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## Public acceptance of offshore wind power across regions and through time

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This paper analyses mail surveys of residents living near two proposed offshore wind projects – Cape Wind off Massachusetts and Bluewater Wind off Delaware, and compares responses in 2005 or 2006 with 2009. On Cape Cod, compared with 2005, a majority (57%) now supports Cape Wind. Support in Delaware has remained relatively constant since 2006, reaching 80% in 2009. Questions examined reasons for support or opposition. A desire for energy independence is an increasingly significant reason for support in both areas and has motivated some individuals to switch from opposition to support. Conversely, those who switched from support to opposition said they were most concerned about fishing and recreational boating impacts.

**Keywords:** offshore wind; public opinion; Cape Wind; outreach; NIMBY

### 1. Introduction

United States coastal waters are rich in wind resources (Kempton *et al.* 2007), yet to date, no offshore wind project has been built. In 2001, a private company, Energy Management, Inc. proposed to develop the first such project – Cape Wind – in Nantucket Sound, off Cape Cod, Massachusetts. As of this writing, 10 years later, construction has not begun in Nantucket Sound or elsewhere in the Americas. The Cape Wind project spurred a well-financed opposition, and the resulting news coverage led many industry observers to believe that the Cape Wind opposition presaged a general public rejection of offshore wind energy along all US coasts. Outside Cape Cod, however, the public has received proposed US offshore wind projects positively. The opposition has instead been some limited resistance due to over-market price (e.g. Deepwater's Block Island project in Rhode Island) and political forces marshalled by the existing fossil fuel interests (e.g. Bluewater Wind's Delaware project).

### 2. Need for public acceptance studies

For land-based wind power, abundant literature exists on public opinion, community involvement and the effects of projects on cultural landscapes. Less research is

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available regarding the nature of public attitudes towards offshore wind power projects (Hinshelwood 2001, Vorkinn and Riese 2001, Strachan and Lal 2004, Kempton *et al.* 2005, Firestone *et al.* 2009). Although there is much journalistic and editorial discussion of opposition to offshore wind projects, in-depth analysis of the factors underlying the resistance to, or support for, these developments is sparse. Furthermore, there is a tendency to generalise the character of opposition movements with short-hand labels such as 'NIMBY' ('not-in my-back-yard') (Devine-Wright 2005, Kempton *et al.* 2005, Wolsink 2006, Jones & Eiser 2009), labels that are more descriptive of a result – opposition – than of reasons underlying that opposition. Here, we provide a detailed analysis of public attitudes and expectations of impacts of wind power development through time at two locations.

In previously published studies about the Cape Wind project, we analysed a series of semi-structured interviews conducted in 2003 and 2004 (Kempton *et al.* 2005). In 2005, we conducted a detailed, mail survey of 500 Cape Cod, Martha's Vineyard and Nantucket Island residents regarding their knowledge and attitudes towards the proposed 450 MW Cape Wind project (Firestone and Kempton 2007). At the time of our first Cape Cod study, the project was widely discussed on the Cape, and the US Army Corps of Engineers had earlier released a Draft Environmental Impact Statement (DEIS). Building upon this research in 2006, we carried out 12 in-depth semi-structured interviews, then surveyed by mail approximately 950 residents of the State of Delaware. That survey shared many questions with the earlier Cape Cod study (Firestone *et al.* 2009), but also included a choice modelling section to allow us to model trade-offs between distance from shore and other factors (Krueger *et al.* 2011). When the 2006 survey was conducted, little to no public discussion on offshore wind power had occurred in Delaware.

To gauge public attitudes and potential shifts in perceptions over time, a follow-up survey was distributed to Cape Cod and Delaware residents in 2009. By the time the 2009 survey commenced, a second EIS was undertaken at Cape Wind and the Delaware Public Service Commission had approved a power purchase agreement (PPA) between Bluewater Wind and Delmarva Power Company. In contrast to the Cape Wind project, which was initiated in 2001 by a private developer who was out ahead of both federal and state planning or regulation, the Bluewater Wind project first came into the public's consciousness in late 2006 in response to a multi-source request for power generator proposals mandated by a Delaware state law. Since the completion of our 2009 survey, Cape Wind received federal and state permits (Cape Wind 2011) and has an approved PPA for half of its expected output. For the Delaware project, the corporate parent of Bluewater Wind, NRG, had begun the federal regulatory process and intends to proceed with seeking a federal lease for the ocean area, however, in late 2011 it withdrew from its PPA given federal tax policy uncertainty.

This paper presents the findings of the 2009 mail survey of Cape Cod and Delaware residents and analyses how public perceptions of offshore wind have evolved through time. Other US projects are at earlier stages in the development process. For example, Rhode Island approved a PPA for a small project off Block Island, New Jersey is moving forward with policies to enable several large projects and has one 30MW project at a more advanced stage, and the federal government has recently issued requests for interest in developing projects off Maryland and Massachusetts. Planning for these other projects may benefit from analysis of public perceptions of these early projects off Cape Cod and Delaware.

Cape Wind is set to place up to 130 turbines about 9.5 km from Hyannis Port on Cape Cod, 14.4 km from Martha's Vineyard, and about 21 km from Nantucket Island. In Delaware, the Bluewater Wind project initially called for the placement of as many as 150 turbines approximately 21 km from shore. Both Cape Cod and Delaware rely on archaic generation plants powered by fossil fuels, have similar population densities, and have economies that depend on coastal tourism. For that reason we chose to compare a distinct region of Massachusetts with a complete state, Delaware. Yet, Delaware is three times the size of Cape Cod and its economy is much more diverse, relying heavily on manufacturing, financial services and agriculture (Firestone *et al.* 2009).

