ELSEVIER

Energy Policy 32 (2004) 2049–2066

ENERGY POLICY

www.elsevier.com/locate/enpol

Implementation of wind energy in the Netherlands: the importance of the social–institutional setting

Susanne Agterbosch*, Walter Vermeulen, Pieter Glasbergen

Copernicus Institute for Sustainable Development and Innovation, Utrecht University, P.O. Box 80115, 3508 TC Utrecht, Netherlands

Abstract

This paper analyses the differences in performance of the different types of wind power entrepreneurs now active on the wind power supply market in the Netherlands. The development of the market is divided into three successive market periods: *Monopoly powers* (1989–1995), *Interbellum* (1996–1997) and *Free market* (1998–2002). For each of these periods, the interdependency between various systemic conditions—technical, economic, institutional and social conditions—is analysed, with the focus on the relative importance of the institutional and social settings for market development. This interdependency is analysed using the implementation capacity concept. Implementation capacity is defined as the total of those systemic conditions and mutual interdependencies that influence the behaviour of wind power entrepreneurs. It indicates the feasibility for wind power entrepreneurs to adopt wind turbines. From the analysis it was concluded that no overall implementation capacity exists, and implementation capacities differ for entrepreneurial groups with different entrepreneurial features. With respect to the relative importance of institutional and social conditions, it became clear, that it is mainly these conditions that differentiate between the various entrepreneurial groups. The dynamic configuration of institutional and social conditions facilitates some and hinders other types of wind power entrepreneurs, and as a result determines the development and composition of the market. Finally, the analysis explains the changing roles of entrepreneurial groups throughout the 1990s.

Keywords: Wind power supply market; Implementation capacity; Wind power entrepreneur

1. Introduction

Once a pioneer in the area of wind energy, the Netherlands is now lagging behind compared to the countries that make up the current main markets in Western Europe, namely Germany, Spain and Denmark. This is not because of lack of aspirations or ambitions. Like most European countries, the Netherlands has set clear targets with regard to the minimum share of renewables in the total energy supply in future. The Ministry of Economic Affairs (1995) stated its goal of 10% renewable energy by 2020. For wind energy, an ambitious goal of 1000 MW by the year 2000 had already been formulated in 1985—this goal was maintained as the official basis for wind energy policy until 2000 (Wolsink, 2000; Verbong, 2001). Implementation, however, turned out to be a laborious process.

Various studies have been carried out on this topic, both to explain current implementation rates and to predict future implementation rates. Studies on wind energy potential and future implementation rates commonly stress economic and technical conditions—meteorological conditions, grid connection, and energy prices for competing resources—as crucial factors for implementation (Hilten et al., 1996; Ybema, 1999; Cleijne et al., 1999; Voogt et al., 2001). Although these studies mention and sometimes even stress the importance of other characteristics like government policy and the attitudes and behaviour of relevant policymakers, government authorities and private players, they are not incorporated into the models used to calculate future potentials and penetration rates. The effects of government policies are only taken into account insofar as they have an effect on quantifiable economic feasibility (Junginger and Agterbosch, 2003).

Studies on implementation rates that have actually been achieved cite different conditions to explain lagging implementation. Often, resistance to wind turbine siting has been explained by the NIMBY argument (Berenschot and Paardekooper, 2000; Krohn and Damborg, 1999) or by local public resistance (Blom

*Corresponding author. Tel.: +31-302532312; fax: +31-302532746.
E-mail address: s.agterbosch@geog.uu.nl (S. Agterbosch).

0301-4215/03/$ - see front matter © 2003 Elsevier Ltd. All rights reserved.
doi:10.1016/S0301-4215(03)00180-0

et al., 2002; Verheij and Hoeve, 2002). Wolsink (1996, 2000) on the other hand, states that institutional constraints play a more important role in this than the lack of public acceptance. Another study (Enzensberger et al., 2002) focuses on the neglect of the interests and requirements of important stakeholder groups as criteria for policy instrument selection for wind energy stimulation. In addition, numerous policy reports stress things like lengthy and complex planning processes and approval procedures, lack of financial incentives and a lack of administrative capacity as reasons for disappointing implementation results (de Jong, 1999; Ministry of Economic Affairs, 1997, 2002; Blom and Klimbie et al., 2002; Verheij and Hoeve, 2002).

A variety of valid but partial explanations for current and future implementation rates have clearly been put forward.

