Public Opinion about Large Offshore Wind Power: Underlying Factors

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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 the 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 cost 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. In addition, further insights into the nature of the opposition and support for this project, being the first offshore wind power project in the United States could assist policymakers in the creation of broader federal regulatory policy for offshore wind power]Firestone, et al., 2005; Energy Policy Act of 2005,§ 388 (H.R. 6)].

In an earlier article on public opinion about Cape Wind Associates' Nantucket Sound project, we reviewed studies of opposition to wind power and presented evidence based on in-person qualitative interviews (Kempton et al 2005). A description of the proposed project, its setting, and of the main opposition organization, the Alliance to Protect Nantucket Sound (an organization specifically created to oppose the development) can be found in that paper. In this paper, we report on a large survey of local residents to better understand the causes of support or opposition.

That prior work articulated many concerns and odd gaps in the debate that had not previously been recognized. However, a survey was needed to quantitatively estimate their relative importance and to infer the causal relationships between them and support or opposition. Thus, based on the findings of the semi-structured interviews, a set of 62 survey questions was developed. After pre-testing and piloting the survey instrument, a random sample of 1500 names and addresses of residents of Cape Cod, Martha's

Vineyard, and Nantucket Island was drawn. On January 26, 2005, 1500 survey packets were mailed; 191 were returned as undeliverable and, over the next few months, 504 completed surveys were returned.

The survey instrument sought information on (a) whether the respondent supported or opposed the project; (b) his/her beliefs about the project's impact; (c) factors that might cause the respondent to change his/her mind; (d) whether the 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. In order to correct for this bias, we weighted our sample to bring it in line with the demographics of the area (Other studies of public opinion on this project have not used weighting to correct for the demographics of response bias.)

Support or opposition

Whether or not this project is permitted will be determined by administrative criteria of federal and state laws applicable to the project, 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.

The survey began with a two-sentence description of the project and asked if respondents had heard of it. 99.8 percent had (503 of the 504 respondents). 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, 20 percent 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 indicate a direction in which they were leaning. When individuals who lean one way or the other are added to supporters and opponents, the picture changes somewhat because 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 ($p < .1$). Our subsequent analysis of support and opposition includes both those who had formed a definite opinion and those who lean either way.

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 ten counterfactuals, respondents were asked to check whether, "Regardless of the above, I would not change my mind." About a third checked this. In other words, by not checking, two-thirds of respondents 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 $p < .05$). 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 questions can be combined to distinguish among degrees of support or opposition (although the questions were not asked in that way, in particular, the last question discussed was removed from the context of support, opposition or leaning). We combine them to distinguish supporters and opponents in whether they are firmly decided, decided but willing to change their mind if new facts are presented, or not decided but leaning. Using these figures, we can then create three categories of support and opposition: firm position, soft position (those that express an initial position, but whose mind could be changed depending on the facts), and leaners. This sheds two interesting insights. First, the opposition commands 1.77 times the number of core individuals whose positions are unlikely to change in any event than supporters. Second, in total, each category—firm, soft and leaning—commands approximately one-third of the population.

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%), while those individuals who were employed tended to support the project more than those 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 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 Not-In-My-Back-Yard (NIMBY) hypothesis; however, together, those who believe they will be able to see the project from either their home or during their daily routine only represent approximately 50% of the opposition (with only 18 of the 504 respondents in our survey indicating that they believe that they will be able to see the project from their home). Thus, as we develop later, a more in-depth analysis of the data reveals that other factors predominate. Finally, those individuals who voted for the Democratic Presidential candidate John Kerry in the last election 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) those issues that effect local residents' support or opposition; (2) what new information, if inconsistent with their beliefs of the positive and negative impacts of the project, could affect support and opposition (e.g., if you supported the project but learned that it would adversely affect bird life); and (3) degree of support for alternative projects with different characteristics.

