Wind power—an assault on local landscapes or an opportunity for modernization?

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Abstract

Wind power development has produced controversies in many places. Some people see wind power as a sustainable source of energy, others see it as destroying nature and landscapes. The opposition to wind power is often asserted to be from local forces and NIMBYism, and support to be based in the national and global benefits of increased supply of renewable energy. In this paper, I challenge this view by analyzing how local communities with established or planned wind power parks went through the process of developing wind power, what arguments they used and how they think about the wind power technology and its expected local effects. I found that most of the arguments in favour of wind power development addressed local concerns regarding the economy, modernization, and employment opportunities and not a need for sustainable energy. The opposition to wind power development was not based on NIMBYism. Rather, many different arguments were used, and the features of the controversies were distinct to each community.

Keywords: wind power, renewable energy, local government, controversies, actor-network theory

Introduction

Increasing the production of energy from renewable sources is being emphasized throughout the world. These sources include wind power, which has become controversial. While proponents of wind power see it as a sustainable source of energy, opponents see it as destroying landscapes and spoiling natural settings. Bye and Solli (2008) and others have argued that a shift in opinion has taken place—from the long-held perception that wind power is environmentally friendly to the perception that it represents an unwanted intervention in nature. Also, resistance to wind power is often asserted to be local (Wolsink 2000), while support is mainly offered in terms of the national or global benefits of an increased supply of sustainable energy. In this paper, I will challenge this view by analysing how local communities with either existing or proposed wind parks conceive of this technology and its potential local effects. A main finding is that most arguments in favour of as well as against wind power had local references.

Denmark is a prime example of a country where many wind power plants have been built without controversy. This country has a long tradition of wind power development, dating from the 1890s. Many farmers had their own wind turbine, as did other farmers in north-western Europe (Vermeylen 2010). After the oil crisis in 1973, Denmark embarked on developing wind power on a fairly large scale. Danish development started with installations that generated between 20 and 50 kW as opposed to countries like Germany and the United States where they tried to construct large wind turbines. As Danish technology improved and their wind turbines increased in size (Meyer 1995), Denmark succeeded in establishing a world-class wind turbine industry (Jørgensen & Karnøe 1995; Buen 2006).

Denmark's history of wind power development, in addition to a large degree of local control and an active government promotion of wind power, laid the foundation for establishing the wind power industry that Denmark has today. Eventually, however, wind power became controversial in Denmark. Conflicts centre around noise, land use, and the visual impact of wind turbines. The Danish government has attempted to resolve these

conflicts by increasing pressure on local communities and by developing offshore sites for wind power parks (Meyer 1995).

Today, wind power development is increasing in many countries. People who were not used to seeing energy production are being confronted with the visual and environmental aspects of wind power production. Wind power parks require large amounts of space, and the turbines are visible from a great distance. These negative aspects of wind power are apparent at the same location where production takes place and may cause negative attitudes towards wind power development. Pasqualetti (2000) suggests that the opposition to wind power is related to the history of energy production. In the beginning, people used local resources, such as chopped wood or a single wind turbine, to supply their energy needs. Thus, they saw the production of the energy they used as well as the impact of this production on nature. As the demand for energy increased, energy production increased in scale, and was located farther away from where people lived. People did not see the consequences of increased energy demand and were alienated from the consequences of energy production.

The fast growth in wind power installations has resulted in an increasing number of conflicts between wind power developers and interest groups (Swofford and Slattery 2010, Kempton et al. 2005). What is the nature of these conflicts, who takes part in them, and what are the consequences? The increased number of conflicts is described as being a result of uninformed resistance and is often explained by invoking the Not In My Back Yard (NIMBY) concept, pointing to the apparent paradox between the overall positive attitude towards wind power and the protests that occur over the actual location of wind power parks (Wolsink 2000). However, the opposition to wind power is complex, and the NIMBY diagnosis has been argued to be incorrect (Aitken, 2010a) and to belittle potentially rational arguments against certain locations (Devine-Wright 2005). Moreover, local attitudes may be positive. A survey in Texas found that 46.6% of all respondents were willing to support a wind farm on their property (Swofford and Slattery 2010: 2516). For those with positive attitudes towards the project, this might be motivated by economic benefits in terms of

leases to local landowners. This suggests a need to analyze more carefully the arguments that produce positive attitudes.

Some studies find that opposition to wind power development has increased in local communities. Wind power planning is, to a large degree, top-down based, and the general trend is to prioritize the common good and fight climate change over local concerns. The burden is then put on the local communities, in terms of the local consequences to nature, to the landscape (Breukers and Wolsink 2007), and to wildlife (Solli 2010). A national interest in wind power development does not automatically translate to a local interest, which in turn makes it difficult to find appropriate locations for wind power projects (Bergek 2010).

