WIND ENERGY
Wind Energ. 2008; **11**:000–000
Published online in Wiley Interscience
(www.interscience.wiley.com) DOI: 10.1002/we.316

Research Article

Public Acceptance of Offshore Wind Power Projects in the USA

Jeremy Firestone*, Willett Kempton and Andrew Krueger, Center for Carbon-free Power Integration, College of Marine and Earth Studies, University of Delaware, Newark, DE 19716, USA

Key words:
offshore wind power;
public opinion;
social acceptance;
environmental beliefs;
climate change;
wind energy

Although a rich literature exists on public concern for the effect of land-sited wind power structures on cultural landscapes and the benefits of community involvement in this issue, less is known about how society perceives sea-based structures. Offshore wind power has existed for some time in Europe; in the USA, its development has been hampered by opponents of the Cape Wind project off of Massachusetts. At present, the developer of the proposed Cape Wind project and a second developer proposing a project off of Delaware each strive to erect the first offshore wind power project in the Americas. Here, we examine public opinion. We first provide background on the case studies, then a review of prior studies of support and opposition of wind power projects in order to place the mail surveys within the context of the wider literature. After detailing the methods employed, we analyse the results and provide insights into the similarities and dis-similarities that are revealed in the data, with the intent of gaining a broader understanding of how individuals think about offshore wind power. The strikingly higher public support for offshore wind development in the mid-Atlantic, and especially off Delaware, suggests the possibility of substantially higher US public acceptance of offshore wind power than previously anticipated. Moreover, when offshore wind power is seen as transformative, we find substantial support even for residents near the first developments—residents who thus inherently take more risk. Potentially increasing acceptance of wind power, we argue, portends the shape of things to come. Copyright © 2009 John Wiley & Sons, Ltd.

Received 30 April 2008; Revised 28 November 2008; Accepted 2 December 2008

Introduction

The USA today generates most of its electricity from fossil fuels. The USA, however, has large wind resources on the Great Plains. In the East, the onshore wind resource is limited, but the offshore wind resource is near the concentrated Eastern coastal city load centres and several times larger than their total electric and fuel consumption[1]. To date, however, no offshore wind project has been constructed, nor even fully permitted, off of the US coast.

The reasons that offshore wind power deployment has been blocked or hindered may include public opinion factors such as the lack of citizen understanding of global warming and its effects, perceived negative aesthetics, failure of the public (and regulators) to compare the potential negative impacts of wind energy with those of existing means of electric generation[2] and knowledge of improperly sited land-based wind farms that have caused excessive avian deaths. Policy and political barriers include regulatory obstacles and lack of adequate incentives. Here, we focus on public opinion.

Need for these Studies

Although a rich literature exists on the benefits of community involvement and concern for the effect of land-sited wind power structures on cultural landscapes [e.g. Strachan & Lal (2004); Hinshelwood (2001); Vorkinn

*Correspondence to: J. Firestone, College of Marine and Earth Studies, University of Delaware, Newark, DE 19716, USA.
E-mail: jf@udel.edu

& Riese (2001)],[3–5] less is known about how society perceives sea-based wind power structures [e.g. Kempton *et al.* (2005)].[6] And while much has been written about support and opposition of wind farms, complex analyses of the factors (knowledge or lack thereof, perceptions and attitudes) that underlie that support and opposition have been, for the most part, lacking.[7–9] Absent detailed study, many in industry have, we feel, over-generalized from news reports about the opposition to offshore wind near Cape Cod. We argue here that a more comprehensive analysis of public opinion data in multiple locations will lead to different and more subtle, perhaps even diametrically opposed, conclusions about public opinion and offshore wind.

In earlier publications about the Cape Cod project, we analysed a series of semi-structured interviews conducted in 2003–2004[6] and a detailed survey of 500 local residents in early 2005[7] regarding their perceptions, attitudes and knowledge of an approximately 450 MW wind farm proposed for Nantucket Sound, off Massachusetts. Following up on that research, we conducted semi-structured interviews and a mail survey of approximately 950 residents of the State of Delaware in 2006, described in an unpublished report.[10] In this article, we first provide background on these two case studies, followed by a review of prior studies of support and opposition of wind power projects to place the surveys within the context of the wider literature. After detailing the methods used, we analyse the results of the two studies. Finally, we discuss the similarities and dis-similarities that are revealed in the data, with the intent of gaining a broader understanding of how individuals think about offshore wind power in the Americas. Public opinion on wind, we argue, portends the shape of things to come.

Case Studies

This section describes the two cases of proposed offshore wind projects, as background for the reader to assist in interpretation of the survey data we present. The geographical locations of the two projects are shown in Figure 1.

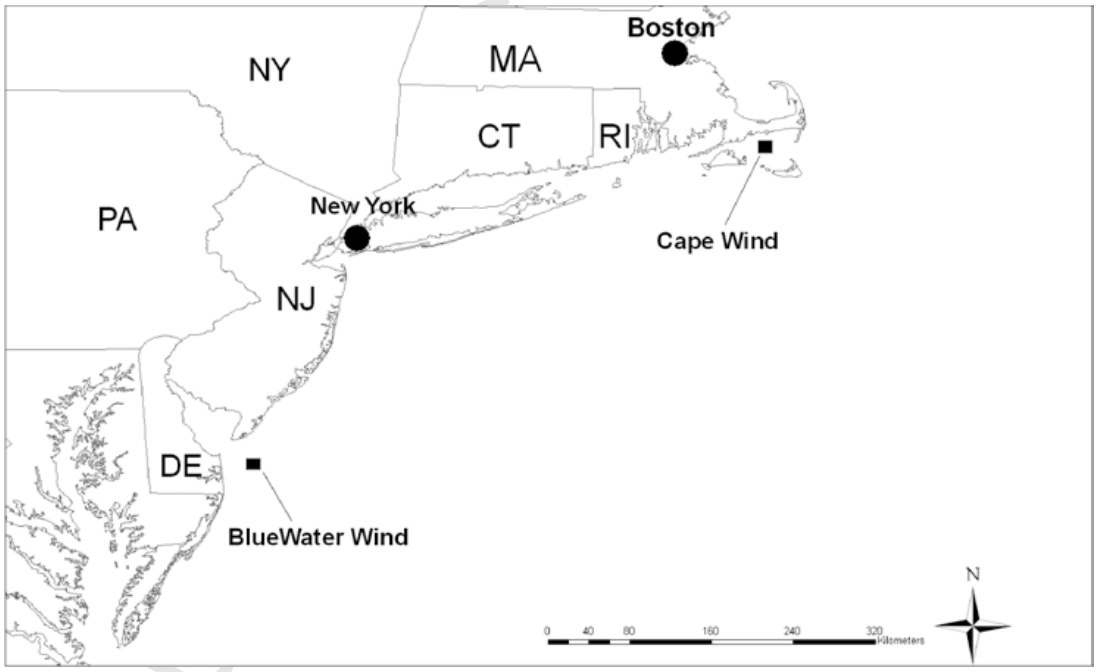

Figure 1. Map of portion of US Atlantic coast, depicting the location of the two case studies: one in Nantucket Sound, off Massachusetts, and the other off Delaware's Atlantic coast

DOI: 10.1002/we

Cape Cod Setting and Proposed Project

A private company, Energy Management, Inc., has applied to install 130 wind turbines in 24 square miles of Nantucket Sound. Nantucket Sound is bounded by Cape Cod, Martha's Vineyard and Nantucket Island (see Figure 2). In 2006, the total population in those three areas was roughly 250,000, about 90% of whom live in Cape Cod.[11] The three areas comprise approximately 550 square miles of land, for a population density of approximately 458 people/square mile (ibid). The area economy is based in large part on ocean and coastal tourism and fishing. If permitted, the facility will be capable of generating 468 MW of peak power—for a total of approximately 1.6 million MWh of electricity per year. This represents approximately 10% and 75%, respectively, of the electrical power needs of Massachusetts and Cape Cod.[12,13] Cape Wind originally said it would sell the energy generated on the spot market, but more recently has expressed interest in a Power Purchase Agreement. A Draft Environmental Impact Statement (DEIS) was recently issued by the Minerals Management Service.[12]

The Mirant Canal Station power plant, located in Sandwich, MA on Cape Cod, provides most of the electricity to Cape Cod and the Islands. It is comprised of two 560 MW generators. One unit, which began commercial operation in 1968, is oil fired, while the other, which has been in operation since 1976, can be fired by either oil or natural gas. Canal Station is on the northern coast of Cape Cod, about 14 miles as the crow flies from Hyannis Port, MA, the tourist destination on the southern coast of Cape Cod. Hyannis Port is, in turn, approximately 6 miles from the proposed Cape Wind offshore wind facility.

Delaware Setting and Proposed Project

Delaware has a diverse economy that relies on manufacturing (chemical and automotive), financial services, coastal tourism and farming. Delaware is 1954 square miles, and had a 2006 population of 853,476, or a population density of 437 people/square mile. Almost 100% of the electricity generated in Delaware is from fossil fuels, although Delaware imports nuclear power from New Jersey. Delaware's in-state generation is comprised of 60.5% coal, 25.6% natural and other gas, and 13.9% petroleum. Much of the coal generation occurs at the 805 MW Indian River Generation Station in Millsboro, Delaware, which has been in operation for approximately 50 years. The plant is about 9 miles inland from the Delaware coast, and about 12 miles to the resort town of Rehoboth Beach, by straight-line distance. Four coal-fired steam boilers account for 788 MW, with the remaining 17 MW associated with an oil-fired combustion turbine. By itself, the Indian River plant accounts for more than 72% of coal-fired Delaware capacity.