Identifying and promoting a reliable and continuous wind power supply market is a crucial step in the implementation process: after all, without entrepreneurs and continually taking initiatives and risks, implementation will not take place. The development of this market can be explained by many systemic conditions, namely technical, economic, institutional and social conditions. In this paper, the coincidence between changes in the configuration of these conditions and the emergence and performance of different categories of wind power entrepreneurs on the Dutch wind power supply market in the 1990s is analysed. We differentiate between different categories of entrepreneurs with different entrepreneurial features—a new approach to analysing the Dutch wind power supply market. With this approach, we aim to improve the understanding of the development and heterogeneity of the market. In particular, the analysis emphasises changes in institutional and social conditions. We attempt to answer the following principal question: *What is the relative importance of the dynamic configuration of institutional and social conditions for the emergence and performance of important entrepreneurial groups on the wind power supply market in the Netherlands?* This question will be answered using the implementation capacity concept.

The paper is organised as follows. In the next section, Section 2, we introduce the concept of implementation capacity. After that, in Section 3, the results of a quantitative analysis of the development of the wind power supply market in terms of the main entrepreneurial groups in 1990s are presented. This quantitative analysis leads to a division of the period 1989–2002 into three successive but distinct market periods, which are described in Section 4. This is followed, in Sections 5–8, by an analysis of the implementation capacity for the main categories of wind entrepreneurs in order to explain their emergence and performance during the three different market periods. Finally, in Section 9, we conclude with a reflection on the main findings with regard to important shifts on the wind power supply market.

The analysis is based on interviews with key stakeholders on the Dutch wind power market, including senior policymakers at different ministries, civil servants at both provincial and municipal levels, different wind power entrepreneurs and renewable energy consultants. The analysis is accompanied by an extensive literature and document study. Data on the number of projects, turbines, and total capacity installed are based on the KEMA wind monitor, and are complemented with data from Wind Service Holland.[1]

2. Implementation capacity

The process by which projects diffuse and are implemented in society can be studied from different perspectives. In the case of wind energy, an integrative perspective is needed, in which different systemic conditions affecting implementation are seen as one societal system. Such a systemic approach is fruitful because of its focus on the relative importance of these different conditions for the origination and composition of the market. By studying the characteristics of this system, along with the background of the entrepreneurs attempting to implement a specific product such as a wind park, it will be possible to analyse its potential, bottlenecks and dynamics in the implementation process, and we will be able to estimate the relative importance of different systemic conditions (Jacobsson and Johnson, 2000, p. 629; Carlsson et al., 2002).

These conditions must not be seen as merely complementary explanatory factors for the emergence and implementation of new wind power projects. An important factor to be stressed is their mutual interdependency, implicating multi-causal explanations. In this paper, this mutual interdependency is analysed with the help of the implementation capacity concept. *Implementation capacity* is defined as the total of relevant systemic conditions and mutual interdependencies, and indicates the feasibility for wind power entrepreneurs to adopt a technology (wind turbines). It makes possible to explain, in comparative terms, the changing possibilities over time for different categories of entrepreneurs.

Implementation capacity consists of four clusters of direct conditions and two clusters of indirect conditions. The four clusters of direct conditions are as follows. First, *technical conditions* like wind speed at a given site, capacity of the turbines, rotor diameters, and height. Second, *economic conditions*, which are conditions

[1] KEMA registers the energy yields of Dutch wind turbines under the authority of Novem: the executive office of the Ministry of Economic Affairs.

connected with the economic feasibility of a project. A variety of fixed costs for investment (costs for turbines and grid connection) and exploitation costs (maintenance and insurance costs) determine this economic feasibility. Third, *institutional conditions*, which are more or less solidified expectations or obligations that pattern the behaviour of stakeholders. In this paper, institutional conditions are obligations to be met that are related to definitions of renewable energy, spatial planning procedures, building and environmental permit procedures and national and international laws.[2] And fourth, *social conditions*, which are conditions resulting from cooperation between and the interests, behaviour and power position of the stakeholders involved (wind power entrepreneurs, government authorities, grid regulators, landowners, environmental organisations and local residents). Implementation of institutional conditions or the way different stakeholders deal with prevailing institutional conditions is part of their behaviour and because of this part of the cluster of social conditions. In this paper, we explicitly focus on the behaviour of different types of wind power entrepreneurs.

In addition to the direct conditions, we have to consider two indirect conditions. The first one, *government policy*, includes all legal, financial and communicative instruments in the renewable energy field. It is assumed that changes in these instruments influence the direct conditions in various ways. In other words, government policy is an important source of intended and unintended change. Two aspects are important with respect to government policy. First, government policy consists of four interconnected policy layers: municipal, national, provincial and European Union (EU) policies. Policymaking at higher levels of government institutionally restricts policymaking at the lower levels. In this paper, we focus on national-level policy to explain the behaviour of different categories of entrepreneurs, and by doing so also the development of the Dutch wind power supply market. Second, policy does not arise in a vacuum but is shaped in interaction with stakeholders. This aspect is not investigated in detail in this paper.