The main conflict around wind power development relates to land use. Pasqualetti (2000) suggested that the conflict between developer and society can be resolved if the wind power industry would listen to the public and settle public opposition by making technical improvements. These improvements would include fewer wind turbines, which would be more efficient and quieter. The second step would be to place the wind turbines in the landscape so that the visible impact is reduced. The wind power developer has to consider the symmetry of the park, the construction of roads, and general maintenance in the park. Dialogue between wind power developer and the local community is important. A recent Norwegian survey showed that inhabitants in smaller communities overall was more satisfied with the level of community service. One possible reason for this difference is the smaller distance between inhabitants and politicians than in large communities. The population also tends to be more homogenous in small local communities than in larger ones (Monkerud and Sørensen 2010).

Wind power development is a complicated and controversial process. Previous studies have shown that the controversies mainly revolve around land use and changes to the landscape, and actually, most of the research has focused on such conflicts in the wake of wind power development. Fewer efforts have been made to analyse positive motives behind establishing wind power parks. Why do some local communities welcome the establishment of such a park? What arguments are used to justify the visual effect on the landscape and the area

used for the park? We need to know more about the support of wind power development to answer these questions. In this respect, local communities play an important role. In the Norwegian context, they have the last word in the process due to the present regime of license permits, which emphasizes local points of view. Consequently, the arguments used in local communities' deliberation play a vital role in the final decision to grant permits or not (Gjerald, 2012). Studying local communities and the arguments they use to support the development of wind power parks will provide new insights into the discussions about wind power development and why there may be a strong local support for wind power parks. Studies in the UK suggests the importance of participatory arrangements as well as compensation schemes (Aitken 2010b, Cass et al., 2010, Walker et al. 2010). Does this mean that local supporters of wind energy are motivated mainly by economic gains, while those opposing wind power are doing so because of environmental concerns?

From controversy to assemblages: Analyzing technology dynamics

Frequently, projects involving technology development have a potential for conflicts. The study of controversies plays an important role in the study of science and technology. I draw upon Nelkin (1992), the SCOT (social construction of technology) model (Bijker and Pinch 1984), and actor-network theory (ANT) (Latour 2005). These three perspectives provide a theoretical framework for studying how local communities think about wind power development and its expected effects. Based on her own research, Nelkin proposes a classification of controversies according to the underlying concerns, the SCOT model looks at how controversies may be stabilized and closed by shaping and reshaping technology, and finally, ANT looks at how controversies can be managed by constructing wind turbines as sociotechnical objects, emphasizing technological as well as social features of wind power.

To understand the underlying issues that shape wind power controversies, Nelkin's (1992) categorization of controversies are helpful. Her categorization was not intended as a

theoretical framework, but it provides an understanding of the dynamics inherent in different forms of controversies. Nelkin lists the following four main types, which are not to be seen as mutually exclusive:

1. Controversies that arise when science seems to challenge or threaten social or moral values.
2. Controversies that arise from tension between environmental values and political or economic priorities.
3. Controversies that arise when health hazards are associated with industrial and commercial practices. These clashes would be between people with economic interests and people concerned about risks.
4. Controversies that arise from tension between individual expectations and social or community goals. Constraints are imposed on the public to achieve a public good.

According to Nelkin, argumentative exchanges may reveal special interests and hidden motives. The study of controversies may therefore enable us to see the underlying political and moral values and ideas. With respect to wind power, we might expect most controversies to fall into category 2—tensions between environmental and economic concerns. However, supportive environmental arguments could also raise concerns related to the identity of the local community. In addition, wind power development could raise moral concerns and concerns about health hazards. Thus, we should be aware that controversies belonging to all four categories may emerge.

While Nelkin helps us to analyze the kind of concerns fuelling wind power controversies, the SCOT model of Bijker and Pinch (1989) shifts the focus to closing the technological controversies. Bijker and Pinch (1989) model the connections between the artefact (wind power development), the social groups (the proponents and opponents of wind power development), and the problems or controversies. The development of an artefact is shaped by the way the relevant social groups interpret it and their acceptance or non-acceptance.

To be more precise, a SCOT analysis first identifies the relevant social groups that are related to the artefact being studied. These groups can have a bearing on its design, and could be institutions and organizations as well as unorganized groups of individuals. The key requirement is that all members of a group share the same set of meanings concerning the artefact (Bijker and Pinch 1984:414). Social groups are relevant if the artefact has a similar meaning to all the members of a group, and if the artefact is used or influences the people in the group in some way. Describing the problems and solutions related to each artefact clarifies the development process. All controversies, technological as well as judicial and moral, along with their solutions are displayed in a scheme. The various social groups will have different opinions concerning the development of the artefact, and they will try to influence the development.