1. Issues that Resonate with Supporters and Opponents

We asked respondents about their beliefs regarding certain specified potential positive and negative impacts of the project (not reported here), and then, which items

had the most effect on their support. More specifically, 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.[1] The ranking of issues is presented in Table 1, ordered with the most important factors first (not the order in the survey). The issue said to most affect the decision was the project's anticipated environmental effects, including its effect on marine life (38%), followed by aesthetics and electricity rates (each at 22%), and fishing impacts/boating safety (19%).[2]

Table 1. Factors reported to most affect prior decision to support or oppose (free listing, responses categorized by researchers, 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%
Jobs/Economic Concerns	4%
Global Warming/Climate Stability	2%
Other	27%

We split the "most important effect on decision" data from Table 1 to compare supporters with opponents. This is shown in Table 2. Like the previous table, we weighted the first-ranked issue more heavily than the second-ranked issues, and so on, and moved "other" to the end. 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, then fishing and boating impacts. Although opponents ranked aesthetics second, they also ranked tourism and property values low (seventh and eighth, respectively), so they are consistent with some aspect of the NIMBY stereotype of opponents, but not others. Some of the largest splits were aesthetics, which thirty-three percent of opponents listed, but only six percent of supporters, and foreign oil dependence, which twenty-three percent of supporters gave as affecting their decision, but only three percent of opponents did. "Renewable energy" is also a large split (28% of

[1] 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 percent.

[2] "Other" has a weighted response of 27% in Table 1, which might appear to be the second most commonly mentioned. However, unlike other categories in Table 1, it is a collection of single-digit percent answers that coders did not separately categorize.

supporters, but less than 1% of opponents). Finally, unexpectedly, global warming/climate stability resonated more with opponents than supporters (a weighted 3.0% compared to 1.8%), although it was not a particularly prevalent factor for either.

Table 2. Factors reported to most affect prior decision to support or oppose, divided by supporters and opponents (open-ended, ordered by opponent's rank).

Issue	Opponents' Rank	Supporters' Rank
Marine Life/Environmental Impacts	42%	34%
Aesthetics	33%	6%
Fishing Impacts/Boating Safety	29%	7%
Electricity Rates	13%	36%
Private Use of Public Lands	10%	3%
Tourism	9%	2%
Property Values	8%	4%
Foreign Oil Dependence	3%	23%
Global Warming/Climate Stability	3%	2%
Air Quality	2%	14%
Jobs/Economic Concerns	1%	7%
Alternative/Renewable Energy	0.4%	28%
Other	30%	19%

2. What Facts might change Support or Opposition?

a. *Descriptive Analysis*

Up to this point we had elicited support or opposition, beliefs about impacts, and the rated importance of these beliefs to the position they had already taken. Respondents were then asked to rate, if they found that their beliefs were wrong, would that new information affect their support or opposition. (This is the counterfactual question we referred to earlier). Supporters and opponents were directed to two separate sets of questions, although the only difference between the two 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 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". (Opponents were asked the same, except it was "…no serious harm to bird life…").

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. This suggests that serious impacts on fauna would do much to dampen supporters' enthusiasm for the project. (What constitutes "serious harm" is self-defined by the respondent as they interpret 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 that the project will have positive impacts on these factors. 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%). Together, these suggest that supporters expect negative aesthetic impacts, but that negative aesthetics are compensated by other factors such as job creation, lowered electricity rates, and energy independence.

Opponents of the project are less likely to change their mind than supporters. Indeed, when asked a similar set of questions, much fewer of them indicated that new facts would make them more likely to support the project. Adding much more and somewhat more, the largest effects would be if the Cape received the electricity (53%), electricity rates decreased (52%), the local fishing industry was helped (50%), or air quality improved (48%). Conversely, forty-eight and thirty-four percent of opponents, respectively, indicated that increased property values and the project not being visible from shore would have no effect on their position. This suggests that for a large segment of the opposition that the NIMBY theory lacks support.

