits were aesthetics, which ranked 2nd for opponents and 10th for supporters, and foreign oil dependence, which ranked down at 10th among opponents but 4th for supporters. “Renewable energy” is also a large split, 3rd for supporters, and 13th for opponents (but it is unclear what the underlying cause of support is when a respondent gives “renewable energy”).

Table 6. Factors reported to most affect prior decision to support or oppose, divided by supporters and opponents (open-ended, 1= most frequently mentioned).

Issue	Opponents' Rank	Supporters' Rank
Marine Life/Environmental Impacts	1	2
Aesthetics	2	10
Fishing Impacts/Boating Safety	3	7
Other	4	5
Electricity Rates	5	1
Private Use of Public Lands	6	7
Property Values	7	13
Tourism	7	10
Jobs/Economic Concerns	7	7
Foreign Oil Dependence	10	4
Global Warming/Climate Stability	10	12
Air Quality	12	6
Alternative/Renewable Energy	13	3

3. What Facts might change Support or Opposition?

Up to this point we had elicited support or opposition, beliefs about impacts, and the rated importance of these beliefs to making a decision. Respondents were then asked to rate whether, if their beliefs were wrong, if it would affect their support or opposition. (This is the counterfactual question we referred to earlier.) Supporters and opponents

(including leaning) were directed to two separate sets of questions, although the only difference between the two sets is in the substitution of positives for negatives (and vice versa) in order to move supporters toward opposition and opponents toward support.

For example, supporters (including leaning toward support) were asked “If you knew the project would seriously harm marine life ... Your support for the project would be ...” to which they could check “much less”, “somewhat less,” “just a little less” or “no effect”.

Specifically, supporters were asked to characterize the effect () on their support for the Cape Wind project if it were to have a series of effects such as “seriously harm marine life.” Opponents and supporters were directed to two separate sets of questions, although they differed only in that one was the negative of the other (see Tables 7 and 8).

Seventy-seven and seventy-two percent of supporters, respectively, indicated that if the project were found to harm marine and bird life they would be much or somewhat less likely to support the project. See Table 7. In conjunction with the earlier findings, this suggest that while supporters believe the project will have negative impacts on bird and marine life, they do not believe that the impact will be “serious.” It suggests as well, that serious impacts on fauna would do much to dampen supporters’ enthusiasm for the project. (What constitutes “seriously harm” is self-defined by the respondent in answering the question.)

In addition, supporters indicated that they would be much less or somewhat less likely to support the project if it results in increased electricity rates (76%) or in job losses (70%). This is not surprising given supporters’ beliefs. On the other hand, while 46 percent of supporters believe the project will have a negative impact on the aesthetics of the ocean view, only twenty-one percent of supporters indicated that they would be much or somewhat less likely to support the project if it was “very visible from shore,” with most of those only somewhat less likely (15%). This suggests that for supporters, although negative aesthetic impacts are expected, they are compensated by other factors such as job creation, lowered electricity rates, and energy independence. Finally, 26.6 percent of supporters indicated that regardless of the possibility that the facts may not match their beliefs (for example, there are serious marine life effects or electricity rates increase), they would not change their mind.

Table 7. Supporters: Effect of new facts on position.

If you knew the project would...	Your support for the project would be ...			
	Much less	Somewhat less	Just a little less	No effect
Seriously harm bird life	37	35	18	11
Seriously harm marine life	57	20	14	9
Be very visible from shore	6	15	30	48
Increase electricity rates	58	18	9	15
The Cape would not	57	18	10	15

receive the generated electricity				
Result in jobs lost	48	22	15	16
Does not improve air quality on the Cape	31	19	18	31
Hurt the local fishing industry	34	28	18	19
Hurt tourism and related business	24	24	22	30
Decrease coastal property values	24	18	15	43

Opponents of the project are less likely to change their mind than supporters. Indeed, when asked a similar set of questions, they indicated that they would be much more or somewhat more likely to support the project in much smaller percentages, with the largest effects given by the Cape receiving the electricity (53%), a decrease in electricity rates (52%), help to the local fishing industry (50%), and improvement of air quality (48%), registering the highest. See Table 8. Conversely, forty-eight and thirty-four percent of respondents, respectively, indicated that increased property values and the project not being visible from shore would have no effect on their support. This suggests that for a large segment of the supporters the NIMBY theory lacks support. **As mentioned previously, at the end of the set of counterfactuals, 38.5 percent of opponents indicated that, regardless of new information in these ten areas, they would not change their mind.**

Table 8. Opponents: Effect of new facts on position.