With regard to the second indirect condition, the implementation process itself is embedded in and therefore influenced by *the wider societal context*. This context consists of conditions that cannot be influenced by the individual stakeholders involved. A clear example of such a condition is the price of electricity produced from fossil fuels, which is determined to a large extent by world coal and oil prices and geopolitical developments. It influences the feasibility of wind power projects but cannot be influenced by stakeholders in turn.

Changes in one cluster of conditions may result in a domino effect, with changes in one systemic condition affecting others. In the end, this results in improvement or worsening of the *implementation capacity* for different entrepreneurial groups, thus explaining the development of the market.

3. Main types of wind power entrepreneurs in the 1990s

In this paper, we illustrate the importance of analysing wind power implementation from the perspective of varying entrepreneurial groups under changing systemic conditions. One thing should be said about this distinction in different entrepreneurial groups. During the period 1989–2002, 26 projects, 50 turbines and 42.2 MW were realised in joint ownership, which amounted to 3.2% of all turbines and 5.9% of the total capacity installed during those years. More projects were realised with the help of a professional wind power developer or outside expertise.

However, the focus in this paper is on ownership, and in this respect, the market and the distinction between different entrepreneurial groups gets less transparent. Nowadays, it is not unusual for projects to be installed in joint ownership between energy distributors, farmers, cooperatives, and new wind power producers. The increased competition for good wind sites, the increase in the scale of wind power projects and clustering policy force entrepreneurs to cooperate for different reasons. For example, energy distributors need to cooperate with farmers because they lack the required site locations on land, and farmers need to cooperate with distribution companies and new wind power producers because they lack expertise and finances. Also, local authorities sometimes demand cooperation between different entrepreneurs.

In this paper, if a project is realised by a joint venture, the assignment of this project (or the number of turbines involved) to particular entrepreneurial groups takes place based on proportion of ownership.

Having said that, we will move on to the final decade of the twentieth century, where we can see major changes to the market structure.[3] In the 1990s, four

[2] The term 'institution' is surrounded by conceptual ambiguity. Different authors mean different things when they use the term. The term is used in two main senses. First, as 'things that pattern behaviour' like norms, rules and laws (the sociological viewpoint), and second, as 'formal structures with an explicit purpose', i.e. organisations (the science of public administration viewpoint) (Edquist, 1997, pp. 24–26, parentheses added).

[3] With respect to the wind power market, two interrelated but different markets can be distinguished: the wind turbine manufacturing market and the wind power supply market. The number of Dutch wind turbine manufacturers decreased from 12 in 1986 to three in 1991 to only one in 2000. This unsuccessful development of the Dutch wind turbine industry has been explained and described in detail by several other authors (Kamp, 2002; Johnson and Jacobsson, 2002; Verbong, 1999), and will not be considered any further in this paper.

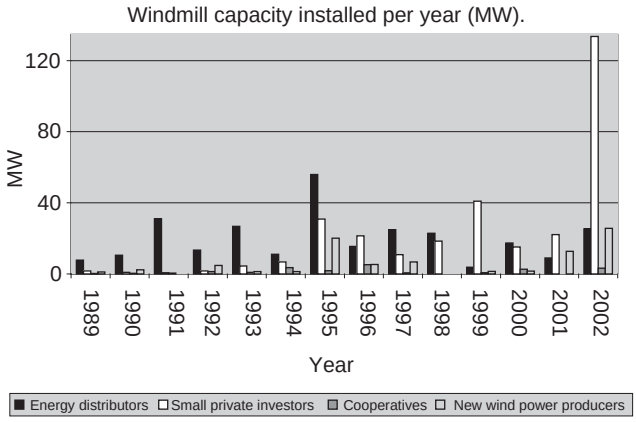

Fig. 1. Windmill capacity installed per year (MW). (Sources: KEMA, 2002/2003; Wind Service Holland, 2002/2003.)