According to Bijker and Pinch (1989), the development process consists of several stages. Technological development is influenced by discussions between the social groups where the involved actors try to state their arguments. By following the development, we are able to see the artefact in varying degrees of stabilization. Eventually, the essential details and characteristics of the artefact are taken for granted and a dominant design wins the day, and the controversy is closed (Bjiker and Pinch 1989:416). Closure and stabilization can occur in two different ways—by rhetorical closure or by redefinition. Rhetorical closure occurs when an experimental result or an unquestionable argument closes the debate on a controversial issue. For example, rhetorical closure could occur if wind park technology was redesigned so that wind park installation was considered either positive or negative by all stakeholders. Redefinition of the problem closes a controversy when the meaning of the artefact, for example wind power, is translated into becoming the solution to another problem. This would be the case if an agreement was reached, e.g., to see wind power as an instrument of climate mitigation.

A third way that wind park controversies can be analyzed is by using ANT to describe the development of the actor-networks that constitutes the parties of the controversy. An actor-network consists of several actors or actants, where an actant is defined as an

individual/object or a group that makes a difference in the controversy. Actants can be members of several networks and are connected to each other through relationships that may be strengthened or weakened because of struggles inside the network as well as between networks. The implementation of new technology is affected by the ways in which networks—in our case, wind power networks—are assembled (Latour 2005). Thus, we need to ask questions like what kind of arguments are presented, how is wind power interpreted, and how are actor-networks constructed through particular assemblages of actors, arguments and interpretations? A wind park can be represented by several different assemblages depending on the context and the strategies deployed, for example, an assemblage favouring wind power development because of local benefits or an assemblage resisting development because of concern about the aesthetics of a wind farm. The resulting networks may include national and international actors as well as local stakeholders.

Local controversies may be formatted in the sense that ready-made chains of action (Latour 2005), produced by the larger society, can be used in the local context. For example, if one believes that the arguments and interpretations with respect to wind parks have become standardised, then this implies that all local conflicts follow the same pattern and re-enact well-known positions. Or are there unique features? ANT also interprets the closure of controversies as the result of trials of strength between actor-networks, where one actor-network becomes victorious over another, which is in contrast to the SCOT assumption that closure tends to be more harmonious. This shall be investigated in this paper.

In summary, I analyze how local communities engage in wind power development by pursuing three theoretical approaches. First, drawing on Nelkin, I look at the features characterizing the controversies. Second, using inspiration from SCOT, I study the efforts that were made to close and stabilize the wind power controversy, including looking for effects of the controversies on the design of the wind power installations and on the communities' relationships to the wind parks. Third, drawing on ANT, I focus on how the arguments were assembled and how the actor-networks were constructed with respect to local wind parks. Did the local controversies follow more or less the same pattern, or were

there unique features? Was closure—meaning that the question of wind farm development was decided—a rhetorical closure, a closure by redefinition, or a matter of strength?

Methodology

Only 13 communities in Norway had wind power parks up and running when I did this study, and I have used interview data collected in all of them. In-depth interviews were conducted with important stakeholders in the communities of Måsøy, Vågsøy, Frøya, and Smøla, and telephone interviews were conducted with one individual from Narvik, Roan, Bjugn, Hitra, Lindesnes, Sandøy, Lebesby, Nærøy, and Vikna. A common feature of these communities is their relative size, with a population between about 1000 (Roan) and 6000 (Vågsøy) inhabitants. The only exception is Narvik, which has approximately 18,000 inhabitants.

The interviews were conducted with "central actors". Latour (2005) uses the term "actor" to describe someone or something that "makes a difference" and can be people, animals, or objects. Central actors, in Latour's understanding, are someone or something that is important to a process, and makes a difference. Because the communities are relatively small, they are also easy to outline in terms of central actors, opposition groups and others involved in the process. In this project, central actors were participants from the local communities, wind power developers, local inhabitants, and people affected by the wind power park, including opponents. Thus, the interviewees included representatives of local administrations but also local citizens.

The interviews in Måsøy, Vågsøy, and Frøya were done in the spring and fall of 2009 in collaboration with Ingrid Øverås, a fellow doctoral candidate. We did the interviews in Måsøy together; I did the interviews in Vågsøy, and the interviews in Frøya were done by Øverås. The interviews in Smøla were done in 2005 by Tollef Bjørgen and made available through his master's thesis (Bjørgen 2005). The in-depth interviews were done with the mayor, the city manager or the local government planner, the wind power developer, local

landowners, and opposition groups in Måsøy, Vågsøy, and Frøya. In Smøla, the leader of the Headwind Association (a local environmental group that opposes wind power farms) was interviewed in addition to representatives from NVE (Norwegian Water Resources and Energy Directorate), the developer (Statkraft), and representatives from the Ministry of the Environment. In the other communities, the person with the best knowledge of the process—the mayor, the city manager, or the local government planner—was interviewed. A total of 28 people were interviewed.

The focus of these interviews was not only to learn more about the internal processes in each community but also to study the relationships between the local community and the external actors. How did actors try to assemble wind power development? This issue was investigated by conducting between four and five interviews with central actors in each local community. The central actors were selected on the basis of ANT (Latour 2005) and included the mayor, the local community manager, the local community planner, the wind power developer, local landowners, and representatives from the opposition groups. Each community was represented by different actors, depending on who had been involved in the process. The interviews lasted on average about an hour each and were transcribed afterwards.