To place our results in a wider context, we first review prior studies on support and opposition of wind projects. After discussing the methodology employed, we analyse both the results of the present survey and the changes over time. Then, we examine the data in more detail in order to gain a broader understanding of how individuals perceive offshore wind power. We focus on reasons for both attitude entrenchment and shifts in perceptions, and attempt to explain why residents in Delaware are more supportive than those in Cape Cod. Ultimately, we argue that understanding public perceptions and public acceptance of wind energy projects is critical, as the public has the power to obstruct or advance development. Social considerations, along with regulatory and fiscal policies, as opposed to purely technological considerations, are likely to be the main determinants of the extent of offshore wind energy adoption in the Americas during the coming decade.

### 3. Background

#### 3.1. Previous studies on wind power support and opposition

Observations and examples provided in other studies help to place results of the Cape Cod and Delaware surveys in a wider context. One popular hypothesis for opposition to local developments is NIMBY ('not in my backyard'). This hypothesis posits that people may have generally positive attitudes towards some type of development, such as offshore wind power, until confronted with a nearby proposal. At that point, they start to view the development as hazardous or detrimental to their own neighbourhoods and end up opposing it for selfish reasons (O'Hare 1977, Wolsink 2007, Firestone *et al.* 2008, Jones and Eiser 2009, Swofford and Slattery 2010).

In the *Oxford English Dictionary* (OED), NIMBY-ism is defined as "an attitude ascribed to persons who object to the siting of something they regard as detrimental or hazardous in their own neighbourhood, while by implication raising no such objections to similar developments elsewhere" (OED 2012). The second part of this definition is the primary factor that distinguishes NIMBY from mere opposition (Wolsink 2006). Put more simply, NIMBY residents "want to protect their turf" (Devine-Wright 2009, p. 430). Thus, the concept refers to protectionist attitudes of community members who, while conceding the need for these facilities somewhere, do not want them close to their homes (Devine-Wright 2009, p. 430).

The NIMBY label also has been used as a spatial explanation for opposition to developments, one that assumes that proximity to a project is the most significant factor influencing response (Devine-Wright 2009). In several studies, however, residents living closer to projects had more positive views of the developments than those living farther away (Warren *et al.* 2005). Wolsink (2000) found that most

people who exhibited so-called NIMBY behaviour did not support wind turbines anywhere. The NIMBY concept has also been applied more broadly to explain opposition that is influenced by irrationality, ignorance and selfishness (Burningham *et al.* 2007). The basis of this assumption is that residents oppose a development simply due to the lack of knowledge (Owens 2000) or because they are victims of myths about the damaging aspects of the technology, which if separated from facts, would diminish the opposition (Devine-Wright and Devine-Wright 2006, Devine-Wright 2009). This conclusion has been disputed, as often the opponents are well informed and cannot be simply called ignorant (Petts 1997, Devine-Wright 2009). To sum up, while superficially attractive, NIMBY theory has not been substantiated with empirical evidence as a major source of opposition (Devine-Wright 2005, Firestone *et al.* 2009, Jones and Eiser 2009).

Due to the aspects that call into question the concept's applicability, and the imprecise and broad use of the term, the NIMBY label unfortunately muddles the reasons behind opposition, making it difficult to discern whether it is a belief towards a development, a behavioural response or a collective action of organised groups (Devine-Wright 2009). As many still use the NIMBY label without properly investigating the motives for opposing the siting of wind energy and other facilities (Wolsink and Devilee 2008, Devine-Wright 2009), describing project opponents as NIMBY becomes pejorative labelling and "a succinct way of discrediting project opponents" (Burningham 2000, p. 55). The theory has become so controversial that some researchers have called for its abandonment altogether, while others argue strongly that opposition is best explained by concepts of procedure and institutional capacity (Devine-Wright 2009) (a companion paper, Firestone *et al.* (2012) describes this more fully). Besides its questionable analytic value, in practical terms it is also an ineffective tool for mediating frequently over-heated dialogues about wind developments.

Other hypotheses provide a better sense of the nature of opposition against wind energy projects, and have been substantiated by evidence. In the UK, numerous wind projects have been blocked largely because developers did not appreciate the cultural connection rural communities have to the land, an attachment that has become a "metaphor for national identity" (Short 2002, p. 57). This failure by developers to grasp the vital connection between memory, beauty and landscape in achieving a high quality of life has led to rigorous resistance (Short 2002). In Germany, the primary reason projects are not awarded permits stems from the potential "reduction in value of existing landscapes" (Hoppe-Kilpper and Steinhäuser 2002, p. 85). Such "industrialization of landscape" can often violate individuals' expectations that pristine areas where they live would always remain unchanged (Firestone *et al.* 2008).