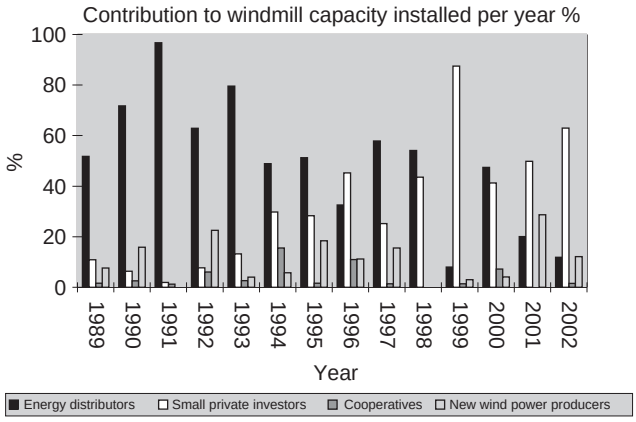

Fig. 2. Contribution to windmill capacity installed per year (%). (Sources: KEMA, 2002/2003; Wind Service Holland, 2002/2003.)

different types of wind power entrepreneurs were active on the wind power supply market[4] (Figs. 1–3):

- *Small private investors* (mainly farmers): Wind power exploitation is a supplementary income for this entrepreneurial group. Their core business lies outside the energy sector.
- *Electricity sector* (energy distributors): Wind power exploitation is a small but growing business component in these companies. Their core business is producing and selling a portfolio of (renewable) energy sources.
- *Wind cooperatives*: For this entrepreneurial group, wind power exploitation is not a means of making money, but a device to use in working for a sustainable society.
- *New independent wind power producers*: Wind power exploitation is a (new) part of their core business, which is most likely related to the renewable energy sector.

The electricity sector and small private investors or farmers dominated the wind power supply market during this decade. Comparing them on the basis of the number of turbines installed and the number of projects and the total capacity that was installed (Figs. 1–3), one comes to the conclusion that while the contribution of small private investors increased, the role of the electricity sector decreased in importance. In terms of the number of projects realised, small private investors dominated throughout the 1990s. As far as the number of turbines and total capacity installed are concerned, a dominance of the electricity sector up to the middle of the 1990s can be seen. In 1994, the number of turbines installed by small private investors exceeded the number of turbines installed by the electricity sector for the first time. In 1996, the same applied to total capacity installed. From 1997 and 1998, small private investors dominated the market in all three areas: in the number of turbines, the number of projects and total capacity installed annually.[5] Over the last few years, small private investors did catch up to—and in 2002 even surpassed—the electricity sector in terms of total capacity installed over the years.

In addition to 1997 and 1998, two other remarkable years worth mentioning are 1995 and 2002. Both 1995 and 2002 showed peaks in implementation. With the exception of 1995, throughout the 1990s an average annual increase of more than 30 MW was realised. In 1995, 101 MW of capacity was installed, and 2002 was an absolute record year, with 166 newly installed turbines and an increase in capacity of 217 MW. We will elaborate on the 1995 peak later on, in Sections 5–8.

The other two categories of entrepreneurs outlined have been of minor importance, as the statistics on the number of turbines, projects and capacity show (Figs. 1–3). The market share of cooperatives exceeded 10% in only 2 years, 1994 and 1996. The market share of new independent producers fluctuated between 0% in 1991 to a maximum of 30% in 2001.

[4] The upcoming offshore wind power supply market is not considered in this paper. The Dutch government has decided that only one 100 MW experimental park will be built within the near-shore 12-mile zone. With regard to the area outside the 12-mile zone, an interdepartmental commission is working on a concession system. No permits will be issued until the moment this system is ready. This lack of an operational institutional structure has brought the Dutch offshore wind energy supply market to a complete standstill. An exceptional case in this context is the Q7 project. Q7 is a 120 MW offshore project initiated by an alliance led by a new independent wind power producer E-Connection Project BV, which was fully licensed on 18 February 2002.

[5] Dinica and Arentsen (2001, pp. 15–16) inaccurately state that the overwhelming share of the installed capacity is in the sole or joint ownership of distribution companies. This statement has been quoted in the 'Handbook of Renewable Energy in the EU' (Reiche, 2002, p. 187). This conclusion is not in accordance with our analysis and not in accordance with the source (EnergieNed, 1998) they used to reach this conclusion.