Table 3 summarizes this data by comparing opponents and supporters, and combining "more" with "somewhat more". When comparing columns in Table 3, note that the new facts and changed opinions are in opposite directions. For example, Table 3 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. We have ranked the issues 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. Interestingly, Table 3 shows that although the factors move opponents and supporters in opposite directions, whether or not the Cape would receive the electricity generated from the project and the project's impact on electricity rates resonates very strongly with both supporters and opponents, and thus, the outcome of the issues most closely bound to the generation of electricity itself may greatly affect long-term support and opposition for the project (assuming its is built).

Table 3. Effect of new facts on opinion, comparing opponents and supporters.

Issue	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	42

** Finding of EIS or other strong evidence.
* Weak evidence, or subject to interpretation.
(blank) No effect, or no evidence.

We have added to Table 3 notations to indicate our best judgment of which possible "new facts" are correct. The point of the present analysis is neither to evaluate the merit

of the project nor to determine the project's environmental, energy, economic or other impacts. In Table 3, we summarize our own judgments by indicating with an asterisk when we feel an outcome is supported by evidence. A double asterisk in Table 3 indicates areas that we judge there is strong evidence while a single asterisk indicates weaker evidence, or a statement that can be interpreted in multiple ways.

We review the evidence for our evaluation of each belief in this paragraph. The first item, "who receives the electricity", if interpreted literally, must be the Cape—power will flow by the path of least resistance from the injection point to nearby loads on Cape Cod. We thus put two asterisks next to the opponents' counterfactual. For the second item, "electricity rates", the nature of the power bidding process in this region (ISO-New England) is that new wind power will be bid at zero price and will displace all or part of a high power bid. Thus, on average, any new wind power must necessarily lower the prevailing wholesale cost, and thus (eventually) reduce retail costs. On the other hand, the price drop will probably be small and be diluted over a wider area than Cape Cod itself. We asterisk the "opponents" counterfactual, because electric rates will be lowered. Regarding the third item, the fishing industry, the Cape Wind Draft Environmental Impact Statement (DEIS) finds no significant impact (U.S. Army Corps of Engineers, 2004). Although many local commercial fishers believe they will be curtailed, the developer has granted open access to all boating and fishing through the site. Conversely, any increase in sport fishing opportunities due to improved fish habitat around the towers may be minimal. Thus, we check neither a positive nor negative impact on fishing.

For "air quality", the project would result in fewer hours of fuel-burning at nearby power plants, displacing, on average, a 170 MW power plant (1,491,384 MWh/year ÷ 8760 h/year, Kempton et al 2005). We find no plausible argument that the project will not significantly improve air quality, so we place asterisks in the opponents' column for the counterfactual "air quality improved". The visual simulations of the project's appearance from various shore points (DEIS) suggests that the project is likely to be visible from several areas of Cape Cod and Martha's Vineyard, so asterisks here go under the supporters. It must be noted nevertheless that the simulations are based on clear skies; during times of summer haze, visibility in the area can be less than a mile or two during the day, rendering the project not visible from shore during daylight hours (DEIS). Given this further explanation of the visibility impacts, and the fact that the question posed described the "new fact" as the project being "very visible" from shore, we put a single asterisk, although one could plausibly argue for a double asterisk.

For "marine life", the DEIS finds no significant impact. On jobs, the DEIS finds that the project will result in an annual permanent increase of 154 new jobs, and that many new jobs will be created during manufacture, assembly and construction phases. For "local tourism", the DEIS concludes that the project is likely to have an overall positive effect on tourism, relying on data from two offshore wind facilities in Europe and onshore wind facilities in the northeastern U.S. (DEIS). However, since the evidence is comparatively weak, we check neither column. On bird life, the DEIS estimates that zero to 360 shorebirds will be killed yearly by the project (U.S. Army Corps of Engineers, 2004). A recent study at an offshore wind farm in Denmark found that less than one percent of geese and ducks were at risk of collision because they tended to avoid the wind farm (Desholm and Kahlert 2005). One can argue whether this is "serious harm" in