Among coastal residents, similar feelings may persist with regard to preserving untouched seascape (Kempton *et al.* 2005). For many coastal community residents there "appears to be something special about the ocean," which can translate into opposition (as seen with Cape Wind) (Kempton *et al.* 2005, p. 132). Schwahn (2002, p.139) noted that rapid landscape changes resulting from large-scale wind power projects can lead residents to feel like they have been "expelled from their homeland". Impacts of wind power projects are complex and extend beyond merely physical transformations of the environment to the symbolic and socially constructed aspects of those transformations (Devine-Wright 2005). An additional suggestion made by several authors about change through time is that local

support follows a 'U' or 'V' shaped pattern, whereby local support begins high (when people are not confronted with a wind energy project near their community), drops when the project is under development and the impacts are immediate, and then rises again after the project is in operation (Bishop and Proctor 1994, Gipe 1999, Devine-Wright 2005, Wolsink 2007). Some studies also suggest that even with low levels of initial support, acceptance of wind energy projects has grown after those projects began operation (Bishop and Proctor 1994, Gipe 1999, Krohn and Damborg 1999, Devine-Wright 2005). However, even though there is support for that hypothesis, the relationship between familiarity with wind projects and support for new developments is unlikely to be that simple or linear (Devine-Wright 2005).

Indeed, some individuals may care as much or more about how a decision on a given project is reached than the decision itself, e.g. were local residents' views heard, was the permitting process fair, and has the developer been transparent? Indeed, a process perceived as fair may go a long way towards garnering public acceptance of a project. As a result, we consider in detail the question of the relationship between procedural fairness and substantive outcome in Firestone *et al.* (2012). We also have separately examined the effect of offshore wind development on coastal tourism (Lilley *et al.* 2010), and acknowledge that other considerations also may play a role in project acceptance such as risk perception and media coverage. However, our focus in this paper and in the mail survey instrument is on the substantive factors underlying support or opposition, rather than on influences on those factors.

## 4. Methods

### 4.1. Survey development

Drawing upon our earlier surveys, the 2009 survey was administered to both Cape Cod and Delaware residents and investigates to what extent, how, and why offshore wind perceptions have changed over time. In each location, we also had the 2005 or 2006 survey data to compare.

All the surveys elicited perceptions of an offshore wind project proposed nearby, opinions on its expected effects, and the top-three reasons for supporting or opposing it. In the 2009 follow-up survey, the Cape Cod project description remained effectively unchanged, whereas the Delaware project description was updated to match the Bluewater Wind project. Simulated photographic views of the Cape Wind project were employed in the 2006 Delaware survey<sup>1</sup>, while more generic views were specifically created for the 2009 surveys, to simulate an offshore wind project from either location, thus increasing comparability of the two surveys. In order for a photomontage to accurately reflect what turbines will look at a given distance, the image must be held a specified distance from the eyes of the person viewing the simulation. To account for this, we provided survey respondents with written instructions and a graphic illustrating how far the photo-simulation should be held from their eyes.

The survey instrument was pilot tested with a demographically diverse set of 67 respondents at the Division of Motor Vehicles (DMV) in New Castle, Delaware from 25–26 June, 2009. After the respondents completed the survey, we solicited their overall feedback and asked clarification questions – a crucial step for final survey clarity, reduced length and lack of bias.

#### 4.2. Survey sampling, response and weighting

For all three mail surveys, random samples were obtained. The 2005 ‘Cape Cod’ sample comprised residents from Cape Cod, Martha’s Vineyard and Nantucket Island. In 2009, the Cape Cod sample was divided into three discrete strata (subsamples): individuals living on the islands (‘Martha’s Vineyard and Nantucket Island’); those living on Cape Cod with a ‘View of Nantucket Sound’; and those living on the ‘Rest of Cape Cod’ without a view. Likewise, both the 2006 and the 2009 Delaware samples were drawn from three geographic regions: ‘Bay’ (those living adjacent to the Delaware Bay); ‘Ocean’ (those on Delaware’s Atlantic Coast), and ‘Inland’ (Delawareans living outside the ‘Bay’ and ‘Ocean’ subsamples). Not having stratified the initial Cape Cod sample prevents us from making some trend comparisons (e.g., between those with a view of Nantucket Sound in 2005 and in 2009), but otherwise has no effect on the analysis, and indeed, some comparisons can be made in any event such as whether the respondent is likely to be able to view the project through post-stratification. See Tables 1 and 2 for more details.

Protocols for designing, pre-testing, and administering each survey followed Dillman’s Tailored Design Method (Dillman 2007) to the greatest extent possible. The 2005 survey, mailed to 1500 Cape Cod residents, yielded a response rate of 38.5%. The 2006 survey obtained a higher response rate (51.9%) from its sample of 2000 Delaware residents. For more information on these earlier surveys, see Firestone and Kempton (2007), Firestone *et al.* (2008), and Firestone *et al.* (2009). In August and September of 2009, survey packets (consisting of a survey, offshore wind simulations and a return envelope) were mailed to 2600 Cape Cod and Delaware residents (1300 total in each region), with a response rate of 50.0%, after accounting for bad addresses. The responses of the returned surveys were coded and then entered into a database. As a quality check, a sample of the data entries (from 107 surveys, with 68 coded responses apiece) was reviewed for accuracy. A total of 10 errors were found, a data entry error rate below 0.1%.