If you knew the project would...	Your support for the project would be ...			
	Much more	Somewhat more	Just a little more	No effect
Have no serious harm to bird life	14	23	21	42
Have no serious harm to marine life	16	24	21	39
Would not be visible from shore	25	21	20	34
Decrease electricity rates	26	26	21	27
Cape would receive the generated electricity	33	20	17	30
Create new jobs	17	22	17	44
Improve air quality on the Cape	27	21	16	36
Help the local fishing industry	32	18	18	32

Increase local tourism and related business	20	19	16	45
Increase coastal property values	16	14	21	48

Table 8-B summarizes Tables 7 and 8, by comparing opponents and supporters, and combining whether the position would change much more or somewhat more. In interpreting Table 8-B, remember that the changed beliefs are in the opposite direction. For example, Table 8-B shows that 53% of opponents would be more supportive if the Cape would receive the electricity, whereas 75% of supporters would be more opposed if the Cape would not receive the electricity. The same counterfactual questions are given as in Tables 7 and 8, but here in 8-B they are ranked by most likely to change opponents' views. Overall, we see higher numbers in the supporters' column, indicating that supporters say they would be more willing than opponents to change their mind in the face of new information.

Table 8-B shows that opponents say they would most likely be swayed by local allocation of the electricity and cost savings, assurance that it would not harm fishing, and knowing that it would improve air quality. The smallest number of opponents would change their mind if property values increased. For supporters, support would be most diminished if marine life would be harmed. Next biggest are electric allocation and costs, (which also were rated highly by opponents), followed by "serious" harm to bird life. The smallest effect in the table is higher visibility, which would affect only 21 percent of supporters.

Table 8-B. Comparing effect of new facts on opponents and supporters. [WK: Data here need to be checked—sums of columns from tables 7&8.]

	Opponents	Supporters
Who receives the generated electricity (Cape would/would not)	53	75
Electricity rates (decrease/increase)	52	76
Local fishing industry (helped/hurt)	50	62
Air quality (improved/not improved)	48	50
Visible from shore (not visible/very visible)	46	21
Marine life (no serious harm/serious harm)	40	77
Jobs (create jobs/jobs lost)	39	70
Local tourism and related business (increased/hurt)	39	48
Bird life (no serious harm/serious harm)	37	72
Coastal property values (increase/decrease)	30	52

[NEED TO ADD HERE: Discuss which of these are true false. JF: it makes sense to discuss here as it will be clearer, where the is the likelihood for movement in opinions (conclusion is a possibility as well).]

4. Factors that Affect Support and Opposition: Multivariate Statistical Analysis

In order to gain additional insight into support and opposition of offshore wind power in Nantucket Sound, logistic regression was employed. With the logistic model we compare the likelihood of support or opposition, when influenced by other, possibly causal, variables. We tried a number of different models, using different variables. The model selected and shown below had the highest pseudo- R^2 (.4375), which measures the percentage of variation in the variable of interest (here, the likelihood of project support) explained by independent variables. As independent variables, we tested both demographics (e.g., respondent's age, education, income, whether they can see the project site), and the respondent's answers to other questions, such as expected impacts.

In the process of testing different models, we found that the strongest explanation of variance was from question 5, "In deciding whether you support or oppose ... write in the three issues you consider to be the most important..." . Since this question was open-ended, our variables are yes/no whether or not a person gave "air quality" as one of the answers.

Similarly, in the demographic variables, we describe below only those that we found to explain more of the variance in whether someone opposed or supported the project. Thus, for example, we found that although income generally did not explain much variance, whether or not the respondent reported making at least \$200,000/year (a dichotomous variable) did explain a significant part of the variance.

Table 9 shows the influence of each of the variables. All variables in the model are significant at the 5% level ($p < .05$) and many variables are significant at the 1% level. A positive coefficient implies that the variable makes it more likely that an individual supports the project, while a negative coefficient makes it less likely, holding all other variables constant. The larger the absolute value of a coefficient the greater the effect. This is more directly reflected in the odds ratio, in the second column. Thus, for example, the odds of project support increase by 20.4 times (2040%) if a person identifies air quality as one of the three most important issues compared to someone who does not identify air quality, while the odds increase by only 2.6 times (260%) if a person identifies, electricity rates.¹³ Conversely, the odds of support decrease by 86.5% if property values are identified as one of the three most important issues and by 84% percent if household income is at least \$200,000/year.

Table 9. Logistic regression of factors influencing support or opposition.

Variable	Coefficient	Odds Ratio	Std. Error	P value
Air Quality	3.017	20.428	.709	.000

¹³ The logit is the log of the odds of support versus opposition of the project. The exponential of a coefficient is simply the odds (Long 1997). Thus, $e^{3.017} = 20.428$. A negative coefficient such as property values can be interpreted as follows: $e^{-2.004} = .135$. $1 - .135 = .865$. Thus, identifying property values as a concern decreased the odds of support by 86.5%.