When we conducted the Delaware survey, there had been little, if any, public debate on offshore wind power. (This was in contrast to our Cape Cod survey, conducted after substantial public debate and media coverage.) Since the completion of our Delaware public opinion survey, there has been unprecedented citizen involvement in a bid for new power in Delaware. Responding to a request for large new electric power generation, Bluewater Wind, LLC proposed to establish a 200 turbine, 600 MW wind farm off the Delaware coast. (State agencies picked Bluewater's offshore wind project over competing bids for natural gas and an expansion of coal generation at Indian River.) The three proposed areas for the Delaware project were: (i) a location 6 miles from the coast in Delaware Bay; (ii) a location approximately 7 miles from shore along the southern half of the Delaware coast; and (iii) a location that is 11–12 miles off the northern half of the Delaware coast. Figure 3 shows the third location, which is the site ultimately selected for development off of the Delaware coast.

Common Elements in the Two Cases

Delaware and Cape Cod share a similar reliance on antiquated fossil-fuelled power plants and have comparable population densities, although Delaware is more than three times as large as Cape Cod. Although both

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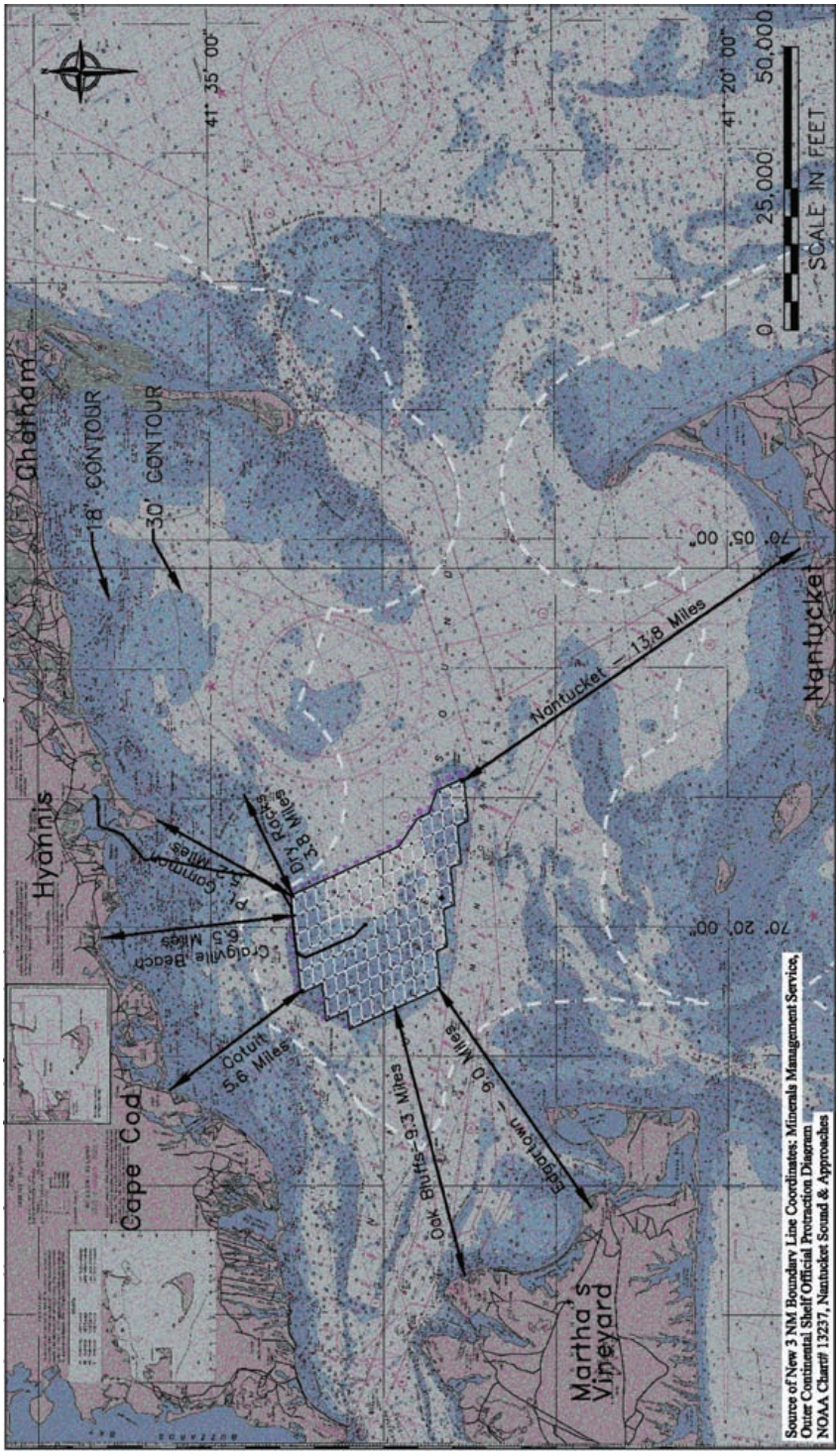

Figure 2. Wind turbine array for proposed for the Cape Wind Energy Project. Source: Minerals Management Service (MMS) Cape Wind Draft Environmental Impact Statement (2008) [12]

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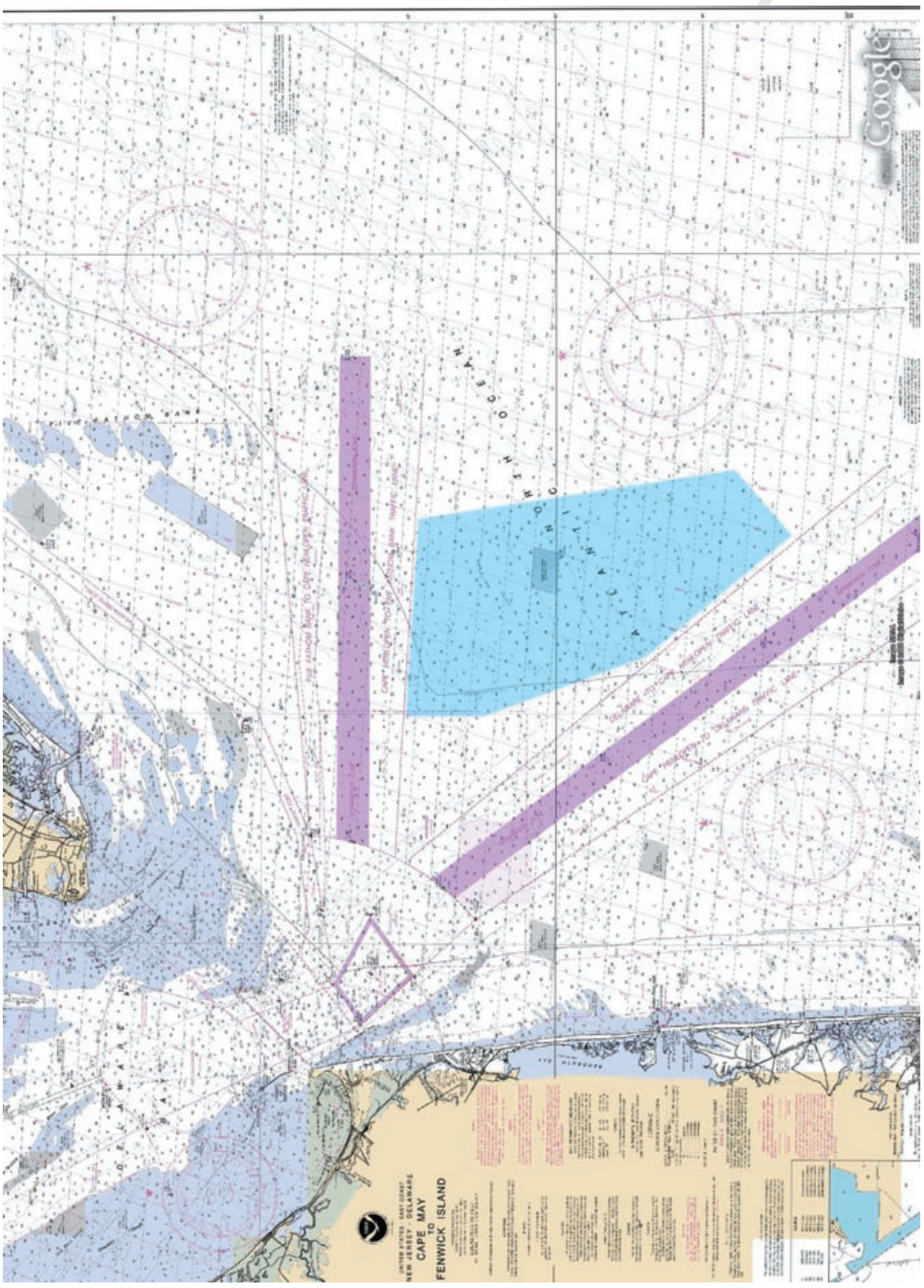

Figure 3. The Bluewater Wind Offshore Wind Energy Project site. (c) 2008 Bluewater Wind, reprinted by permission

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DOI: 10.1002/we

areas rely on coastal tourism, Delaware's economy is much more diverse than Cape Cod's. On the other hand, Delaware coastal towns, like those on Cape Cod, rely on tourism.