We oversampled the subsamples closest to the ocean (described subsequently as ‘View of Nantucket Sound’ and ‘Martha’s Vineyard and Nantucket Island’ in Cape

Table 1. Cape Cod survey samples.

|                                      | Sample size (n) |      |
|--------------------------------------|-----------------|------|
|                                      | 2005            | 2009 |
| Martha’s Vineyard & Nantucket Island |                 | 300  |
| Cape Cod (‘View of Nantucket Sound’) | 1500 total      | 500  |
| Rest of Cape Cod                     |                 | 500  |

Table 2. Delaware survey samples.

|        | Sample size (n) |      |
|--------|-----------------|------|
|        | 2006            | 2009 |
| Bay    | 400             | 300  |
| Ocean  | 400             | 500  |
| Inland | 1200            | 500  |

Cod, and 'Ocean' and 'Bay' in Delaware). These areas were oversampled in order to adequately represent those smaller populations whose views presumably will be more affected. Martha's Vineyard and Nantucket are islands and that island subsample contained a high number of discontinued, or otherwise undeliverable, addresses. To account for the imbalance in this small subsample and to address any demographic response bias from oversampling, we weighted the data according to demographic and geographic characteristics. Of course, when we tabulate larger groups, the oversampling is adjusted down proportionally, so that, for example, percentages for 'Delaware' are not affected by oversampling. Therefore, each sample and subsample accurately represents the demographic characteristics within its geographical area.

## **5. Results and discussion**

Wind projects are permitted according to their compliance with state and federal requirements, not according to popular vote. Yet current and long-term support and opposition trends are likely to influence the extent and rate of adoption of offshore wind energy. Furthermore, understanding factors behind those trends can help tailor communications to be more effective. We now turn to questions of support or opposition, and the factors underlying them.

### **5.1. *Believed effects of offshore wind***

Due to the novelty of Cape Wind, the project and the decision-making process have suffered from uncertainty over its anticipated environmental, social and economic effects. Thus, we elicited respondents' beliefs regarding the project's potential to have positive or negative ('benefit' or 'harm') effects. We have found that after years of planning, multiple community meetings and, especially after the completion of a second extensive EIS for the Cape Wind project, the public appears to have a better understanding of the expected negative effects in the 2009 survey than it did in 2005. As can be seen in Table 3, a smaller percentage of the population now believes that the project will have a host of negative effects, including negative effects on the fishing industry, tourism, aesthetics, property values, marine and bird life and recreational boating. Although some people still expect the project to cause disruption to many of these activities, the drop in numbers reporting that they expect negative impacts is evident. This suggests that the lengthy EIS process and accompanying publicity may have performed an important educational function.

Across the board, the percentage of Delaware residents who expect negative effects from local offshore wind development is substantially less than the percentage of Cape Cod residents who do so. Many of the differences between the two areas are substantial and have remained so over time. Although we find higher support in the area with fewer beliefs about negative effects (Delaware), from these data we cannot ascertain the direction of causality.

### **5.2. *Support and opposition across projects and through time***

#### **5.2.1. *Support and opposition levels***

In the 2009 survey, respondents were first asked several questions about their general acceptance of wind energy, whether they had already heard of the specific project proposed in their area, and what effect the debate over the project had on the

community. We then asked each respondent whether he or she supported, opposed or had not yet made up his or her mind about the project. The undecided respondents were asked a subsequent question: whether they were 'leaning' towards support or opposition. Table 4 first presents the data for those who chose 'support' or 'oppose' to the first question (the 'Firm Opinion' columns in Table 4) and then adds to it respondents who answered the follow-up question that they were leaning towards support or opposition ('Firm + Leaning' columns).

Several findings are striking. First, at least one-third of Cape Cod/Islands and Delaware residents have yet to make a firm decision (33% and 38%, respectively, see Table 4). At the time of the survey, more than eight years had passed since the announcement of the Cape Wind project, and after extensive analysis, press coverage, and controversy, 33% continue to only lean towards an opinion, (31%) or are altogether undecided (2%). Second, a majority (statistically significant at the 1% level using a Wald test) now supports the Cape Wind project (57%:41%), in contrast to the majority (56%:44%) who opposed it in our 2005 survey (not shown in Table 4, but reported in Firestone and Kempton, 2007). Third, support for the Bluewater Wind project at 80% firm or leaning – is significantly higher than for Cape Wind at 57%. Fourth, while support for the Delaware project has remained relatively constant (78% in 2006 and 80% in 2009), opposition has increased from 4 to 15%,

Table 3. Believed negative effects ('harm').

|                              | Cape Cod & Islands |      | Delaware |      |
|------------------------------|--------------------|------|----------|------|
|                              | 2005               | 2009 | 2006     | 2009 |
| Local fishing industry       | 54%                | 41%  | 18%      | 15%  |
| Tourism & related business   | 42%                | 36%  | 16%      | 15%  |
| Job creation                 | 8%                 | 5%   | 1%       | 1%   |
| Air quality                  | 6%                 | 5%   | 1%       | 3%   |
| Electricity rates            | 7%                 | 13%  | 2%       | 6%   |
| Aesthetics of ocean view     | 72%                | 57%  | 44%      | 38%  |
| Property values              | 48%                | 38%  | 17%      | 19%  |
| Marine life                  | 44%                | 34%  | 11%      | 13%  |
| Bird life                    | 48%                | 40%  | 15%      | 21%  |
| Recreational boating/fishing | 54%                | 45%  | 22%      | 17%  |
| Reducing climate change      | 3%                 | 3%   | 1%       | 2%   |
| Navigational safety          | NA                 | 42%  | 26%      | 22%  |

Table 4. Project support in 2009, both regions.