The telephone interviews were with one person from each of the remaining communities. The people were selected on the basis of an assumption about who had the most knowledge of the process, often the mayor or chief officer of the local government. These interviews were shorter, because the purpose was to get a broad impression to confirm or invalidate the results from the four main cases.

The interviews were transcribed and analysed inspired by grounded theory. This approach uses guidelines to collect and analyze qualitative data to construct a theory that is "grounded" in the data (Charmaz 2006:2). Analysis has been done by writing drafts and memos about various aspects of wind power development for the purpose of coding. In this manner, the empirical data was processed in several stages. Writing memos and regrouping the data can reveal new connections in the collected data because it enables the researcher

to see the data in a new way. The quotes used in this paper have been translated by the author.

Overall, the debate concerning wind power development has been characterized by a relatively low level of conflict in most of the local communities. Thus, there are not any major differences in the arguments used by local community politicians, administration and the public in general.

The arguments against wind power were investigated first and then the arguments used in favour of wind power developments. How may the emerging controversies be characterised? How were controversies resolved? What actor-networks were constructed, and how were arguments deployed in the controversies?

Sources of wind power controversy: The arguments against

My initial hypothesis was that wind power development would be controversial, regardless of location. In a general sense, this was confirmed by the interviews, even if the level of local controversy was quite low in a couple of cases. The impact of wind power establishments were thought to have wide-ranging consequences and the plans for development generated discussions on many topics. In the following, these observations will be analysed in greater detail. How were controversies managed by the involved actors? What arguments did they use? Even though an element of controversy was present in all the local communities, the planned wind power development was passed by all the community councils. Did that mean that the arguments against such developments were too weak?

Related to Nelkin's (1992) categories of conflict, it was clear from the interviews that wind power development had generated a broad spectrum of concerns with respect to how wind power parks would affect the local community. A main conflict was the impact on birds and wildlife. Conservationists at Vågsøy were concerned about the location of the wind power park because that area had large deposits of costal moors. In addition to the

landscape and the fauna, there was a large bird cliff just below the planned wind power park. Prominent reports (Kuijken 2009, Follestad et al., 2007) of sea eagles colliding with wind turbines also made this an important issue for the local community:

> *What one was concerned about, was how it would look in relation to tourism. It was aspects related to birds, and if it would be an obstacle to ... There is a bird cliff sanctuary out there—if [the wind power farm] would affect [the bird sanctuary] and kill a lot of birds.*[i]

This concern led those who were against wind power to focus on the effect of a wind power farm on bird life, and seeing it as a threat to sea eagles in particular. The conflict was a tension between environmental values and political or economic priorities, where opponents of wind power were afraid that bird life would be sacrificed for the wind power park, prioritizing economy before nature.

> *We have a relatively large population of sea eagles at Frøya. Just half an hour ago, I was out checking my boat; I saw a large sea eagle flying across the bay. No, as I said before, it [wind power] doesn't belong here in the nature at Frøya. The topography is low, and if the wind turbines are supposed to be placed at the highest peaks they would be very overpowering.*[ii]

At Hitra, there were concerns that deers would leave the area where the wind power park was located.

The main group that opposed the wind power park at Smøla was the hunting and fishing association—one member later became the leader of the Headwind Association.[iii] Their main concern was for the wildlife, and in particular for a large population of sea eagles nesting at Smøla. The local newspapers provided the platform for much of the debate, mostly between the mayor and the Headwind Association. Sea eagles were the main argument of those against the wind power park.

Another concern was the effect of a wind power park on tourism. At Frøya, tourism was beginning just as the park was being planned. Most tourists visiting Frøya go sea fishing, and would therefore have a clear view of the wind power park. A representative from the tourist industry had already received reactions from tourists on the wind park at Smøla, which is visible from Frøya.

> *I get quite a lot of reactions from my guests when I take them out to the sea. On the horizon, they can see something, and they ask me what it is. And it's Smøla, right in the southwest; it has a large wind power park. Smøla is quite flat. When we leave the harbour at Titran, and the view is good, all we can see close to the sea level is the wind power park. I have to say, it's not the prettiest horizon, to have an industrial park in the middle of a picturesque area.*[iv]

At Lindesnes, the park was proposed by a local landowner who established a company to develop it. After the park was operative, he wanted to expand, but his proposal was protested by the community. The main concern was tourism, as Lindesnes has about 80,000 tourists visiting each year. The landscape is flat, and the wind turbines would be very visible.

> *I'm not sure if there has been any conflict, but as I mentioned in the beginning, we are a little afraid of ruining the image that Lindesnes lighthouse and the area have, by overloading it with too many turbines. This has been the main objection against having more; it is related to tourism.*[v]

There was little controversy with respect to fear of pollution; Frøya was the only place where this was an issue. The main argument of the opposition group was that Frøya's water source was located in the middle of the planned park.