Jobs/Economy	2.672	14.465	.935	.005
Renewable Energy	2.493	12.101	.495	.000
Electricity Rates	0.972	2.642	.431	.025
Property Values	-2.004	.135	.663	.003
Aesthetics	-1.770	.170	.498	.000
Private Use of Public Land	-1.240	.289	.598	.039
Fishing Impacts/boat safety	-0.954	.385	.441	.031
Income ≥ \$200,000	-1.829	.161	.828	.028
Education	0.485	1.625	.128	.000
Age	-0.027	.973	.012	.024
Constant	-1.124		1.019	.271

Using demographics, we can statistically evaluate the stereotype that opposition is based on “rich coastal property owners”. The “rich” part is borne out statistically, but it is not especially significant ($p < .05$). Our demographic questions included both owners (versus renters) and those who thought they would see the project. These are not included in Table 9 because neither had a statistically significant effect. By comparison, education was much more statistically significant than wealth (the coefficient is smaller for education because it, like age, is a continuous variable and “income \geq 200,000” is dichotomous). We also note that, although income is generally correlated with education, the multivariate logit model allows separating these effects – for example, the more educated are more likely to support the project, whereas the most wealthy are less likely to.

In question answers, it is worth noting variables that are not included in the model because their effects on support/opposition are small. These include other responses to the “most important” question: less dependence of foreign oil, environmental effects (including impacts on marine life), climate change, and tourism, none of which had a significant effect on support/opposition. This does not mean that these factors are unimportant. Indeed, as noted earlier, supporters and opponents rank, for example, environmental effects as either the most or second most important issue affecting their position. Because both supporters and opponents rank environmental effects high, that factor does not divide supporters and opponents, and hence does not affect the likelihood of support and opposition (the statistical test we are using).

Table 9A defines the variables in the logistic equation [TOO DETAILED? DELETE?]

Table 9A. Definition of Variables in Logistic Regression

Variable	Coefficient
Air Quality	Each of these are dummy variables that are assigned a “1” if the identified factor was self-
Jobs/Economy	
Renewable Energy	
Property Values	

slattet: This raises the question of how supporters and opponents each can rate environmental effects as important to their decision, yet come to differing opinions on the project as a whole? The difference in opinion in part reflects a difference in supporters’ and opponents’ beliefs as to the likely affects of the project on issues such as marine life where, as noted earlier 72% of opponents, as opposed to only 9% of supporters, believe the project will negatively impact marine life. Thus, while marine life effects are important to supporters in their decision of whether to support or oppose the project, they have for the most part concluded that the project will not negatively impact marine life. As a result, other factors that are less important to both supporters and opponents, such as a belief that the project will have a positive impact on jobs and the economy and will improve air quality, determine likelihood of support and opposition. The difference in opinion of the understanding of the effect of the project on marine life and other factors suggests as well that information dissemination and education could go a long way to narrow the differences of opinion among residents of Cape Cod and the Islands. ¶

Aesthetics	reported as one of the three most important factors influencing decision to support or oppose, and “0” otherwise
Private Use of Public Land	
Electricity Rates	
Fishing Impacts/boat safety	
Income >= \$200,000	Dummy variable assigned a “1” if income is greater than or equal to \$200,000 and assigned a “0” if self-reported income is less than \$200,000
Education	Education of Respondent, assigned a “1” if some high school, a “2” if high school graduate, a “3” if some college credit, a “4” if Associate degree, a “5” if Bachelor’s degree, and a “6” if either a graduate or professional degree
Age	Age of respondent in years

Conclusions

As noted above, supporters and opponents, both rank environmental effects as important, yet they diverge substantially in their beliefs about the likely effects of the project. For impact on marine life, as noted earlier, 72% of opponents, as opposed to only 9 percent of supporters believe the project will negatively impact marine life. Thus, while marine life effects are important to supporters in their decision of whether to support or oppose the projects, they have for the most part concluded that the project will not negatively impact marine life, and as a result, it allows other factors to more strongly influence their decision, such as a belief that the project will have positive effects on electricity rates and air quality.

The difference in opinion of the understanding of the effect of the project on marine life suggests that residents do not know, or have not accepted, the conclusion of the Draft Environmental Impact Statement (DEIS), that the project will have no major impact on marine life. Thus it would seem that dissemination of this DEIS finding could reduce opposition to the project. Although getting this across convincingly may require more than just promulgating information, we note that, given our understanding of the opposition based on empirical data from a thorough survey, suggests a very different course of action than would be taken by developers who proceeded based on the stereotype that opposition is “rich people who don’t want windmills in their view”.

[MORE NEEDED FOR CONCLUSIONS]

Acknowledgments

We are grateful to Andy Krueger for managing the survey process, and to Christina Jarvis and Andy Krueger for data entry and checking. We also wish to thank Jonathan Lilley,

Amanda Wenczel, Ami Kang for their assistance in mailing the survey. We wish to acknowledge as well, the University of Delaware, General University Research (GUR) Program for a grant to Jeremy Firestone to support this research.

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[NOTE: TRIM REFERENCES DOWN AFTER ALL CITATION ADD/DROPS ARE IN TEXT OF PAPER]

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