Offshore wind power has existed for some time in Europe—the first offshore wind turbine was installed in 1991, with utility scale projects existing for almost a decade. Yet both the Cape Wind and Bluewater proposals strive to be the first offshore wind power project in the Americas. With these two projects at hand, and others contemplated in oceanic (e.g. both New Jersey and Rhode Island have recently sought offshore wind power bids) and Great Lakes waters of the USA and Canada, it is timely to compare the results of our Cape Cod and Delaware surveys side-by-side, using the two to anticipate future perceptions of offshore wind power in the Americas.

Previous Studies of Wind Power Support and Opposition

Previous studies of public opinion on wind power projects inform and place in context the Cape Cod and Delaware surveys and analyses. One hypothesis for opposition of local projects is NIMBY ('not in my backyard'), which has been defined as 'an attitude ascribed to persons who object to the siting of something they regard as detrimental or hazardous in their own neighborhood, while by implication raising no such objections to similar developments elsewhere'.[14] Although many people have classified opposition to wind power development as NIMBY, Devine-Wright[9] notes that the NIMBY concept has failed to find empirical support in the literature. As such, he advocates moving towards a more integrated framework for understanding public perceptions of wind energy. Likewise, we have previously eschewed calling opposition to wind 'NIMBY' because this term simply relabels the opposition without pointing towards any explanation.[6]

In Germany, where wind power development is strongly supported by the government, the most common reason cited for the rejection of a wind turbine proposal is the 'reduction in the value of existing landscapes'.[15] Short[16] likewise suggests that the reason that three-quarters of proposals do not result in developments in England is because of a failure to 'grasp the important links among landscape, memory and beauty in achieving a better quality of life'. Indeed, adding wind turbines to a landscape that is otherwise viewed as pristine has been called 'industrialization of a landscape', and it can violate nearby residents' expectations that those landscapes would remain forever unchanged (Pasqualetti, discussing a desert landscape).[17] Kempton *et al.*[6] (p. 132) argue that the same feelings can be present among coastal residents for the preservation of the seascape, and that on a deeper level, 'there appears to be something special about the ocean, a feeling which for many people underpins their opposition to the [Cape Wind] project'. This 'public sense of angst brought about by the rapid changes in the landscape that wind power can bring' can even lead some local residents to feel as if they have been 'expelled from their homeland'.[18] As summed up by Wolsink,[19] 'It's the landscape, stupid.' In light of findings like these, Devine-Wright[9] (p. 127) argues that research on public acceptance should not focus so much on physical attributes of wind farms (e.g. colour, size), as on 'symbolic, affective and socially constructed aspects' such as how people come to make sense of the impact of an unfamiliar technology upon the places in which they live.

Attachment to place underscores two important distinctions that must be drawn—the difference between social and public acceptance and the difference between opinions on wind energy generally and on a specific wind power project. Social acceptance is a broad term that encompasses market acceptance, local community acceptance and socio-political acceptance, the last of which includes acceptance of the public, key stakeholders and policy makers.[20] Here, we focus on public acceptance, and to a lesser extent, community acceptance. Second, it is well established that there is a gap between acceptance of wind energy in general, which tends to be high, and acceptance of a particular project.[21] In a somewhat related vein, a number of studies have found increased local support for wind projects once they are constructed and become operational.[22–24] Others have suggested that support and opposition follows a 'U' or 'V' pattern: acceptance is initially high, drops during the planning and construction phase, and then rebounds to almost the initial level after the wind farm commences operation.[8,9,24,25]

DOI: 10.1002/we

Studies examining the value of information also provide insight. Zarnikau[26] found mixed results from the provision of information about energy alternatives—there was a decrease in the median willingness to pay for renewable energy, but the preference for renewable energy was held by a broader segment of the study population. While Firestone and Kempton[7] found a net shift towards offshore wind when 'new' facts are presented, Reiner *et al.*[27] found a shift away from renewable energy when they attempted to correct misconceptions such as that 'costs of renewables are substantially higher than competing technologies'. One explanation offered for the findings of less than full embrace of renewable energy has been that technologies such as wind power help solve invisible problems whereas their impacts are 'clear and unavoidable'.[28]

Finally, financial incentives and benefits[29] and stakeholder participation[8,30] in the planning and development process also are factors that may influence public acceptance of wind farms.

Survey Methods

In both Cape Cod and Delaware, we conducted semi-structured face-to-face interviews with a small sample, and then administered a written survey mailed to a probability sample of the entire areas. In 2005, we sampled residents of Cape Cod and the islands of Nantucket Sound and Martha's Vineyard—hereinafter, for simplicity sake, and because the vast majority of the sample lives on Cape Cod, we refer to this sample as the 'Cape Cod' sample. In 2006, we sampled the entire state of Delaware, although we oversampled the coastal areas of Kent and Sussex Counties (using census tract and block data). In order to analyse the Delaware survey results by geographic region, we divided the survey sample into three distinct areas (strata) using a stratified random sample: 'Bay' (those individuals living along the Delaware Bay), 'Ocean' (those living along the Atlantic coast of Delaware) and 'Inland' (Delaware residents not in the Bay or Ocean subsamples).

Both the Cape Cod and Delaware surveys included questions regarding perceptions and knowledge regarding an offshore wind project. In Cape Cod, this was the real Cape Wind project, well known from media coverage. In Delaware, the survey instrument described a 'hypothetical' project with characteristics similar to Cape Wind, and it included questions that paralleled our earlier Cape Cod survey instrument. The Delaware survey also added new data and analysis to quantify the value respondents assign to offshore wind characteristics.[31]

Both survey instruments were pilot tested. A pilot Cape Cod survey was sent to 100 individuals randomly selected from the Barnstable County telephone book. In Delaware, we used the Department of Motor Vehicles office in Wilmington to verbally check survey comprehension, length and any perceived question bias. Given the more complex design of the Delaware survey, a face-to-face pilot test was critical to ensure that the choice experiment section of the survey was understandable and realistic.[31]

Survey construction, pilot testing and administration protocols in each case followed Dillman's Tailored Design Method[32] as closely as possible, given time and budget constraints. The Cape Cod and Delaware surveys had effective response rates of 38.5% (based on 504 completed surveys) and 52% (949 completed surveys), respectively.

Because a significant rate of non-response raises the concern that the data being analysed may not reflect the larger population, methods were used to test and account for the possibility that non-respondents held different opinions than respondents. First, for each survey, we compared project support of early versus late respondents, based on the theory that non-respondents hold views that are more similar to those held by late than early respondents.[33] In both cases, support by early respondents was not statistically different from that of late respondents. Second, for each case, we collected demographic data and used that data not only as independent variables, but for weighting responses to adjust the sample to match the population.

For the Delaware survey, the sampling strategy resulted in an Ocean area with respondents who live on average 0.6 miles from the beach, and a Bay area with individuals living on average 4 miles from the beach, with 182 surveys completed in the Ocean area, 203 in the Bay area and 564 in the Inland area. More details on survey mechanics and statistical analysis, as well as a copy of the survey instruments, can be found in Firestone and Kempton (2007) and Firestone *et al.* (2008).[7,10]

DOI: 10.1002/we

Support for and Opposition to an Offshore Wind Facility like Cape Wind

Although the two surveys differed in certain respects, a focal point of each was trying to understand support and opposition to offshore wind power. Prior to asking Cape Cod respondents whether they supported or opposed an offshore wind project, they were given the following description of the Cape Wind project, although the words 'Cape Wind' were not included in the description:

> A private developer has proposed to place 130 turbines that stand 423 feet high in Horseshoe Shoal in Nantucket Sound to generate electricity from wind. The Cape Cod project would be closest to Point Gammon at a distance of 4.1 miles offshore, about 5.5 miles away from Martha's Vineyard, and 11 miles from Nantucket.

We then asked Cape Cod respondents whether they had 'formed an opinion' about the proposed project, and if they had, whether they supported or opposed the project. As noted in Table I, column 1, 42.4% opposed the project, 24.6% supported it and 33% answered that they had not yet made up their mind. Those respondents who had not made up their mind were next asked whether they nevertheless were leaning one way or another. When individuals who lean one way or the other are combined with supporters and opponents, the opponents move from plurality to majority, but the percentage difference is smaller and only is marginally statistically significant (column 2).