> *We want to have a clean tourist industry. We don't want any external influences on the tourist industry. We are going to sell fish from Frøya that is not contaminated. It's obvious that when we place wind turbines next to a source of drinking water, if there are oil spills …, diesel and fuel will flow directly into the drinking water.*[vi]

As a result, wind turbines were moved away from the water source. In addition to the possible pollution, Perikum, an opposition group at Frøya, was concerned about noise and visual impacts of the wind turbines.

> *They (Perikum) arranged brainstorming sessions in order to come up with negative consequences and all that. The only argument of the opposite part [those in favour of development] was that it supported the local community financially—that was the main argument, but nobody said it looked nice. Here we actually had a stable income for the local government. It was very positive in that respect. And then, you know, it was brushed aside saying that here are all the cynics, just thinking about money and not caring about the rest of the community.*[vii]

Overall, the main controversies and the main arguments against wind power development in the local communities were the visual impact of the wind power park, fear of noise from the park and concerns regarding land use. At Måsøy, national plans that would designate the road through Måsøy as being part of the "National Tourist Roads"—roads that pass through the best parts of Norwegian nature[viii]—were jeopardized because of the proposed wind power park. The mayor, however, argued that the wind power park showed Måsøy to be a community of activity and development, and not a "preserved" community. Thus, the road became part of the tourist road project. Some people who no longer lived in Måsøy opposed the park because of its visual impact, especially from the local community centre.

> *It's classic. Places, where we have our holiday cottages and vacation properties, are places where we want time to stand still. We want everything to be as it always has been. Where we live, we want development, and things happening.*[ix]

This opposition, expressed as a fear of visual impact, can also be interpreted as a fear of change and a wish to keep the landscape and surroundings the way they always have been. This is particularly evident when it is expressed by former residents with emotional attachment to the place.

The national roads project wanted tourists to see Måsøy as a small, picturesque village and was selling that picture of Norway. The mayor, however, had a different opinion of what Måsøy should look like— an alive, innovative place—and used wind power in Måsøy to symbolize a transformation of the village from being based on traditional fishing industry to hosting a high-tech industry.

At Vågsøy, there were protests from conservationists, mainly outside the local community and especially from a neighbouring community, where the wind power park would be more visible. They argued that a protected landscape area, including an old monastery across the fjord, would be damaged by the presence of the wind turbines. A few negative reactions from the locals, which focused on the visual impact, have mainly been because the park was located in a recreation area. Still, the head of the local tourist association was positive because the wind park and the new road make the area more accessible for people.

During the planning of a wind power park at Bjugn, there were yet another set of concerns. The park was planned close to private houses and vacation homes. The worries were mainly related to shadows and ice from the rotating blades, the wind turbines scaring fish in the ocean, and so on. Owners of the vacation homes protested, but the local inhabitants were more positive, and the protests were not taken into consideration.

The wind power park at Måsøy is located close to the community centre. Local inhabitants were worried about the visual impact of the park and how it might damage the landscape. This was an important concern since the location of the wind power park was close to people's homes. People living in the area were mainly worried that the noise from the turbines would disturb people hiking in the area as well as those living in the homes closest to the park.

The arguments regarding landscape and birds can be placed in Nelkin's (1992) category of controversies that arise from tensions between environmental values and political or economic priorities. Wind power development would, in many people's opinions, jeopardize nature and wildlife for the sake of providing extra income to local landowners.

During the process at Frøya, there was considerable division both among inhabitants and in the local council, with fractions in all the political parties. Early on, several people in both administrative and political positions put forward their personal views concerning the planned wind power park. This provoked many people in the community who thought that the administration was uncritically positive towards the wind power plans even before the impact assessment had been finished. The majority of people thought the reason for this was the economic compensation offered to the local community and local landowners if the wind power park was established. This seemed to have made the conflict worse, because people in favour were accused of being bought off:

> *People who were negative in the beginning—some politicians—were bought off by NVE [Norwegian Water Resources and Energy Directorate] and TrønderEnergi [energy company developing the wind farm] on the basis that the local government would receive 8 million Norwegian krone each year as compensation for the land used for the wind power park. It's obviously business for them; the local government receiving the money, but those affected were the people living at Frøya who would have to live with the pollution, the visual pollution.*[x]

Narvik got some objections from the Reindeer Husbandry and the Central Office of Historic Monuments, the latter concerning some cultural monuments not far from the park. The former was resolved through an economic agreement with the Reindeer Husbandry. The objection from the Central Office of Historic Monuments was appealed to the department, where it was rejected.

Opposition at Frøya used a broad set of arguments against the wind power park. The planned park was considerably larger than the parks at Måsøy and Vågsøy. The arguments reflected the broad impact the wind power park would have on the local community, both in terms of nature and wildlife, and economy and activity. At Hitra, the debate was never particularly agitated, according to the local community planner. An agreement in the local community may have contributed to keeping the level of conflict low. Local politicians and

the administration agreed to not go public with their view on the wind park before an impact assessment had been done.