|                             | Cape Cod & Islands 2009 |                | Delaware 2009 |                |
|-----------------------------|-------------------------|----------------|---------------|----------------|
|                             | Firm Opinion            | Firm + Leaning | Firm Opinion  | Firm + Leaning |
| Sample size                 | 450                     | 450            | 595           | 595            |
| Support                     | 36%                     | 57%            | 52%           | 80%            |
| Oppose                      | 31%                     | 41%            | 9%            | 15%            |
| Unsure                      | 33%                     | 2%             | 38%           | 5%             |
| Support: opposition         | 0.28                    | 0.009          | 0.000         | 0.000          |
| Wald test ( <i>p</i> value) |                         |                |               |                |

despite the fact that the hypothetical project in 2006 was closer to shore than the actual project described in 2009 (9.5 km versus 21 km).<sup>2</sup>

The most analogous groups to compare opinion on the two projects may not be the largest units (Cape Cod/Islands versus Delaware), but rather each area's residents with a view of the respective project. We use two measures of being within view, one is our sample by sub-area of those living in a census tract or block group bordering Nantucket Sound ('Sound') or those near the Atlantic Ocean in Delaware ('Ocean') and the second is the respondents' self-reported expectations that they would be able to see the project from their home ('Project View'). The results are rank ordered in Table 5. Those with a self-reported project view are most likely to oppose, followed by those more broadly in adjacent census tracts, and those in neither category are least likely to oppose. Yet the highest level of opposition in Delaware (31% among those who expect to see the project from their home) is still lower than opposition by any of the groups in Cape Cod (74%, 53% and 35%). Although the Cape Cod project would be closer (9.5 km from Hyannis Port versus 21 km from Rehoboth Beach), even Delaware residents with a view of the project are more supportive than Cape Cod residents who neither live near the shore nor expect to see the project. In short, whether one lives in Delaware versus Cape Cod is a stronger determinant of support than expected view of, or proximity to, the proposed project.

Several questions tried to get at factors possibly related to opposition by nearby residents. However, these place-based metrics, such as attachment to the place where one lives (Cape Cod, 94%; Delaware Ocean area, 97%) or whether the respondent considers the area part of their identity (Cape Cod 70%; Delaware Ocean area, 77%), were similar in the two areas. However, the relevant attachment to consider may not be to where one lives, but to the body of water adjacent thereto, and individuals may have greater attachment to semi-enclosed or enclosed water bodies such as sounds and bays than to the open-ocean (Firestone *et al.* 2009). In future surveys, refinement of such questions on the place-based characteristics of the two areas is warranted.

### 5.2.2. Increased intensity of support and opposition among the entrenched

For the 2009 survey, we considered re-sampling previously sampled individuals to ask how opinion changed. Instead, we took new representative samples of each area (because we wanted to avoid sampling bias against new residents and we wanted to

Table 5. Support and opposition by those self-reporting a view of the project, those living adjacent to the Ocean or Sound, and those not adjacent to Ocean or Sound.

| Sample or subsample         | Delaware     |       |        | Cape Cod     |       |            |
|-----------------------------|--------------|-------|--------|--------------|-------|------------|
|                             | Project view | Ocean | Inland | Project view | Sound | Rest of CC |
| Sample size                 | 27           | 229   | 214    | 14           | 187   | 190        |
| Support                     | 69%          | 77%   | 81%    | 26%          | 46%   | 63%        |
| Oppose                      | 31%          | 22%   | 15%    | 74%          | 53%   | 35%        |
| Unsure                      | 0%           | 2%    | 4%     | 0%           | 1%    | 2%         |
| Support: opposition         | 0.07         | 0.000 | 0.000  | 0.09         | 0.55  | 0.001      |
| Wald Test ( <i>p</i> value) |              |       |        |              |       |            |

oversample small but project-proximate areas, as mentioned earlier). Since we did not independently know of the respondents' prior project support, we asked respondents to recall the time of the prior survey, and asked whether they supported or opposed the project previously.<sup>3</sup> We then asked respondents who had not changed their mind about the project (that is, they still supported or opposed it) whether they were more or less supportive (or opposed), and those who had changed their mind, why they had done so. While recalled memory is imperfect, it was the only way we could examine questions of change from a prior time.

Table 6 presents the results for those individuals who said they had not changed their position from the one they held earlier. A strong pattern is that those who were initially opposed are now more opposed and those who were initially supportive are now more supportive. That is, previous positions (as recalled today) have hardened; this would lead us to expect that current positions now among these individuals are unlikely to change through further debate and information provision, although prior studies show that opposition may lessen after construction and operation.

### 5.2.3. *Self-identified reasons for project support or opposition*

After inquiring about the respondents' support or opposition for the relevant wind project proposal, we asked which three factors most shaped their decision to support or oppose it. This was an open-ended question and was the same in all surveys; they wrote their reasons in the spaces provided and we categorised those responses, as shown in Table 7. The respondents were also asked to rank the factors in order of importance. Although we did not ask residents whether these factors affected their decision in a positive or negative way, we do know whether a respondent was supportive or opposed. The results in Table 7 (and Table 8) must be interpreted with some caution given the open-ended structure of the question. For example, 30% of Delawareans in 2009 listed the effect of the wind project on marine life or the environment as a top reason for support. This could mean, for example, that those individuals believe that the wind project will enhance marine life through various means such as habitat creation, providing marine mammals with a safe haven from instrumentalities such as commercial vessels or (more likely) through the displacement of other means of generation that have more harmful effects on the environment. Alternatively, it could mean that they support the project despite its negative environmental effects. Given question wording, therefore, we have had to interpret whether respondents see these factors in a positive or negative way.