comparison to the far larger bird mortality from other human causes (including bird deaths from fossil fuel power plant pollution, Jarvis 2005), yet we feel justified in placing a double asterisk for counterfactual in the "Supporters" column for serious harm to bird life. Finally, local property owners on average expect a 10% drop in property values (Haughton, Giuffre, and Barrett, 2003), but based on a study of ten communities in the view shed of new wind facilities, in eight of the ten, "after projects came on-line, values increased faster in the view shed [of the wind farm] than they did in the comparable community" (Sterzinger, Beck, and Kostiuk, 2003: 4). Here, we check neither column (although the Sterzinger et al. study could be used to argue for an asterisk in the opponents' column).

Looking at Table 3 overall we can compare the two columns. For opponents of the project, there are five areas with clear evidence that are "counterfactual" to what they now believe to be true. For these five areas, if opponents knew the best evidence available, they say they would be more supportive of the project. For supporters, there are two areas for which, if they knew the best evidence available—one with clear evidence, the other with weaker evidence—they indicate that they would be more opposed to the project. Given our data, we predict that further public debate on the project, and promulgation of a final EIS with conclusions similar to those in the DEIS, would shift more individuals from "soft opposition" or "leaning toward being opposed" toward support than vice-versa, although the extent of the shift remains an open question.

b. *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 examine the likelihood of support or opposition under the influence of other, possibly causal, variables. We tried a number of different models, using different variables. The model selected and shown below had a high pseudo-R^2 (.4839), which measures the percentage of variation in the variable of interest (here, the likelihood of project support) explained by independent variables.[3] As independent variables, we tested both demographics (e.g., respondents' age, education, income, whether they can see the project site), and the respondents' answers to other questions.

In the process of testing different models, we found that the strongest explanation of variance was from the following question: "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, these variables are dichotomous, and depend on whether or not a person gave, for example, "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. See Table 4A. Thus, for example, we found that although income generally did not explain much variance,

[3] One model that we choose not to use here had a slightly higher pseudo-R^2 of .4898, and included the non-significant variable identifying whether the respondent voted for President Bush or Senator Kerry (individuals who voted for someone else were identified as missing in this formulation). However use of this variable resulted in our multivariate analysis being based on 26 fewer observations. Moreover, a higher pseudo-R^2 does not necessarily imply a better fit, as it increases each time a variable is added to the model (Long 1997). As a result, it was rejected.

whether or not the respondent reported making at least $200,000/year (a dichotomous variable) did explain part of the variance.

Table 4 shows the influence of each of the variables. All variables, except the variable SEX, 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 that an individual supports the project increase by 29.1 times (2910%) if that 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 3.1 times (305%) if a person identifies electricity rates.

Conversely, the odds of support decrease by 89.7 percent if property values are identified as one of the three most important issues and by 84.5 percent if household income is at least $200,000/year.[4] Or, to make a more direct comparison to those factors increasing support, we can invert the odds ratio for those variables that have odds ratios of less than one, an interpret the coefficient as increasing the odds of opposition. Thus, the odds of opposition increase by 9.7 times (970%) if a person identifies property values compared to some who does not, while the odds of opposition increase by only 6.5 times (645%) if a person has a household income of $200,000 or more per year.

Table 4. Logistic regression of factors influencing support or opposition.

Variable	***Coefficient***	***Odds Ratio***	***Standard Error***	***P alue***
AIR QUALITY	3.371	29.104	.889	0.000
RENEWABLE ENERGY	2.772	15.991	.541	0.000
JOBS/ECONOMY	2.517	12.390	.934	0.007
ELECTRICITY RATES	1.116	3.052	.426	0.009
PROPERTY VALUES	-2.275	.103	.722	0.002
AESTHETICS	-1.977	.138	.483	0.000
PRIVATE USE OF PUBLIC LAND	-1.643	.193	.613	0.007
FISHING IMPACTS/BOAT SAFETY	-1.247	.287	.459	0.007
AGE	-0.032	.968	.012	0.008
EDUCATION	0.556	1.743	.140	0.000
INCOME <= $200,000	-1.866	.155	.615	0.002
OWN RESIDENCY	1.696	5.454	.625	0.007
SEE FROM HOME	-2.344	.096	1.182	0.047
SEE FROM ROUTINE	-1.252	.286	.463	0.007
SEX	-0.132	.876	.369	0.720
CONSTANT	-2.190		1.067	0.040