> *I think that in other places where mayors, for example, go right out and say "We want wind power," no matter what, they provoke the environmental organizations and make the frontlines much harder than necessary".*[xi]

Table 1 summarizes the arguments that were used to oppose wind power. As we see, all four of Nelkin's (1992) categories are represented. The table indicates that some arguments were more widely used than others: visual impact and risk of noise and land use were the two most commonly employed arguments, with concern for birds and wildlife in third place. Thus, the main controversy revolved around how the land, the landscape, and nature should be used. Should local communities prioritize industrial development and growth, or should they preserve nature untouched? In most communities, two or more of the critical arguments were voiced, but only in one case were all of them observed. Moreover, no one argument was used in every community—visual impact and risk of noise was found in 9 out of 13. Consequently, we conclude that the local controversies were not formatted in Latour's (2005) sense—they had unique local features.

Did the critical arguments impact the design of the wind parks? According to our interviewees, this was not the case. Apparently, there were no efforts to achieve rhetorical closure of the controversies. Only at Frøya did we find a visible actor-network had been established to oppose wind power development. In the other local communities, resistance was not translated into an organization. Arguably, this meant that resistance was not very strong.

Table 1. Main types of arguments that opposed wind power and the local communities where they were used.

Arguments / Local communities	Birds and wildlife	Tourism	Pollution	Visual impact / noise	Use of area / interventions / cult. monuments	Number of arguments used in the local community
Måsøy	X			X	X	3
Vågsøy	X	X		X	X	4
Smøla	X			X		2
Sandøy				X		1
Lebesby					X	1
Roan				X		1
Bjugn	X			X		2
Lindesnes		X		X		2
Hitra	X				X	2
Frøya	X	X	X	X	X	5
Vikna					X	1
Narvik				X	X	2
Nærøy				X	X	2
Number of communities in which the argument was used	6	3	1	10	8	

The general impression was that the opposition to wind power development in these local communities was not strong enough to stop the projects, with the possible exception of Frøya where national authorities may refuse to approve the development application due to the substantial local resistance. However, the development of wind power raises many locally embedded concerns as well as more general issues with respect to nature. These concerns are evidence of the precariousness of wind power developments and how such developments may be seen to permeate a wide set of issues and concerns.

Sources of wind power controversy: The arguments in favour

The obvious argument in support of wind power is the need for more sustainable production of energy. More sustainable production may be relevant to the community if there are local energy needs, but usually this argument means that local communities need to serve national interests. Thus, controversies are commonly framed in terms of national advantages and local disadvantages. However, as we shall see, this may be too simplistic. Actually, many local interests and concerns seem to be well served by developing wind power, without referring to what might be seen as a national or an environmental responsibility. How was this articulated?

First, claims about economic benefits were an important argument in many of the communities. These communities were small, coastal municipalities. Several of them faced a decreasing population. For these communities, the income from a wind park would often make a considerable contribution to their economic situation. This could serve as an important argument and the basis of a strategy towards mobilizing support for the development project. Wind power could be assembled as a solution to difficult local problems.

At Lebesby, the local government initiated development of the wind power park by contacting Statkraft and inviting them to inspect the location. The local government had been looking for new industry and thought that the income from a wind power park could become important. Overall, the park has generated about 50 million Norwegian kroner [about $ 8,3 million] in local income. All of the communities included in the study expected some income to be generated as a result of a wind power park, as property tax, as a direct settlement between the local community and the wind power developer, or indirectly as increased activity in local businesses.

> *We see a development [of a wind park] as a great opportunity for development of local industry. This would create effects in our local community, and maybe even more important, it would create effects in the outskirts of our local community.*[xii]

The large wind power park at Smøla was expected to generate income as well as to counteract depopulation. At Smøla, however, the actors used different argumentative strategies. The two main actors in the debate were the mayor and the Headwind Association. The mayor, on behalf of the local government, had worked hard to "get" the wind power park; his focus was on the local community and the perceived benefits from the park. The mayor described Smøla and other local communities as being in a competition, with the wind power park as the "prize". His arguments emphasized the advantages of a wind power park. The local government believed that it had a strong enough position so that it could set the terms on which it dealt with the wind power company:

> *From the first day, we grabbed hold of the process and felt that we were part of it. We were involved, and had thoughts of how the process should work, and contributed to meetings, both with local people and with others.*[xiii]

Local governments that encouraged wind power development also supported more generally "new things" and activities in their community. Interviewees from these administrations mentioned increased possibilities for new and existing businesses and industries, which included hotels and other non-engineering companies.

> *Basically, the local communities are very poor; receiving 2–3 million Norwegian krone in property tax each year [from the wind power company], that is very important. Clearly, it's a very big carrot for local communities, and one of the reasons why one is tempted to go out and compete for wind power.*[xiv]

At Måsøy, the local government saw the wind power development plans as an opportunity to establish new jobs in the community. Expanding the labour market with high-skill workplaces had been an important goal for the local government for a long time.