Table 6. Opinion intensity of respondents who did not change their position.

|                    |                 | Delaware |        | Cape Cod |            |
|--------------------|-----------------|----------|--------|----------|------------|
|                    |                 | Ocean    | Inland | Sound    | Rest of CC |
| Previous supporter | More supportive | 57%      | 54%    | 66%      | 61%        |
|                    | Less supportive | 5%       | 5%     | 2%       | 5%         |
|                    | Same            | 38%      | 42%    | 31%      | 34%        |
| Previous opponent  | More opposed    | 55%      | 54%    | 65%      | 48%        |
|                    | Less opposed    | 12%      | 17%    | 7%       | 11%        |
|                    | Same            | 33%      | 30%    | 38%      | 41%        |

Table 7. Top three reasons for project support or opposition.

| Issue                       | Cape Cod |        |  |         |        |  | Delaware |        |  |         |        |  |
|-----------------------------|----------|--------|--|---------|--------|--|----------|--------|--|---------|--------|--|
|                             | 2005     |        |  | 2009    |        |  | 2006     |        |  | 2009    |        |  |
|                             | Support  | Oppose |  | Support | Oppose |  | Support  | Oppose |  | Support | Oppose |  |
| Electricity rates           | 51%      | 22%    |  | 53%     | 32%    |  | 68%      | 43%    |  | 62%     | 49%    |  |
| Marine life or environment  | 49%      | 66%    |  | 22%     | 62%    |  | 54%      | 40%    |  | 30%     | 37%    |  |
| US energy independence      | 38%      | 6%     |  | 59%     | 8%     |  | 10%      | 15%    |  | 56%     | 27%    |  |
| Renewable energy            | 36%      | 1%     |  | 15%     | 3%     |  | 10%      | 14%    |  | 10%     | 5%     |  |
| Air quality                 | 24%      | 3%     |  | 24%     | 4%     |  | 43%      | 21%    |  | 23%     | 13%    |  |
| Job creation                | 18%      | 2%     |  | 22%     | 1%     |  | 19%      | 9%     |  | 30%     | 23%    |  |
| Fishing/boating             | 15%      | 46%    |  | 27%     | 63%    |  | 34%      | 30%    |  | 21%     | 40%    |  |
| Aesthetics                  | 14%      | 57%    |  | 15%     | 53%    |  | 11%      | 72%    |  | 15%     | 45%    |  |
| Property values             | 8%       | 16%    |  | 4%      | 12%    |  | 7%       | 13%    |  | 3%      | 16%    |  |
| Tourism                     | 5%       | 17%    |  | 9%      | 8%     |  | 6%       | 27%    |  | 7%      | 16%    |  |
| Climate change              | 4%       | 5%     |  | 24%     | 4%     |  | 14%      | 0%     |  | 19%     | 0%     |  |
| Private use of public lands | 4%       | 16%    |  | 2%      | 8%     |  | 1%       | 0%     |  | 0%      | 0%     |  |
| Other*                      | 35%      | 44%    |  | 24%     | 42%    |  | 24%      | 16%    |  | 25%     | 29%    |  |
| Total*                      | 300%     | 300%   |  | 300%    | 300%   |  | 300%     | 300%   |  | 300%    | 300%   |  |

Note: \*Other is an amalgam of single digit percentage answers that were not separately coded. The total is 300%, as each respondent identified three reasons.

Table 7 compares reasons given by supporters and opponents by year and location. We include individuals who had a firm position or were leaning in the 2005 and 2009 surveys, and those who expressed a position in the 2006 Delaware survey.

#### 5.2.4. *Reasons for support in 2009*

Table 7 shows that the reasons most identified by project supporters in 2009 in both Cape Cod/Islands and Delaware are energy independence (59% and 56%, respectively) and electricity rates (53% and 62%). Interestingly, while the importance of electricity rates in decision making has been relatively stable over time, the percentages identifying energy independence as a motivating factor increased substantially, from 30% to 59% in Cape Cod/Islands and from 10% to 56% in Delaware. What do we make of the continued support of offshore wind energy on a price basis in times of cheap natural gas produced electricity? It is possible that the public is mistaken about the cost of offshore wind energy, but this seems unlikely because competing industrial interests portrayed both projects as costly (and opponents in both areas were slightly more likely in 2009 than earlier to mention electricity rates). More likely, in our view, price is mostly a positive factor because the public values wind energy for its price stability. On Cape Cod/Islands only, another possible factor could be the Cape Wind-publicised argument that its project would drive down the price of competing generators, an argument rarely mentioned in the Delaware debate. Another notable change is the sharp increase in support due to energy independence, understandable eight years into a more than decade-long conflict in the Middle East. The third highest reason for support is fishing/boating (27%) in Cape Cod/Islands, and jobs and the protection of marine life (tied at 30%) in Delaware. (Job creation was tied as the fifth highest reason and was named by only 22% on Cape Cod/Islands.) The fact that job creation was not ranked higher in the middle of a deep recession suggests that residents may not see offshore wind projects as bringing jobs to their community in the short-term or do not believe that they are likely to be job-intensive over the long-term.