[4] 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: $e^{-2.275} = .103$. 1-.103=.897. Thus, identifying property values as a concern decreased the odds of support by 89.7%.

Table 4A. 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-reported as one of the three most important factors influencing decision to support or oppose, and "0" otherwise
JOBS/ECONOMY	
RENEWABLE ENERGY	
PROPERTY VALUES	
AESTHETICS	
PRIVATE USE OF PUBLIC LAND	
ELECTRICITY RATES	
FISHING IMPACTS/BOAT SAFETY	
AGE	Age of respondent in years
EDUCATION	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
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
OWN HOME	Dummy variable assigned a "1" if respondent owns dwelling on Cape Cod/Islands and a "0" if rents
SEE FROM HOME	Dummy variable assigned a "1" if the respondent thinks he/she will be able to see the project from his/her house and a "0" otherwise (no or not sure)
SEE FROM ROUTINE	Dummy variable assigned a "1" if respondent thinks he/she will be able to see the project from his/her day-to-day routine and a "0" otherwise (no or not sure).
SEX	Dummy variable assigned a "1" if male; "0" if female.

The odds ratios of AGE, a continuous variable, and EDUCATION, a variable with six categories are not directly comparable to the odds ratios of the remaining variable in Table 4, which are dichotomous. Thus, the odds ratio in Table 4 for AGE indicates that the odds of support for the project decrease by about three percent as a person ages one year. However, we can generate odds ratios for any combination of multiple years. Thus, the odds that someone who is 65 years old will support the project compared to someone who is 35 years old decrease by 61.7 percent (or alternatively the odds of opposition increase by 2.61 or 261%).[5] Because we did not ask individuals how long they had owned or rented property on Cape Cod and the Islands, we cannot distinguish how much of our observed correlation with age is in fact due to length of residency (long time residents may more vigorously oppose a change to the Nantucket seascape). Finally, the odds that someone holding a graduate or professional degree will support the project compared to a high school graduate increase by 9.24 times (or 924%).

[5] The odds are calculated as follows. $e^{-0.032x30} = .383$. 1-.383= .617; 1/.383=2.61. See Long (1997).

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 only to the extent one considers, for example, someone with an income of $150,000 as not being rich. The "owners" part is not borne out because renters are more likely to oppose the project than owners. It is true that those who can see the project from their home are significantly less likely to support the project, but given that only 18 of the 504 respondents to the survey said they thought they would be able to see the project from their home, it is too much to argue that the opposition is composed solely of those individuals. 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 those who are most wealthy are less likely to.

The fact that individuals who believe that they will be able to see the project from either their home or routine and those who identified aesthetics and property values as important issues are significantly less likely to support the project provides support for a NIMBY hypothesis for at least a portion of the opposition, although we note that home owners are more likely to support the project than renters.

It is worth noting the variables that are not included in the model because their effects on support/opposition are not signifcant. 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. However, 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 versus opposition (the statistical test we are using in this section).