Table I. Support for offshore wind at six miles from shore in Delaware and Cape Cod in four studies, with subsamples

State/Area	Cape Cod, Martha's Vineyard and Nantucket Islands					Delaware				
Column No.	1	2	3	4	5	6	7	8	9	10
Sample or subsample	All (firm opinion)[a]	All (firm opinion + leaning)[a]	View of wind farm (firm opinion + leaning)	All, opinion research	All, opinion research	Statewide[b]	Bay[b]	Ocean[b]	Ocean View	StatewideRickinson
Study Date	January 2005			October 2007	February 2008	Fall 2006				September 2007
Responses (*n*)	504	504	18	501	96[v]	935	201.0	178	55	599
Support (%)[c]	24.6	43.8	22.2	61	74	77.8	73.5	65.0	55.9	87
Oppose (%)	42.4	55.5	77.9	36	24	4.2	9.0	19.5	24.2	7
Unsure[d] (%)	32.3	0.7	0	2	2[e]	18.0	17.5	15.5	19.9	4

[a] Difference between firm level of support and opposition at Cape Cod is significant at the 1% level ($p < 0.01$); when those leaning added, difference is only borderline significant ($p < 0.1$).
[b] Difference between Delaware Statewide and Ocean support significant at the 5% level ($p = 0.05$); difference between Delaware Statewide and Ocean opposition significant at the 1% level ($p < 0.01$); and difference between Delaware Statewide and Bay opposition significant at the 10% level ($p = 0.08$).
[c] Delaware Statewide and Delaware Ocean support and opposition are significantly different than either Cape Cod All (firm opinion) and Cape Cod (firm opinion + leaning) at the 1% level ($p < 0.01$); Delaware Ocean View support and opposition are significantly different than Cape Cod View (firm + leaning) at the 1% level ($p < 0.01$).
[d] The meaning of 'unsure' varies. Our Delaware survey used 'unsure'; our Cape Cod survey, 'I have not yet made up my mind'; Opinion Research used 'strongly support', 'support it somewhat', 'oppose it somewhat', 'oppose it strongly' and 'don't know/not sure', and then collapsed the two categories of support together and the two categories of opposition together. The Rickinson survey asked 'how favorable are you towards wind power' and had six categories, although they excluded one, 'don't know', from analysis. We collapsed the remaining five into three categories: 'extremely' or 'somewhat' favourable (= support); 'extremely' or 'somewhat' unfavourable (= oppose); and 'neutral' (= unsure).
[e] 96 is our calculation based on the survey's report that 8% of survey respondents were from the Cape and Islands. Unsure is not reported in report; 2% is an estimate.

DOI: 10.1002/we

To facilitate comparisons between opinions in Delaware and those in Cape Cod, and to thus avoid a comparison between a concrete project and general views on wind energy, we duplicated the support/opposition question posed in the Cape Cod survey as closely as possible in the Delaware survey, making appropriate modifications and providing visual information in the Delaware survey in the form of photo simulations that most Cape Cod residents would have seen as part of the public debate. The Delaware questionnaire described the project as follows:

> A private developer has proposed to place 130 wind turbines that stand 423 feet high out on the ocean off of Cape Cod, Massachusetts for electricity generation. The project would be approximately 6 miles from the nearest coastal town . . . *[s]uppose this project were instead developed off the Delaware coast.*

Delaware residents were then asked the same support/oppose question. Unlike the Cape Cod survey, we did not follow the support/oppose question with the 'leaning' question. We also note that earlier in the Delaware survey, we asked the sample about their general views regarding offshore wind power development—asking which policy Delaware should adopt (alternatives were: encouraged and promoted, allowed in appropriate circumstances, tolerated or prohibited in all instances). This more general question, when juxtaposed against the substantially more concrete offshore wind power project question, provides further support for the our conclusion that Delaware respondents were providing answers to a specific, albeit hypothetical, project proposal.

Statewide, Delaware support is 77.8% compared with opposition of only 4.2% (Table I, column 6). In each region, supporters also significantly outnumber opponents ($p < 0.01$). Even in the ocean area (where respondents live on average approximately 0.6 miles from the coast), supporters outnumber opponents by more than 3 to 1 (column 8). Moreover, of those individuals who live in the inland portion of Delaware, those who own a beach house as a second home (not shown in Table I), are as supportive (at 79%) as those individuals statewide who do not own a beach house. That is, one is more likely to oppose the project only if one's primary residence is near the Delaware coast, but not if one owns a second home near the coast.

We can compare the Cape Cod data to either the entire State of Delaware or the Delaware Ocean area. One could argue that the Delaware ocean area is more similar to Cape Cod, because all residents of the Cape and Islands are close to the ocean and both areas rely on coastal tourism. On the other hand, the largest city in Delaware (Wilmington) is approximately 70 miles from Slaughter Beach on Delaware Bay, which is not much further than the distance from Provincetown to Hyannis Port. Thus, one also could argue that Cape Cod, a region of Massachusetts, should be compared to the entire State of Delaware. As documented in Table I, no matter which comparison is made, Delaware residents are starkly more supportive of offshore wind farm development than residents of Cape Cod, and the difference is statistically significant. One telling comparison is between those Delaware residents who can see the ocean from their home (55.9% supportive*) (column 9) to Cape Cod residents who believe that they will have a view of the Cape Wind project (22.2% supportive or leaning towards support) (column 3). Thus, a beach view cannot explain the differences between these two states.

Our Cape Cod and Delaware survey results are also, to a lesser extent, comparable to more recent telephone surveys based on probability samples in Delaware by the Rickinson Group in 2007[34] for Delmarva Power Company, and samples on Cape Cod by Opinion Research for the Civil Society Institute in 2007[35] and in 2008.[36] The results from the most comparable questions are seen in Table I. We also note, without tabulating, that an opportunistic sample of New Jersey beachgoers,[37] was surveyed; it showed higher support for offshore wind power among New Jersey beachgoers (41% support; 27% oppose; 32% undecided) than Cape Cod residents, but lower than Delaware residents.

Public opinion on Cape Cod appears to be gradually moving towards support. We conclude this based on more recent and ongoing studies of Cape Cod opinion. Specifically, in 2007, Opinion Research[35] found

* A total of 69.2% in the Ocean area without an ocean view support the project, with 17.0% opposed and the remainder undecided. The difference in support between those with and without a view, however, is not statistically significant ($p = 0.13$) given the size of the sample in the Ocean area.

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significantly more support, 61%, than opposition, 36% (Table I, column 4). Subsequently, the January 2008 Cape Wind DEIS was released,[12] which preliminarily concluded that the project, for the most part, will likely result in only 'negligible to minor' environmental harm (it states that some concerns for marine life, particularly bird life, rise to the level of 'moderate' harm, but no harm was deemed 'major' other than visual resources when someone is on the water, and in close proximity to the wind farm). The February 2008 Opinion Research survey[36] found that support increased to 74%, although it is based on less than 100 responses (Table I, column 5).

Although the more recent Opinion Research surveys show a trend of increasing support, we caution that three aspects of the methodology used by Opinion Research could bias the results toward support. First, in the February 2008 survey, several questions asserted various benefits of renewable energy, including a study of job creation, leadership on renewable energy, fighting the ever-increasing cost of energy and mitigation of global warming. These came before the Cape Wind 'support–oppose' question, thus putting Cape Wind in a more favourable context—this could potentially be a serious bias towards more positive answers. In contrast, our survey led with the Cape Wind question. The second possible bias from the Opinion Research surveys is the wording of the support–oppose question.

The support-opposition question in each Opinion Research survey[35,36] presents supporters as having definite opinions based on facts (the question wording included 'It is estimated that the project could produce . . . it is needed to . . .') while the opponents' arguments against are described as less certain and based on opinion ('people who oppose . . . say it might be visually unappealing, could interfere . . . might endanger wildlife'). Finally, although the 2007 sample was weighted on age and gender, the sample is skewed towards residents who live on Martha's Vineyard and Nantucket Island (42% of the 2007 sample compared to ~10% of population of Cape Cod and the Islands), areas, which at their most proximate, are significantly further from the Cape Wind project location than the nearest locations on Cape Cod.

Although Cape Cod opinion appears to have swung more towards support since we conducted our mail sample in 2005, and even ignoring the possible positive bias of the Opinion Research surveys (2007 and 2008) from Cape Cod, we are still left with a Cape Cod public that seems to be much more opposed to offshore wind power than the Delaware public. This is confirmed by a more recent survey of Delaware ratepayers by the Rickinson Group.[34] Rickinson used a statewide sample and conducted a telephone survey of 599 Delaware electric utility customers; qualifying questions eliminated those who could not name their utility company or said they were not involved in product decisions in their household.[34] The sample was weighted by electric utility to reflect the proportion of customers for each utility statewide; however, it was not weighted by county, gender, age or income.

To make valid comparisons between the two Delaware statewide surveys, it is important to understand their differences. The initial Rickinson questions, unlike the other studies cited here, neither described any specific wind project nor indicated whether the project would be on land or offshore, although it implied that the project would be located offshore. This survey was conducted after almost a year of regular news coverage of Bluewater Wind's proposed wind project off of the Delaware coast. Because of the similarity of the actual Delaware project with the hypothetical projects described in the other surveys, it is reasonable to conjecture that a majority of the Rickinson respondents are interpreting the initial 'wind power' question as referring to a project like those explicitly described in the other surveys. It is for that reason that we think Rickinson can be used for comparison. Rickinson's Delaware statewide results are similar to ours, with a shift from 'undecided' to a larger percentage of favourable/support (Table I, columns 6 and 10).