#### 5.2.5. *Reasons for opposition in 2009*

Examining reasons for opposition in Table 7, two of the top three reasons given by project opponents are the same in both locations: impacts on fishing and boating (63% and 40%, respectively) and aesthetics (53% and 45%). The top reason for opposition to the Bluewater Wind project is its impact on electricity rates (49%), a lesser concern for opponents to the Cape Wind Project at 32%. Another regional difference, the second most cited reason for opposing Cape Wind – marine life impacts (62%) – is only the fourth such reason in Delaware at 37%. The most interesting trend is the increasing percentages who now object to the wind projects on the basis of anticipated impacts to fishing and recreational boating (from 46% to 63% in Cape Cod/Islands, and from 30% to 40% in Delaware), with decreasing percentages identifying aesthetics. This suggests that the reason for opposition in both places has shifted somewhat from ‘the ocean view’ to user conflicts.

#### 5.2.6. *Why previous supporters and opponents changed their mind*

A number of respondents reported a changed opinion on local offshore wind development since the time of the earlier surveys. In Tables 8a and 8b we examine

Table 8a. Self-identified reasons why opponents became supporters.

| Cape Cod & Islands         |         | Delaware                  |         |
|----------------------------|---------|---------------------------|---------|
| Reason                     | Percent | Reason                    | Percent |
| Foreign oil dependency     | 36%     | Electricity rates         | 42%     |
| Electricity rates          | 24%     | Foreign oil dependency    | 21%     |
| Marine life or environment | 17%     | Air quality               | 13%     |
| Aesthetics                 | 8%      | Jobs/economic development | 11%     |

Table 8b. Self-identified reasons why supporters became opponents.

| Cape Cod & Islands         |         | Delaware                   |         |
|----------------------------|---------|----------------------------|---------|
| Reason                     | Percent | Reason                     | Percent |
| Marine life or environment | 24%     | Electricity rates          | 40%     |
| Electricity rates          | 22%     | Aesthetics                 | 16%     |
| Aesthetics                 | 13%     | Marine life or environment | 11%     |
| Boating/boating safety     | 6%      | Air quality                | 10%     |

only those respondents who changed their minds and tabulate the direct question asking the reasons why they changed. The top two reasons, as shown in Table 8a, why prior opponents now support the projects are energy independence and electricity rates (with only their relative ranking different between Delaware and Cape Cod). For those who switched to opposition, in Table 8b, the top three reasons are effects on marine life, electricity rates and aesthetics (again common to both areas but differing in rank order).

Interestingly, the issue of electricity rates is a two-sided coin. Again, it appears that the price stability feature of wind energy attracts some citizens while others fear higher electric rates (either initially or continuing longer-term). In relation to prior literature, evidence of the NIMBY hypothesis is mixed. In both Cape Cod and Delaware, a greater percentage of those that shifted towards opposition than towards support for the local project did so on aesthetic grounds. That finding is offset in Cape Cod by the fact that a smaller percentage of the population overall shifted towards opposition than towards support. In Delaware, however, the opposite was true. Unfortunately, we cannot determine whether the Delaware finding is explained by the NIMBY hypothesis, or is simply an artifact of comparing a hypothetical project in 2006 to an actual one in 2009.

### 5.3. Transformative policy: the first project of many

Thus far, we have focused on public opinion of individual local offshore wind projects in isolation. However, introducing a new type of technology could mean more use of that technology in the future. Thus, we asked survey respondents if they would be more or less likely to support the project if it was the first of 300 such offshore wind power projects. In the question, the local project was described as potentially leading to development of a US offshore wind industry. We focus here on undecided individuals, that is, the 33% of Cape Cod/Islands and the 38% of Delaware residents who originally said they are unsure about support or opposition (even through some subsequently said they are leaning, see Table 4); only the undecided are shown in Table 9. If the project would be transformative, about 60 to

Table 9. Change in likelihood of support among the undecided if the local project was the first of 300.

| Survey Area    | More support | Less support |
|----------------|--------------|--------------|
| Cape & Islands | 61%          | 6%           |
| Sound          | 64%          | 8%           |
| DE Ocean       | 71%          | 10%          |
| DE Statewide   | 57%          | 9%           |

70% of the undecided would be more supportive while only 6 to 10% would be more opposed. More precisely, 61% of undecided Cape Cod/Islands residents and 64% of those near Nantucket Sound would be more likely to support the Cape Wind project. In Delaware, 57% statewide and 71% of ocean residents who were previously undecided would be more likely to support the project if it was the first of 300. Although we include in Table 9 only individuals who are undecided, support increases in a similar manner among the firmly supportive and the firmly opposed.

The survey question directly states that while the 300 projects would have a much more significant effect on the ocean than the single local project, those projects would yield large benefits, such as supplying half of the electricity for the Mid-Atlantic and Northeastern US, with a concomitant reduction in the nation's air pollution, dependence on foreign sources of energy, and reduction of climate change and associated sea level rise. Thus, we conclude that local residents are more willing to tolerate perceived negative local effects of offshore wind power if the sacrifice they believe they would be undertaking is for a greater purpose.

One interpretation of this potential increase in support may stem from the fact that one project in isolation may not be interpreted as having a significant impact on large problems (Firestone and Kempton 2007). However, when communities see themselves a part of a larger effort, they may be more willing to absorb the perceived social costs of the first project. Indeed, such a sacrifice may be rewarding and empowering, particularly when individuals perceive themselves as making that sacrifice alongside many others in pursuit of a common goal. This overwhelming sentiment among survey respondents provides further reason to reject the knee-jerk labelling of opponents as NIMBY – adding 300 more offshore wind projects later would not reduce the local impacts at all (Firestone and Kempton 2007).