3. Support for a project with alternative characteristics

A final approach to understanding opinion about offshore wind, complimentary to those explored above, is to ask about support and opposition for other projects that would be similar but have critical (carefully-selected) differences. For example, the alternative characteristic we describe below as "local government" corresponds to the following question: "Suppose the same wind project was proposed by a local government rather than a private developer. Would that make you more or less likely to support it?" Table 5 shows the responses. For this question, twenty-two percent indicated they would be more likely to support a project proposed by a local government, sixty-nine percent indicated that it would not affect their level or support or opposition, and nine percent said they would be less likely to support such a project. Although twenty-two percent represents the smallest positive effect among the alternatives tested, because of the very small percentage of respondents who indicated that it would decrease their level of support, more than twice as many people would be moved toward supporting the project than opposing it were it to be at the behest of a local unit of government rather than a private developer. The other questions are:

"Now suppose … the wind project was proposed to be <u>on</u> <u>land</u> and would

> be visible to you during your day-to-day routine…."
>
> "Suppose the wind project was in the ocean, but out of sight from land…."
>
> "Suppose that instead of a wind project, the developer wanted to build underwater hydropower turbines under Nantucket Sound…."
>
> "Suppose the Cape Code wind project was the first of many offshore wind projects.… Suppose that building 300 such projects of the Mid- and Northeast Atlantic coast would supply ½ [these states'] electricity.… Those projects together would have a much larger impact on the ocean … [h]owever, together they could greatly reduce air pollution, foreign oil dependence and substances causing climate change and sea level rise."

(Emphasis added in the above). Table 5 shows the effect of each hypothetical alternative on overall support as well as for support divided by opponents and supporters. Each alternative illustrates that there are large minorities (22% to 47%) who would be more supportive of the alternative than the original project. On the other hand, this set of questions also illustrates opposition to these alternatives. For example, placing the turbines nearby on land would cause a net shift against, and the underwater turbine hypothetical would shift individuals equally in both directions, for and against that alternative. That is, although impact on the ocean and the view are part of the issue, potential solutions to the impact on the ocean and the ocean view results in as much or more opposition as the Cape Cod project, as proposed. This illustrates that, while a substantial fraction is opposed to certain characteristics (e.g. that it is in the ocean), changing these characteristics would not necessarily increase support.

Two alternatives led to a large shift toward support and only a modest shift toward increased opposition—having the turbines further offshore, out of sight; and having the Cape Wind project lead to 300 more similar projects. The former is another indication that the view of the turbines from land is an important factor. The "first of many" result is, perhaps, the most interesting. As stated, all of the negative impacts of this one project are preserved, and the impact on the coastal ocean is multiplied by 300 times! Yet, this alternative generated the largest shift toward supporting he project. This finding only makes sense to us if we interpret it as follows: One reason for opposition to the project is that it is not seen as significant—it is a project with only a small beneficial effect but highly visible costs to the region. However, if this one project is seen as leading to something with important benefits—even if the costs are correspondingly larger as well—then the project makes more sense. (Again, this is not universal, as a larger scope makes 11% of respondents, and 16% of opponents, more opposed.). The result is also interesting in that the question was framed in such a way that the Cape Cod project would be not just one of the 300 projects, but the first. This finding suggests that a NIMBY hypothesis is not supported. Indeed, in a more typical NIMBY situation, such as a proposal to create a landfill in the vicinity of a neighborhood, one would not expect those neighbors to be any more supportive of the proposal if it was explained that it would be the first of 300 landfills.

We believe that advocates of the project have taken a narrower view of the project

than is warranted by the evidence we obtain from our 'First of many" question. Indeed, the data suggest that advocates' strategy of focusing communications on the benefits of this one project rather than on a long-term vision may forego a critical vision of how this one project leads us into the future. And, given that the "First of many" alternative generates the greatest shift in favor of the project of all alternatives, that vision of the future might be one of the most important and compelling missing ingredients that would lead to more widespread support for the project.

Table 5. Shift in support for a project with alternative characteristics.

	Overall			**Opponents**			**Supporters**		
Issue	**More**	**Same**	**Less**	**More**	**Same**	**Less**	**More**	**Same**	**Less**
Local Government	22	69	9	18	72	10	25	66	9
Land-based	24	49	27	33	38	30	13	64	23
Out-of-sight	44	51	5	42	49	9	45	54	1
Under water	26	50	25	28	50	22	23	50	28
First of Many	47	42	11	35	49	16	61	34	5

Conclusions

Although this project's approval does not require local citizen approval or vote, we feel it is relevant that our sample of Cape Cod and the islands show that the majority oppose the project, and that opponents are more firmly committed to opposition than supporters are committed to support. We developed three measures to understand the factors that underlie that support or opposition.