The Rickinson[34] results provide a useful comparison to the Delaware survey. Our Delaware survey was conducted prior to the Bluewater Wind proposal becoming public, and was, therefore, arguably interpreted by respondents as seeking their general view of offshore wind energy. By contrast, the Rickinson survey was conducted a year after the proposal had been debated in public fora[38] and covered extensively in the news media. Rickinson asked '. . . overall how favorable are you towards wind power?' Responses were 87% favourable, 7% neutral and 4% unfavourable. Thus, overall, the Rickinson survey shows higher support (+10%) with no increase in opposition over what we found with a similarly non-specific question. Other studies have suggested that support for wind in general is higher, but drops when a nearby specific project is proposed. However,

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in this case, a specific project in the contest of a lot of information presented through the media appears to have increased the support for offshore wind power.

In summary, with both the Cape Wind and Bluewater Wind projects, there appears to be a shift to more support for offshore wind projects as time goes on, and as the public acquires more information. Additionally, there seems to be stronger support in Delaware than in Cape Cod. We now address the question, on what grounds do respondents decide whether or not they support or oppose an offshore wind project?

Believed Effects

After asking about their support or opposition to offshore wind power, we presented both the Cape Cod and Delaware survey respondents with a list of possible impacts of a wind farm, and for each, asked if they thought this project would have positive impacts (improve), negative impacts or no impact at all (Table II). Our list of items in the Cape Cod survey was slightly longer than that presented in Delaware (our expansion into preferences in the Delaware survey required us to shorten the survey in other respects), and divided into two groups—project-specific impacts and impacts of wider implementation. Here, we present only those impacts that appeared on both lists.

A plurality of Cape Cod respondents and a majority or near majority of Delaware respondents (statewide and in the Ocean area) believe that offshore wind power will have positive impacts on electricity rates, job creation and air quality. In addition, although a plurality of respondents in all three areas (Cape Cod and the two Delaware areas) believes that such a project would have climate change benefits (in each area, ~30% positive and 1–3% negative), the vast majority (approximately 70%) believe it would have no effect on climate change or they are unsure. The other telling observation is that despite the fact that the Delaware survey was conducted some 16 months after the Cape Cod survey, the percentage who see a positive effect on climate change remains the same.

A majority of Cape Cod respondents and a plurality of Delaware residents also believe that an offshore wind power project will have negative effects on the local fishing industry and on recreational boating, suggesting more concern with a project's effects on offshore recreational activities in Cape Cod then off of Delaware.

Table II. Believed negative, neutral and positive impacts of offshore wind farm (table is ordered by Cape Cod difference between positive and negative)

Item	Cape Cod (firm opinion + leaners)			Delaware					
				Ocean area			Statewide		
	Positive (%)	None, unsure (%)	Negative (%)	Positive (%)	None, unsure (%)	Negative (%)	Positive (%)	None, unsure (%)	Negative (%)
Electricity rates	37	56	7	66	31	2	75	23	2
Job creation	37	55	8	48	49	3	71	28	1
Reduce climate change	29	69	3	30	69	1	30	69	1
Air quality	24	70	6	51	48	1	57	42	1
Tourism	8	50	42	4	69	27	11	73	16
Marine life	6	49	44	16	70	13	13	76	12
Property values	3	49	48	7	64	29	9	74	16
Bird life	2	50	48	5	67	28	10	75	15
Local fishing Industry	4	43	54	15	66	19	10	71	19
Recreational boating/fishing	2	44	54	6	65	28	10	69	21
Aesthetics of view	3	25	72	2	40	58	5	50	44

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Beliefs about the proposed and hypothetical projects' effects on marine and bird life are telling and may provide a partial explanation as to why support increases progressively from Cape Cod residents to Delaware ocean residents to Delaware statewide. In Cape Cod, 44% and 48%, respectively, believe there will be negative impacts to marine and bird life, as compared to 13% and 28% in the Delaware ocean area and 12% and 15% statewide in Delaware. That is, as perceived environmental impacts drop, support for offshore wind increases.

Those who expect negative impacts on aesthetics of the view dwarf those who expect positive impacts, in all areas. This is true among Cape Cod residents (72% negative to 3% positive), Delaware Ocean area residents (58% negative to 2% positive) and Delaware statewide residents (44% negative to 5% positive). Thus, concern about the view does not appear to explain the much greater project acceptance by Delaware residents. Perhaps a partial explanation based on perceived effects is that more Cape Cod residents than Delaware residents expect negative effects on property values (48% to 29%) and on tourism (42% to 27%).

Factors Leading to Support or Opposition

Respondents in both surveys were also asked, in an open-ended question, to write in the three most important issues in deciding whether they would support or oppose the project. In this task, unlike the prior one, a respondent could write in any issue of concern, not limited to our categories. Also note that we did not ask whether the factor 'affected their decision' positively or negatively, only if it affected their decision. Thus, a factor such as 'marine life' could lead towards either support or opposition. Table III presents the results for Cape Cod, Delaware Ocean and Delaware statewide by supporters and opponents.

Table III. Factors reported to most affect decision to support or oppose 'Cape Wind' project, (open-ended, ordered by Cape Cod supporters' rank of top three)

Issue	Cape Cod (firm opinion + leaners)		Delaware			
			Ocean area		Statewide	
	Supporters' top three (%)	Opponents' top three (%)	Supporters top three (%)	Opponents' top three (%)	Supporters top three (%)	Opponents' top three (%)
Marine life/Environmental impacts	48	65	29	71	57	47
Electricity rates	47	20	56	14	62	44
Foreign oil dependence	37	5	23	0	10	15
Alternative/Renewable energy	36	1	16	0	10	13
Air quality	23	3	46	0	39	20
Jobs/Economics	18	2	25	5	28	11
Fishing impacts/ Boating safety	15	50	24	40	38	30
Aesthetics	14	51	25	86	10	67
Property values	7	14	10	24	7	13
Private use of public lands	5	15	0	2	1	<<<1
Global warming/Climate stability	4	4	21	0	12	0
Tourism	4	15	5	37	5	25
Other[a]	41	55	19	22	21	11
Total[b]	299	300	299	301	300	302

[a] Other is a collection of single-digit percent answers that were not separately categorized by the coders.
[b] May not add to 300% because of rounding.

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Earlier in 2006, Delmarva Power residential customers, who comprise about 80% of Delaware households, saw their monthly electric bills increase by 59% (because of an approximately 100% increase in the supply charge). This resulted in the typical consumer paying $660 more per year. Thus, the fact that electricity rates would be mentioned more than any other factor in Delaware is unsurprising. In the Ocean area, concerns over electricity rates and air quality dominated. The fact that air quality would rise to a close number two for Delaware Ocean area residents makes sense, given that they live downwind from a nearby large coal power plant.

Cape Cod opponents state that they decided against the Cape Wind facility because of concern over marine life impacts, on aesthetic grounds and concerns over impacts to fishing and boating. Both in the Ocean area and statewide, Delaware opponents indicate that they oppose a similar project based on aesthetic grounds and because of concerns over marine life impacts, with concerns over electricity rates also resonating statewide among opponents.

Although an expressed 'aesthetic' concern is, for some, a code for NIMBY, as we discussed above, notions of attachment to place likely have more resonance. In our Delaware survey, we asked respondents which policy Delaware should adopt regarding offshore wind development both in the open ocean and in the semi-enclosed Delaware Bay; the latter more similar to Nantucket Sound. Only 0.7% statewide indicated that offshore wind power should be prohibited from the ocean, compared to 2.7% in Delaware Bay. Additional insight can be gained by comparing each group's opinion about wind turbines in the water body nearest to them. While 6.4% of Ocean area residents would prohibit wind turbines from the ocean, a larger 11.4% of Bay residents would prohibit them from the Bay. Although the percentages of opponents are small in each instance, they suggest that Delaware residents have a greater attachment to Delaware Bay than they do to the open ocean adjacent to the coast. Further support for this is found in a subsequent question which asked Delawareans to directly compare developing wind power out on the ocean or in Delaware Bay. Although the majority expressed no preference, twice as many residents (31.6%) preferred the ocean to the Bay (16.3%). This difference is significant at the 1% level.

Supporters of the Cape Wind project state that they were motivated by concerns over marine life and electricity rates, followed by concerns over dependence on foreign sources of oil and a desire to promote alternative energy (see Table III). Delawareans say that their strong support for offshore wind power is based primarily on concerns over electricity rates and marine life/environmental impacts, followed by air quality, fishing impacts and jobs. Thus, what motivates Cape Cod and Delaware residents to support offshore wind power has some commonality but also some differences.

Making a subjective judgment ourselves, if we compare Nantucket Sound, Delaware Bay and the open ocean off the Delaware coast, arguably, the open ocean is the most pristine. Yet, our surveys show that wind farms in the open ocean off Delaware have the highest acceptance of the three areas. We interpret this to mean that place attachment is more relevant than the viewshed per se, in the ocean environment. In contrast, on land, the perceived intrusion of a wind farm on a pristine natural area is greater than that on less pristine areas.[8] Taken together, these findings suggest that individuals may view seascapes differently than landscapes.

One interesting distinction between Cape Cod and Delaware is the influence on opposition of concerns that a developer was expropriating for private use waters that the residents consider to be 'public'. Indeed, while 15% of Cape Cod opponents identify private use of public lands as one of the top three reasons for their opposition, only 2% of Delaware Ocean area residents identify this factor, and only a negligible percentage on a statewide basis.