## 6. Conclusions

Across the surveys, several trends are evident. Compared to the very high support for the Bluewater Wind's Delaware project (80% in favour or leaning towards support), the Cape Wind project has a lower level of support, but support has increased markedly since 2005, going from a minority (44%) to a majority supportive (57%). We judge the majority support among the local Cape Cod/Islands population to be an important milestone for that locally controversial project.

The divergence in local project support between Cape Cod/Islands and Delaware residents is perhaps most stark when we consider only those who expect to live in very close proximity to that project. Among Delaware ocean residents, 77% support the project, compared to only 22% opposed. In comparison, 46% of the individuals who reside in the portion of Cape Cod bordering Nantucket Sound support the project, whereas a slim majority is opposed.

In the area adjoining the ocean, those supporting the Delaware project increased from 65 to 77%. One interpretation of this increased support is that as the project became more concrete through outreach and publicity, some misconceptions were corrected, and possibly that the public began to see the choice is not offshore wind or nothing, but rather wind or other sources of electricity. In some ways, the high and increasing support of in-view Delaware residents is the opposite of a NIMBY effect.

Based on the comparisons afforded by our surveys, we conclude that support and opposition have both a geographic and social component. Project proximity and even the expected view of the project from one's home is one factor, but not an overriding one – some people who will live in view of the project are more supportive than those well out of view, another finding opposite to the expected NIMBY response.

We attempted to uncover the fundamental reasons why individuals support or oppose projects by asking them to identify issues that factored into their decisions. In both regions, concerns about recreational boating safety and the local fishing industry are the top reasons for opposition. Energy independence and electricity price (presumably referring to price stability, as the initial price is higher) are the two leading reasons for project support.

With regard to opinion shifts, prior opponents who are now supporters in both areas named foreign oil dependency and electricity rates as the top reasons for the shift. For supporters becoming opposed, the reported factors include environmental effects, boating safety and aesthetics. Another factor underlying opposition – electricity prices – suggests that offshore wind projects are correctly viewed by some as likely raising the current retail price of electricity. Since electricity price was also given as a prime reason for support, we conclude that price-based support is motivated by offshore wind power's price stability; we speculate that perhaps some are mistakenly expecting lower prices in the short term, others may value price predictability, and yet others see the price premium as reasonable. We note that the National Research Council (2010) found 3.2 ¢/kWh of non-climate-related health costs associated with coal plant emissions on average, and more than 13¢/kWh for the dirtiest coal plants while Epstein *et al.* (2011) found the full life cycle costs of coal to be between 9¢/kWh and 27¢/kWh, with a best estimate of almost 18¢/kWh. Based on such numbers, an economist would see offshore wind as less expensive in both these locations. Our point is that there are several justifications for respondents to consider the 'energy price' as an argument either in favour or opposed, and unfortunately our questionnaire did not definitively distinguish among them. In any case, it is notable that 'electricity rates' are seen by a majority in both areas as a stronger reason for support than for opposition.

When we asked residents about their expectations of negative effects, diminished aesthetics of the ocean view remains a prominent factor among Cape Cod/Island residents, although it decreased from 72% in 2005 to 57% in 2009. Concerns about impacts on the fishing industry, property devaluation, impeded boating and effects on marine life and birds are also prominent concerns regarding the Cape Wind project. For the Bluewater Wind project, the expectations of negative effects are far less severe, with smaller percentages of respondents concluding that fishermen, aesthetics, tourism and boating will be negatively affected. In Delaware, however, expectations of harm to marine life and birds rose slightly in 2009 as compared to 2006. Evaluating the public's responses to questions such as these provides specific explanations of expected negative effects, which can help target research, outreach

and educational campaigns. Research like this, and our earlier personal interviews delving into the specifics of incorrect beliefs (Kempton *et al.* 2005), can guide targeted educational processes aimed at promoting accurate public understanding.

Finally, we found that providing respondents with a wider national context for the local project has the potential to greatly increase support. When asked if they would support or oppose the local offshore wind project if it was the first of 300 such projects, many of those either opposed or undecided were more likely to support the project. This finding again calls into question NIMBY as a reason behind local opposition.

Based on the authors' understanding of the wind industry, we believe that the first projects are important and will lead to many more. Thus, more effective communication, weighing potential local impacts and the revolutionary transformations such large-scale developments can bring, could further increase support of initial offshore wind projects. Creating a sense of a contribution to developing a new technology and combating environmental and energy security challenges could broaden local considerations and debate, and potentially could even help launch a technology of national significance.

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### Notes

1. No simulated photographic views of the proposed Cape Wind facility were used in the first Cape Cod survey. However, such simulated views had been produced by the developer and widely circulated. In the 2009 surveys, we contracted with MacroWorks to create simulated views. Residents were given these along with the survey, and both locations received the same simulations. (The order of the first two simulations was reversed, however, with the first in each instance corresponding to that location's actual project distance from shore.)
2. The rest of the respondents in each survey were unsure and did not lean either way. Because the support/opposition question in the 2006 Delaware survey was presented as a hypothetical one as no project had yet been announced, we did not ask survey respondents which way they were leaning. As a result, a larger percentage was registered as unsure in 2006 (18%) than in 2009 (5%) (Firestone *et al.* 2009).
3. To elicit the respondent's prior support or opposition in the 2009 survey, we used the cognitive method of a memory jog, by naming the year we wanted them to remember and also mentioning an event in that year (in Cape Cod, the release of the Army Corps of Engineers DEIS for the Cape Wind project and in Delaware, the 2006 rate increase and legislation that led to the PPA).

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