> *It was part of our strategy to emphasize that it would increase employment here. We are talking about three or four [workplaces] after the park became operative, and high-tech workplaces. ... Instead of gambling on the fishing industry, we wanted other forms of labour as well. In that respect, this was actually spot-on.*[xv]

The community at Vågsøy supported the wind power park for several reasons. The industrial culture at Vågsøy, traditionally based on shipbuilding and fisheries, made the citizens more familiar with the visual aspect of wind power development; it was considered an industry and not visual pollution, or an "eyesore". The local community administration and local politicians were focused on developing new industry to support the wind power development. The local community did not have high expectations concerning what the wind power park in itself might bring along in terms of employment. The focus was future possibilities, particularly with respect to offshore wind, and how local industry and trade might benefit from having a wind power park in the area:

> *The fact that the wind power industry had its eyes on Vågsøy and saw what happened here makes it easier for companies who want to work with large producers [of wind power]; it shows that we take wind power seriously. In a lot of places I think [the attitude toward wind power development] is ironic, and something that Sogn and Fjordane need to think about carefully. We want employment related to wind power, we want to produce, but we don't want the wind turbines. We think they are ugly and don't want them around, but we want to make money out of them. I think there is a close link—having a positive attitude to renewable energy and having it in the local community, I think, makes it easier for local companies who want to work with the wind power industry.*[xvi]

The local community, including the mayor, believed that local businesses could be used to fill the supply needs of the wind power industry in the same way that myriad businesses are involved in the supply chain of the petroleum industry. In the future, offshore wind was expected to generate at least as much activity onshore at Vågsøy.

For example, the wind turbines need to be transported to the location of the wind power park, which will often require some sort of new infrastructure. Usually, the turbines will be shipped by boat to the nearest port, and then transported by truck to the park. A new port may need to be built, or an existing one improved. The road from the port to the park has to be wide enough for the truck, and often, some parts of the road will have to be improved.

All this will usually contribute to growth and development for the local community, making it more accessible. Also, the effect on local trade, in the form of increased activity and new labour is important.

These improvements are expensive and would be difficult to achieve without a wind power developer willing to pay for some of them, like upgrading of roads. Most of these local communities are fairly poor and unable to make such investments on their own. In this respect, the development of wind parks may represent an important contribution to the modernization of the local community. At least, this is how it was perceived, in particular by local government representatives.

In cases where there were local landowners, they usually received payment as a rent for the land where the wind power park is located. A one-time payment when the park was made operative was common, and an annual rent afterwards. For local farmers, this represented a considerable addition to the income from the farm itself, and in many cases made the difference between profitable and non-profitable farming.

At Frøya and Vågsøy, local landowners voiced their support of the wind power park to their neighbours as well as to the local community administration and the politicians. At Vågsøy, the developer felt the approval process was relatively easy not only because the farmers were a strong group, but also because the local community administration and the politicians saw wind power as an industry comparable to farming. In 2009, landowners in a different part of the community contacted Kvalheim Kraft – a wind power development company – about constructing a wind power park in their area because they observed the benefits from the park at the neighbouring parish at Kvalheim;

> *In cases like that, local landowners can put a great deal of pressure on the local government. It's a new way of using outlying fields, and it provides enough money to make it more attractive to farm. And in these areas, farming is not profitable. That's why the process is so much easier in places where you have local landowners on your side.*[xvii]

Interestingly, the argument that wind power is a renewable form of energy was not important. Some local communities considered sustainability to be a positive side effect but it was not a major reason to develop wind power.

Table 2 summarizes the main arguments in favour of wind power and the local communities in which they were employed. Again, the arguments forwarded are surprisingly diverse. The majority of the communities emphasised increased employment opportunities, but economic benefits and modernization acts like the building of new roads were also mentioned. Thus, the main motive for supporting wind power development was related to a perceived need for economic development of the local community. Compared to Table 1, the arguments used to support wind power development were more homogeneous, even if the wind power controversies had distinctly local features.

Table 2. Main arguments in favour of wind power and the local communities in which they were used.

Arguments / Local communities	Economic benefits	Modernization	Employment / new industry	Local landowners influence	Local communities own initiative	Green energy	Number of arguments per local community
Måsøy		X	X			X	3
Vågsøy			X	X		X	3
Smøla	X	X	X				3
Sandøy					X[1]		1
Lebesby	X		X		X		3
Roan	X	X	X				3
Bjugn			X				1
Lindesnes	x		x				2
Hitra	X		X				2
Frøya	X	X					2
Vikna	x	X	X			X	4
Narvik	X	X	X				3
Nærøy	X		X				2
Number of local communities in which the argument was used	9	6	11	1	2	3	

The overview in Table 2 clearly represents a powerful assembly of arguments for carrying out wind power development. Using Latour's (2005) terminology, we see how actors on each side of the controversy tried to link wind power to actants that could help strengthen their position. The positive assemblages were, above all, characterized by associations to modernization and economic development of the local community, which largely won the day. We saw how local government formed actor-networks that became strong enough to close the controversy over wind power development.