Climate change does not appear to have been a primary driver of public support for offshore wind power in these surveys, which were undertaken in 2005 and 2006. Although 21% of Delaware Ocean area residents listed climate change as one of their top three reasons for project support as compared to only 4% of the residents of Cape Cod, seven other factors had more resonance (Table III). With the high degree of media attention devoted to climate change in the past year in light of federal judicial opinions related thereto, decreasing Arctic sea ice, the fourth assessment of the Intergovernmental Panel on Climate Change[39] and the Bali Climate Change conference, follow-up surveys that explore this relationship would be useful.

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As noted in Table II, a plurality of Cape Cod (42% negative compared to 8% positive) and Delaware Ocean area (27% negative compared to 4% positive) residents believe that an offshore wind farm is likely to have negative impacts on tourism. Among the Delaware Ocean area opponents, this negative perception apparently motivated their opposition to an offshore wind farm, as 37% list tourism concerns as one of the top three reasons that they oppose offshore wind power. Although concern has been raised regarding potential tourism impacts by our survey respondents and by some tourism organizations, there has been little evidence, and none definitive, on the question of tourism effects. For example, in a recent study of tourist accommodations in Australia, Dalton[40] showed visitors a visual simulation of an offshore wind farm. Although he found that only 40% responded positively, no distance to the wind farm appears to have been provided to respondents and the image appears to place the wind farm closer than one would expect (apparently within 3 miles). Moreover, Dalton did not seek to quantify what the perceptions (positive, negative or neutral) meant in tourism effects. In another study, Aitchson[41]found that a small percentage (6.1%) of respondents would be discouraged from visiting an area if there was a wind farm, but a slightly higher percentage (7.2%) would be encouraged to visit. Finally, Kuehn,[42] based on interviews that took place a year after wind farms had been erected off of the Danish coast, found that neither tourists nor summer rental prices had decreased, while the British Wind Energy Association[43] has noted that 30,000 individuals visited an information centre at one UK offshore wind farm within the first 6 months of the centre's opening. We briefly turn to the question of tourism next.

Tourism Implications

We sought to determine the potential effect on beach visitation by Delaware residents if there was a very large 500 turbine wind farm located 6 miles off the coast. Our first question placed the wind farm off the beach that an individual last visited and asked whether it would cause the individual to switch to another beach. Because a wind farm also could have a positive effect on tourism, the next question asked whether the presence of a wind farm off a Delaware beach that the individual did not usually visit or never visited would stimulate a visit at least once to see the wind farm at that unfamiliar beach. The results are set forth in Tables IV and V.

As indicated in Table IV, 89% indicate that they would continue to go to the same beach even if a very large wind farm is constructed 6 miles off the coast from that beach. Of the remaining 11% that would switch beaches, approximately half (5.6%) would choose another beach in Delaware. Still, 3.5% say they would go outside Delaware, and 2.4% say they would visit no beach at all, resulting in a sum of 6% of Delaware residents reporting that they would take their beach visitation business away from the state's economy.

Table IV. Effect on beach choice if turbines located off the coast from last visited beach

	Same beach	Different DE beach	Different beach not in DE	No beach at all[a]
Delaware statewide (%)	88.6	5.6	3.5	2.4

[a] Individuals who previously indicated that they were unlikely to visit any Delaware beach and who selected 'No beach at all' were excluded from this analysis.

Table V. Likelihood of beach visit if turbines located off the coast of less/unfamiliar beach

	Very likely	Somewhat likely	Somewhat unlikely	Very unlikely
Delaware statewide (%)	55.8	28.0	6.6	9.6

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As shown in Table V, respondents expect that an offshore wind farm would have a curiosity attraction—a total of almost 84% say they would be likely to visit a beach with wind turbines at least once, including 55.8% 'very likely' to. We asked only whether respondents would visit the beach at least once, but one can imagine that some of these new visitors would make additional visits. For example, a person going to a beach out of curiosity may decide to continue going to that beach if he or she finds find other amenities attractive, and may make repeat trips to see the wind farm when, for example, out-of-state guests are visiting.

Although expressed intentions are not as reliable as actual behaviour, 11–12% of our sample of Delaware residents indicated that they would visit another beach if a large wind farm was located 6 miles off the coast. This might be a concern for tourism, if not for the countervailing finding that a much larger percentage (84%) expressed the intention to visit an unfamiliar beach near an offshore wind farm. Moreover, the high numbers expressing curiosity to visit suggest possibilities for new services such as recreational boat trips to tour a wind farm, a substantial visitor centre and new possibilities for marketing beaches in adjacent states. (A similar conclusion would be reached from the New Jersey poll's[37] parallel finding that more individuals would embrace beaches with wind turbines than avoid them). More complete data on tourism effects will be gained from analysis, now underway, of a 2007 University of Delaware/NOAA Sea Grant funded survey of more than 1000 out-of-state visitors to Delaware beaches and beach towns.[44]

Shift in Support for a Project with Different Characteristics

In order to gain further insight into public opinion of offshore wind, we asked how one's support or opposition ('more likely to support', 'less likely to support' or 'no effect') would change if the project had different characteristics than that initially described—a single offshore wind power project to be developed by a private entity 6 miles from the coast. Here we report only on questions asked in the same or similar form in both Cape Cod and Delaware surveys. The project modifications presented were:

- Suppose the same wind project was proposed by a *state or local government** rather than a private developer.
- Suppose that instead of an offshore wind project, an *underwater hydropower turbine project* . . . was proposed to generate electricity. (Given the locations, respondents would reasonably assume this is a tidal current generator. To make the question a simple contrast with wind, we simply said it would be an underwater turbine.)
- Finally, suppose the wind project described was among the *first of many* offshore wind projects . . . [S]upp ose that building 300 such projects off the mid- and north-east Atlantic coast would supply half of the [those] 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.

Table VI is divided by the survey area (Cape Cod, Delaware statewide and Delaware Ocean) and by opinion (supporters, not including those leaning towards support), the true undecided and opponents (not including those leaning towards opposition). For example, the upper leftmost cell indicates that of the Cape Cod respondents who were already supportive of the project, 25% said they would be more supportive if the project were proposed by state or local government rather than a private developer. In the corresponding 'Less' cell, 9% said this modification would make them less supportive. The remainder (66%) said it would make no difference.

For the first question, when respondents were asked to suppose that the project were proposed by a government entity rather than a private developer, there was a net increase in support. In the Cape Cod survey, we found that there was a slight shift towards support for the Cape Wind project among opponents (18% more supportive as opposed to 10% less supportive) and among those who were unsure (28% more supportive as

*The Cape Cod Survey referred only to local government rather than 'state or local government'.

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Table VI. Shift in support (more or less than previously) for a project with different characteristics[a]

Alternative project	Survey area	Supporters		Unsure		Opponents	
		More	Less	More	Less	More	Less
Proposed by government	Cape Cod	25%	9%	28%	6%	18%	10%
	DE ocean	23%	11%	19%	14%	0%	10%
	DE statewide	21%	10%	16%	11%	9%	8%
Underwater turbines	Cape Cod	23%	28%	30%	31%	28%	22%
	DE ocean	22%	24%	41%	26%	76%	13%
	DE statewide	16%	26%	30%	28%	28%	35%
First of many projects	Cape Cod	61%	5%	67%	12%	35%	16%
	DE ocean	75%	1%	63%	3%	29%	14%
	DE statewide	75%	1%	55%	12%	47%	9%

[a]For Cape Cod, 'supporters' and 'opponents' include both those who expressed a firm opinion and those who lean in a direction, while 'unsure' includes all those initially undecided (as there were only four respondents who were not firm or leaning). Thus, for Cape Cod there is some overlap of the categories; that is not the case for the Delaware results.

opposed to 6% less supportive), and supporters would tend to be more supportive (25% more; 9% less) (see Table VI). That is consistent with our earlier finding that people opposed the project in part because they perceived it to be a 'water grab' by a private developer. A similar positive shift is observed in Delaware among supporters and those unsure, but not among those opposed—in the Delaware Ocean area, 10% of opponents would be less favourably inclined, while none would be more favourably inclined, and statewide, there would be virtually no effect (9% more likely; 8% less likely). Overall, we find the extent of the shift towards support among those who are unsure to be significantly greater among Cape Cod than Delaware residents ($p < 0.05$), but find no statistically significant difference between the case studies among supporters or opponents.

The second question, whether residents would be more supportive of underwater turbines (presumably using tidal currents) than wind turbines, yields interesting results. Here, we find that of those individuals who live near the ocean in Delaware and who are opposed to the offshore wind power project, an overwhelming majority would be more supportive of underwater turbines (76% more supportive as opposed to only 13% less supportive). This is a reversal of Delaware statewide opponents (28% more; 35% less) and Cape Cod opponents (28% more; 22% less). These differences are significant at the 1% level ($p < 0.01$). The fact that a larger percentage of Delaware Ocean area opponents (86%) list aesthetics as one of their top three reasons for opposing an offshore wind power project than either Delaware statewide (67%) or Cape Cod (51%) may provide a partial explanation for this result. That is, the one small group that most overwhelmingly opposes offshore wind for aesthetic reasons—the 20% of Delaware coastal residents opposing offshore wind—is the only group that is swung substantially towards support by putting the turbines out of sight, underwater. We can also infer from this contrast that the offshore wind opponents on Cape Cod and Delaware statewide are not swayed by solving the aesthetic view problem.