First, what are the beliefs about the impacts of the project? More than half think that the project will have negative impacts on aesthetics, community harmony, the local fishing industry, and recreational boating. In addition, over 40% believe the project will have negative impacts on property values, bird life, marine life, and tourism. As for positive impacts, not one was mentioned by the above cutoff of 40% of the population. (Smaller numbers mentioned electric rates, jobs and clean air as positive impacts.) In short, the overwhelming majority of the population expects negative impacts from the project, and can name many expected negatives. Much smaller numbers expect positive effects, and they can name few of those positive effects.

Second, how do these factors affect their decisions for or against the project? When asked which factors most affected their decision, pro or con (open ended), the most frequently mentioned was damage to marine life/environmental impacts. The next most frequently mentioned effects on their decision were electricity rates, aesthetics, and impacts on fishing or boating.

The ranking of issue importance and beliefs regarding impacts appear to affect support. For example, supporters and opponents, both rank environmental effects as very important, yet they diverge on, for example, expected impact on marine life—72% of opponents, but only 9% of supporters expect negative impact on 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 point concluded that the project will not negatively impact marine life in any significant way, and as a result, other factors more strongly influence their decision, such as a belief that the project will have positive effects on electricity rates and air quality. (It is worth noting in this regard that the DEIS for the project finds no significant impact on marine life.)

Many of the beliefs upon which opinion are based appear to be factually incorrect—that is, inconsistent with prior scientific studies and/or with the DEIS for this project. Thus, we asked both supporters and opponents of the project whether specific new information would change their opinion. For opponents, "new facts" which might move them more towards support were: That electricity rates will decrease (although probably not by much), marine life will not be harmed, air quality will be improved, jobs will be created, and, Cape Cod will receive the physical electricity (the lattermost subject to interpretation of the question). For supporters, "new facts" that would decrease their support are that there will be harm to bird life and that it will be highly visible from shore (both subject to some interpretation).

We also used logit analysis to distinguish supporters from opponents. Supporters were younger, better educated, and more likely to own their own home. Opponents were more likely to earn more than $200,000/year, and more likely to expect to see the project from their daily routine. Gender, the full range of income, and vote in the last presidential election were tested and were all found to not significantly affect support or opposition.

As a final test of the factors of support, we tested whether change in the project would affect support. The biggest change was an increase in support, by 47% of the sample and even 35% of opponents, if the project were only the first of 300 such projects, together having larger total negative impacts but also having large positive impacts. Some will find this result perplexing. We believe this question, in conjunction with our other findings, show that an important part of the opposition to the project is that the proponents have never articulated a larger vision—that offshore wind is abundant along the U.S. East Coast and that large scale development is a plausible outcome of individual successful projects. Other project changes that shifted opinion toward support were to locate the turbines further from shore (out of sight), and to have the project carried out by local government rather than a private developer. Putting the development on land, or out of sight under water, had no net effect on support (roughly equal numbers became more or less supportive).

Looking at the broader picture, it would appear that wide scale implementation of offshore wind power could receive substantial public support in the United States. This is a significant and important finding of this work given the comparative advantage wind power has over fossil fuel generation when it comes to both human health effects and contribution to climate change. It also appears that increased public control over wind power development in terms of municipal development and federal oversight (Firestone, et. al 2004) could play an important role in increasing acceptance of offshore wind power in the United States.

We hope this study has also illustrated the general principle that one can systematically study the sources of opposition and support for new technologies. To the extent that development decisions, policy, or political decisions are made in part on the

basis of public opinion, we feel that such decisions should be based on systematic study. As we believe we have shown, stereotypes and conclusions from casual observation can be misleading.

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