[1] Securing energy supply

Wind power as local modernisation

Wind power development is controversial. All the local communities analysed in this paper had at least some opposition to wind power. Often, such protests are thought to be an expression of NIMBYism, as a conflict between national needs and local interests. However, as we have seen, the observed controversies with respect to wind power development need to be characterized in a different way. The findings from the interviews contribute with new insight concerning the positive arguments of wind power development. Where former research to a large degree has focused on local opposition, this paper has identified positive arguments in support of wind power development. Interestingly, these arguments mainly refer to local rather than national benefits.

Previously, I referred to Nelkin's (1992) classification of scientific and technological controversies into four categories: (1) social or moral values, (2) tension between economic and environmental concerns, (3) health hazards, and (4) tension between individual and community goals. As expected, arguments belonging to the second category were mentioned most frequently. However, there were arguments belonging to all four categories. This is evidence of a considerable range with respect to the flexibility of interpretation of wind power technology but even more so of the local quality of the controversies. I expected the controversies to be prescribed (Latour 2005) and thus display very similar features across the different communities. This was, as already indicated, not supported by the empirical evidence that shows variation rather than similarity. Probably, the local differences in the way the controversies played out reflect variations in what are considered valuable aspects of local nature as well as variations in the way in which wind power development was managed by the local authorities. Interestingly, all the local governments supported the establishment of wind parks and, with the possible exception of Frøya, succeeded in closing the controversies in favour of developing a wind park. How come?

We saw previously how the SCOT model suggested two ways in which technological controversies may be closed, either by rhetorical closure or closure by redefinition of the

problem (Bijker and Pinch 1984). Rhetorical closure could happen if wind power technology was changed in some way to accommodate arguments against the establishment of wind parks. However, no such technological changes were observed. Minor adjustments were made, but nothing that influenced the size or design of the wind turbines and the way the wind park was fitted into the landscaåe. The alternative according to SCOT was closure by redefining the problem with wind parks as the solution to another problem. I expected such redefinition through an emphasis on wind power as a climate mitigation strategy. However, such arguments were not important in the local controversies. Rather, redefinition seemed to happen through the argument that, wind power provided a solution to the challenges of local economic development. We do not know to the actual effect of this redefinition on local opinion. Here, more research is needed.

Turning to ANT, we could understand closure as related to the construction of actor-networks focused on wind power development. The main pattern in the local communities was that either local entrepreneurs or the local administration or both played an important role in establishing a relatively strong actor-network that supported the establishment of a wind park. In doing so, they made links between wind power development and positive effects on the local community, such as increased income, industrial development, and the possibility of counteracting depopulation. In this way, the wind turbines were made into modernization hybrids, representing a tempting opportunity for the inhabitants. Economic benefits, new jobs, and industrial development seemed to be the most important arguments in favour of wind power development. Proponents of wind power development assembled wind power as a solution to many important problems that the local community was facing.

On the other hand, the arguments against wind power, like the references to birds and wildlife, visual impact, and land use, were not used to assemble an organized, oppositional actor-network. The opposition group at Frøya was the only exception. Thus, closure of the controversies was an effect of the relative strength of the actor-networks favouring wind power. Again, Frøya is the important exception where the Headwind Association was

nearly as strong as the actor-network constructed by the local administration. Here, closure was not achieved.

Wind power in the local communities did not become a sustainable energy assemblage. Climate issues and the environmental friendliness of wind energy was not the focal point. Rather, wind power was constructed as a modernization assemblage. As such, it seems to have been persuasive.

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[i] Interview with the mayor, Vågsøy, page 3.

[ii] Interview with a politician and representative from the tourist industry, Frøya, page 3.

[iii] The Norwegian name is "Motvindaksjonen".

[iv] Interview with a politician and representative from the tourist industry, Frøya, page 1.

[v] Interview with the planning and environmental manager, Lindesnes, page 4

[vi] Interview with the leader of the opposition group, Frøya, page 2.

[vii] Interview with the former local government planner, Frøya, page 7.

[viii] Turistveg.no

[ix] Interview with the mayor, Måsøy, page 9.

[x] Interview with the leader of the opposition group, Frøya, page 2.

[xi] Interview with the former leader of local government planning, Hitra, page 2.

[xii] Interview with the mayor, Vikna, page 3.

[xiii] Interview with the mayor, Vikna, page 1.

[xiv] Interview with the former leader of local government planning, Hitra, page 4.

[xv] Interview with the local government planner, Måsøy, page 8.

[xvi] Interview with the general manager of Måløy Vekst, Vågsøy, page 5

[xvii] Interview with the project manager Kvalheim Kraft, Vågsøy, page 11.