With the 'first of 300' projects responses, we see a large shift towards support in all three areas and among all three 'opinions' ('support', 'not sure' and 'opposition'), and a much more modest shift towards opposition. Indeed, among opponents, we see net increases in support of 15–20% in Cape Cod and the Delaware Ocean area and almost 40% in Delaware Statewide (recall that only slightly more than 4% of Delaware residents were opposed). The net increases in support are not significantly different however between Cape Cod and Delaware residents. Among those who were unsure, there are also net increases in support—55%, 60% and 43%, respectively in Cape Cod, the Delaware Ocean area, and statewide in Delaware (again, with no significant difference between Cape Cod and Delaware residents). Among supporters of an individual project, we see that with wide scale implementation, their support becomes more fervent (net support increasing 56%, 74% and 74% among Cape Cod, Delaware Ocean and Delaware statewide residents, respectively), with Delaware residents' net support increasing significantly more than those of Cape Cod ($p = 0.011$).

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It is an intriguing result that, of the modifications to the project proposed, the one most increasing support was not a modification of the project at all. Rather, it was a larger plan—that the project would be the first of 300 such projects, would supply half of coastal states' electricity and have significant environmental benefits (as well as increased impacts). Conversely, putting the turbines out of sight underwater yielded little net benefit in support. This was true in both Cape Cod and Delaware statewide. This result suggests that better communication about the value of offshore wind projects, and a better public understanding of the magnitude and economic competitiveness of this resource,[1] might be more important to public support than resolving aesthetic concerns.

Discussion

Several factors may account for the differences that we observe across the two states. First, Cape Wind had an unusually well-financed opposition.[6] Second, it could be hypothesized that there was little opposition in Delaware because the question was hypothetical, and that despite our attempt to construct a question posing a concrete hypothetical project, respondents were expressing their support for wind energy in general. The second hypothesized factor also leads to the prediction that, when a real project is proposed, greater opposition will materialize.

Hypotheses one and two are called into doubt by the Rickinson[34] survey. That survey was conducted September 2007, after a real project was proposed and widely debated in Delaware. As in Cape Cod, substantial opposition developed, but of a very different sort. In Delaware, the opposition came from the industry—first a competing bidder who wanted to build a coal plant, then later the power companies whose selling or buying of power would be affected by the contract to buy wind power. The industry opponents waged a long public relations and lobbying effort against the offshore wind power project, although in the summer of 2008, Delmarva Power reversed course and agreed to a 25 year contract to purchase the energy generated from 200 MW of nameplate capacity from a Bluewater project that may still be as large as 600 MW. Both the public debate and public testimony[38] suggest that industry opposition, if anything, increased the extent of public support. The Rickinson survey is consistent with that informal observation. To the extent that the Rickinson survey and our University of Delaware survey are comparable, the higher acceptance in October 2007 than in fall 2006 suggests that neither the opposition's publicity efforts nor the formation of a concrete project proposal have reduced public acceptance of the project. None of these comparisons are ideal, but there is not strong evidence for either of the first two hypotheses.

A third possible hypothesis for Cape Cod to Delaware differences is that attitudes towards offshore wind and/or knowledge of and concern regarding global warming may have increased in the 20 months separating the Cape Cod and the Delaware surveys. However, in both surveys, we found similarly small percentages who identified an offshore wind power project as having positive impacts on climate change, and few who stated that climate change was one of the top three reasons for their support.

Fourth, factors such as concern over environmental effects of conventional means of electricity generation and desire for electric rate stability may be greater in Delaware than in Cape Cod, given long-standing air quality issues and their related health impacts in Delaware, and the recent electricity price shock for Delmarva customers. This is supported by the greater number of Delaware project supporters giving these reasons in deciding to support. For air quality in particular, Delaware residents gave this as a reason for support almost two-to-one more than Cape Cod residents. In fact, in Delaware, it may be that coal power is no longer socially acceptable, as 91% of survey respondents would rather avoid new fossil fuel generation in favour of offshore wind power even if that means they would have to pay a monthly premium for 3 years.[10]

Fifth, Cape Cod residents may feel a greater sense of place attachment to Nantucket Sound, the proposed location of the Cape Wind project, than Delaware residents do to the Delaware coast. The difference in place attachment could arise because people feel differently about more enclosed seas (sounds and bays) than the open ocean—an idea that finds some support in the Delaware survey—because of the historical prominence

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and traditions of Cape Cod and the Islands, or because of differences in the length of home ownership on Cape Cod versus the Delaware coast.

Cape Cod residents also expressed concern over the private use of public waters, an expression absent in Delaware. This concern may relate in part to the fact that Nantucket Sound is essentially a donut hole of waters controlled by the federal government surrounded by state waters. This unusual circumstance is likely what led the federal government to extend the jurisdiction and authority of the State of Massachusetts over fisheries in the waters of Nantucket Sound that would otherwise be regulated by the federal government. Whether it is because Cape Cod residents are confused over who 'owns' those waters, or irrespective of actual ownership, residents of Cape Cod appear to feel some sense of ownership of or attachment to the sound.

Among the hypothesized explanations, we find some evidence against the first two, no support for the third and good support for the fourth hypothesis. There is some limited support for the fifth hypothesis; unfortunately, we did not ask our Cape Cod sample information on length of homeownership.

Conclusion

We found that 78% of Delaware residents would support the development of a large offshore wind farm 6 miles from the Delaware coast as compared to only 25% of Cape Cod residents. One factor that appears to have hampered US offshore wind development is that planners and policy makers may have assumed the prominent and well-publicized public opposition in Massachusetts to be representative of opposition in all US coastal regions. This has been informally reported to us by both state and federal officials. Therefore, our finding of strikingly higher public support for offshore wind development in the mid-Atlantic may be important to the development of offshore wind power more broadly in the USA.

Based on questions that sought information on residents' believed effects of a large offshore wind development and the three most important factors leading to their support or opposition, Delaware residents expect that offshore wind power's positive impacts on electricity rates, climate change and air quality outweigh its negative impact on aesthetics. In contrast, Cape Cod residents believe that Cape Wind's negative impact on marine life, aesthetics, and recreational fishing and boating would not be offset by an improvement in electricity rates and less reliance on foreign sources of energy.

We find little concern in Delaware over the effect of offshore wind power on tourism. A tourism effect was only the fourth most cited reason for opposition among Delaware seaside residents and fifth among all Delaware residents. Concern over tourism barely registered for project supporters, being the 10th most cited reason. We did find that approximately 10% of Delaware survey respondents said they would switch to a different beach if a wind farm was constructed offshore of the beach usually visited, and 84% were likely to visit a new beach if it had wind turbines off its shore.

Finally, support increases substantially in Cape Cod, statewide in Delaware and in Delaware seaside communities with our 'First of Many' question—in which the local project was described as leading to large-scale deployment. That is, support increases significantly when there is a vision of transformation, even though respondents in both areas knew that as one of the first sites, they inherently would take additional risk and some cost. Most significantly, net likelihood of support among opponents increases between 15% and 40%, and between 43% and 60% among those who neither firmly support nor oppose offshore wind power development. Moreover, in Delaware, the public was explicitly told that the project would raise electric costs; yet, both in the survey data[31] and in the public debate,[38] the public was overwhelmingly willing to do so. Thus, our findings contradict the often-stated belief that the general public is not willing to accept compromises, such as impacts on viewshed, in order to make transformational changes to our energy system.

Acknowledgements

The authors acknowledge the contributions of George Parsons, Amardeep Dhanju, Meredith Blaydes, Philip Whitaker, Jacqueline Piero, April Rouleau and Jesse Fernandes for their assistance in survey development,

pre-testing, survey assembling and mailing, and/or data entry. The authors thank Patrick Devine-Wright, Bonnie Ram and Martin Pasqualetti for reviewing a report on the Delaware survey on which this article is in partly based. We thank as well the anonymous reviewers. We acknowledge and thank Energy Management, Inc., the developers of Cape Wind, for allowing us to use the photo simulations in our research, and Bluewater Wind and the Minerals Management Service for allowing us to use figures depicting the location of the projects. This research was funded by the Delaware Green Energy Fund and the University of Delaware.

References

1. Kempton, W, Archer, CL, Dhanju, A, Garvine, RW, Jacobson, M. Large CO_2 reductions via offshore wind power matched to inherent storage in energy end-uses. *Geophysical Research Letters* 2007; **34**: L02817.
2. Blaydes, M, Firestone J. Wind Power, wildlife and the migratory bird treaty act: a way forward. *Environmental Law* 2008; **38**: ■■–■■.
3. Strachan, PA, Lal, D. Wind energy policy, planning and management practice in the UK: hot air or a gathering storm? *Regional Studies* 2004; **38**: 551–571.
4. Hinshelwood, E, 2001. Power to the people: community-led wind energy—obstacles and opportunities in a South Wales valley. *Community Development Journal* 2001; **36**: 95–110.
5. Vorkinn, M, Riese, H. Environmental concern in a local context: the significance of place attachment. *Environment and Behavior*, 2001; **33:** 249–263.
6. Kempton, W, Firestone, J, Lilley, J, Rouleau, T, Whitaker, P. The offshore wind power debate: views from Cape Cod. *Coastal Management* 2005; **33**: 121–151. [Online]. Available: http://www.ocean.udel.edu/windpower (Accessed ■■ ■■ ■■)
7. Firestone, J, Kempton, W. Public Opinion about large offshore wind power: underlying factors. *Energy Policy* 2007; **35**: 1584–1598. [Online]. Available: http://www.ocean.udel.edu/windpower (Accessed ■■ ■■ ■■).
8. Wolsink, M. Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives.' *Renewable and Sustainable Energy Reviews* 2007; **11**: 1188–1207.
9. Devine-Wright, P. Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. *Wind Energy* 2005; **7**: 125–139.
10. Firestone, J, Kempton, W, Krueger, A. *Delaware Opinion on Offshore Wind Power*. Final Report for DNREC, 2008; 1–60. [Online]. Available: http://www.ocean.udel.edu/windpower/docs/FinalDNRECOpinionReport.pdf (Accessed ■■ ■■ ■■).
11. Census Bureau. 2006. [Online] Available: http://quickfacts.census.gov/qfd/ (Accessed ■■ ■■ ■■)
12. Minerals Management Service. *Cape Wind Draft Environmental Impact Statement (DEIS)*. 2008. [Online]. Available: http://www.mms.gov/offshore/AlternativeEnergy/CapeWindDEIS.htm (Accessed ■■ ■■ ■■).
13. Army Corps of Engineers. Cape Wind Energy Project Draft Environmental Impact Statement. 2004. [Online] Available: http://www.nae.usace.army.mil/projects/ma/ccwf/deis.htm (Accessed ■■ ■■ ■■).
14. Simpson, JA, Weiner, ESC. (eds). 2003. *Oxford English Dictionary* (2nd edn.). OED Online. Oxford University Press, 1989. Additions 1993–1997 Simpson J, Weiner E, Proffitt, M (eds) and 3rd edn. (in progress) Mar. 2000 Simpson, J (ed.).
15. Hoppe-Kilpper, M, Steinhauser, U. Wind landscapes in the German milieu. In: Pasqualetti, M, Gipe, P, Righter, RW (eds), *Wind Power in View: Energy Landscapes in a Crowded World*. Academic Press: San Diego, CA, 2002; 83–99.
16. Short, L. Wind power and English landscape identity. In: Pasqualetti, M, Gipe, P, Righter, RW (eds), *Wind Power in View: Energy Landscapes in a Crowded World*. Academic Press: San Diego, CA, 2002; 43–58.
17. Pasqualetti, MJ. Living with wind power in a hostile landscape. In: Pasqualetti, M, Gipe, P, Righter, RW (eds), *Wind Power in View: Energy Landscapes in a Crowded World*. Academic Press: San Diego, CA, 2002; 153–172.
18. Schwahn, C. Landscape policy in the northern sea marshes. In: Pasqualetti, M, Gipe, P, Righter, RW (eds), *Wind Power in View: Energy Landscapes in a Crowded World*. Academic Press: San Diego, CA, 2002; 133–150.
19. Wolsink, M. Planning of renewables schemes: deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation. *Energy Policy* 2007; **35**: 2692–2704.
20. Wüstenhagen, R, Wolsink, M, Bürer, MJ. Social acceptance of renewable energy innovation: an introduction to the concept. *Energy Policy*, 2007; **35:** 2683–2691.
21. Bell, D, Gray, T, Haggett, C. The 'social gap' in wind farm siting decisions: explanations and policy responses. *Environmental Politics*, 2005; **14**: 460–477.
22. Walker, G. Renewable energy and the public. *Land Use Policy* 1995; **12**: 49–59.
23. Krohn, S., and Damborg, S. On public attitudes towards wind power. *Renewable Energy* 1999; **16**: 954–960.
24. Bishop, K, Proctor, A. *Love Them or Loath Them? Public Attitudes towards Windfarms in Wales. Working paper # 8*, Cardiff School of City and Regional Planning, Cardiff University, Wales, UK, 1994.

11 25. Gipe, P. *Wind Power Comes of Age*. John Wiley & Sons, Inc.: ■■, ■■, 1995, cited by Krohn, S, Damborg, S. On public attitudes towards wind power. *Renewable Energy* 1999; **16**: 954–960.
26. Zarnikau, J. Consumer demand for 'green power' and energy efficiency, *Energy Policy* 2003; **31**: 1661–1672.
27. Reiner, DM, Curry, TE, De Figueiredo, MA, Herzog, HJ, Ansolabehere, SD, Itaoka, K, Johnsson, F, Odenberger, M. American exceptionalism? similarities and difference in national attitudes toward energy policy and global warming, *Environmental Science and Technology*, 2006; **40**: 2093–2098.
28. Brittan, Jr., GG. The wind in one's sails: A philosophy. In: Pasqualetti, M, Gipe, P, Righter, RW (Eds.), *Wind Power in View: Energy Landscapes in a Crowded World*. Academic Press: San Diego, 2002; 59–79, 60.
29. Jobert, A, Laborgne P, Mimler, S. Local acceptance of wind energy: factors of success identified in French and German case studies. *Energy Policy* 2007; **35**: 2751–2760.
30. Gross, C. Community perspectives of wind energy in Australia: the application of a justice and community fairness framework to increase social acceptance. *Energy Policy* 2007; **35**: 2727–2736.
31. Krueger, A, Parsons, G, Firestone, J. Valuing preferences for offshore wind power using choice experiments (manuscript
12 in preparation).
32. Dillman, D. *Mail and Internet Surveys: The Tailored Design Method*. 2nd edn. Wiley: New York, 2000.
33. Viviënne MH, Lahaut, CJ, Jansen, HAM, Van De Mheen, D, Garretsen, HFL, Verdurmen, JEE, Van Dijk, A. Estimating non-response bias in a survey on alcohol consumption: comparison of response waves, *Alcohol and Alcoholism*, 2003; **35**: 128–134.
34. Rickinson Group, The. *Electric Customer Awareness and Favorability towards Renewable Energy Sources in the State of Delaware*. Report prepared for Delmarva Power, 2007; 1–32. [Online]. Available: http://www.delmarva.com/home/
13 education/windissue/reports/ (Accessed ■■ ■■ ■■).
35. Opinion Research. *Cape Wind: What Cape Cod/Islands Residents Think*. Prepared for Civil Society Institute, 2007. [Online]. Available http://www.civilsocietyinstitute.org/reports/10250%20CSI%20Cape%20Wind%20survey
14 %20FINAL.pdf (Accessed ■■ ■■ ■■).
36. Opinion Research. *Cape Wind: What Cape Cod/Islands Residents Think*, Prepared for Civil Society Institute, 2008. [Online]. Available: http://www.civilsocietyinstitute.org/media/pdfs/030608%20CSI%20MA%20Cape%20Wind
15 %20survey%20report.pdf (Accessed ■■ ■■ ■■).
37. Mills, D, Rosen, H. *New Jersey Shore Opinions About Off-shore Wind Turbines, Lieberman Research Group*, Report prepared for the New Jersey Department of Economic Growth & Tourism Commission and Brushfire, Inc., 2006. [Online]. Available: http://njedl.rutgers.edu/NJdlib/details.cfm?RECORD_ID=4497&formKeyword=4497 (Accessed
16 ■■ ■■ ■■).
38. Piero, J, Dhanju, A, Blaydes, M. *How Wind Bid Against a 'Done Deal' for a Coal Power Plant* (poster presentation), WINDPOWER 2007, Los Angeles, 2007. Organized by the American Wind Energy Association.
39. Intergovernmental Panel on Climate Change. *Fourth Assessment Report*, 2007. [Online]. Available: http://www.ipcc.
17 ch/ (Accessed ■■ ■■ ■■).
40. Dalton, GJ, Lockington, DA, Baldock, TE. A survey of tourist attitudes to renewable energy supply in Australian hotel accommodation. *Renewable Energy*, 2008; **33**: 2174–2185.
41. Aitchinson C. Fullbrook wind farm proposal, North Devon, 2004. [Online]. Available: http://www.devonwindpower.
18 co.uk/pdfs/tia.pdfS (Accessed ■■ ■■ ■■).
42. Kuehn, S. Sociological investigation of the reception of horns rev and Nysted offshore wind farms in the local communities. 2005. [Online]. Available http://www.hornsrev.dk/Miljoeforhold/miljoerapporter/Sociological_
19 investigations_2003.pdf (Accessed ■■ ■■ ■■).
43. British Wind Energy Association. The impact of wind farms on the tourist industry in the UK, 2006. [Online]. Available:
20 http://www.bwea.com/pdf/tourism.pdf (Accessed ■■ ■■ ■■).
44. Blaydes, M, Firestone, J, Kempton, W. *The Effects of Wind Power on Beach Tourism*. Poster presented at WINDPOWER 2008, Houston, TX, 2008. Organized by the American Wind Energy Association.