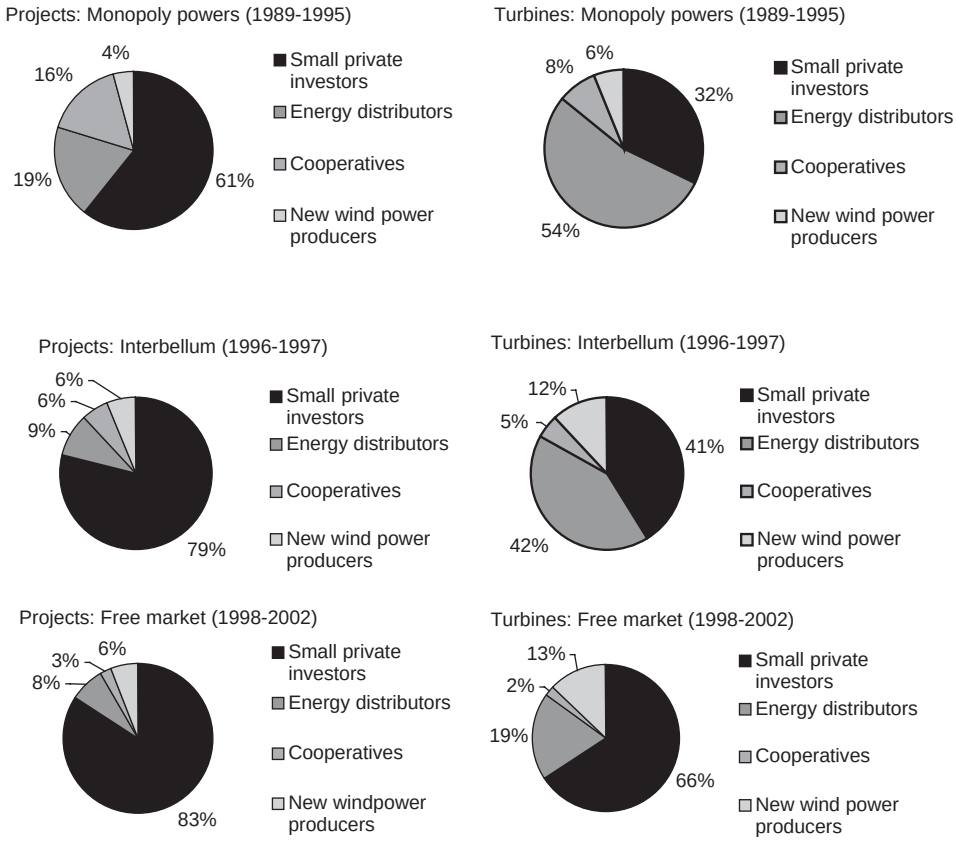

Fig. 3. Contribution to number of projects and turbines installed by different entrepreneurial groups during three successive periods. (Sources: KEMA, 2002/2003; Wind Service Holland, 2002/2003.)

4. Three successive market periods

From the above we can deduce three successive market periods (Fig. 3.). This division in market periods is based on implementation patterns shown by the four categories of entrepreneurs active on this market. We will show that the performance of the different categories of entrepreneurs during the three periods can be explained by the dynamic configuration of conditions and important entrepreneurial features.

Monopoly powers (1989–1995), the first period, started with the implementation of the Electricity Act in 1989, which separated production from consumption. This was a major turnabout in the vertically integrated monopolistic electricity supply sector of those days. The electricity sector and energy distributors dominated this period, both with regard to the number of turbines and total capacity installed.

Interbellum (1996–1997), the second period, ran from the implementation peak in 1995–1998, which saw the reversal in dominance by the electricity sector to dominance by small private investors. During these intermediate years, small private investors and farmers changed places with the electricity sector with regard to the number of turbines and total capacity installed annually.

Free market (1998–2002), the third period, started in 1998. Since 1997 and 1998, small private investors have dominated the market in all areas: the number of turbines, the number of projects and total capacity installed annually. Also, for the first time in the short history of the wind power supply market, in 2001 and 2002 new independent wind power producers surpassed the electricity sector slightly in importance.

5. Energy distributors

In showing the correlation between the configuration of conditions and the performance of the four different groups of entrepreneurs, we will need to discuss the specific configuration during the periods mentioned above. We will do this first for energy distributors.

5.1. Monopoly powers (1989–1995)

Up to 1989, the electricity supply market was a centrally planned and vertically integrated state

monopoly. Electricity generation, high-voltage transmission, low-voltage distribution, and supply to end-users were administratively integrated business processes provided by state-owned electricity companies[6] (Slingerland, 1999, pp. 3–11). A lengthy tradition of interrelatedness existed between the Ministry of Economic Affairs and the traditionally state-owned electricity sector.

In 1989, a new Electricity Act separated centralised electricity production from electricity distribution. After this separation, energy distributors were given the legal position of public limited companies, which gave them a more independent position from which to formulate their own policy (Slingerland, 1999).[7] They were not allowed to exploit large-scale production capacity or to import electricity. However, they were allowed to exploit their own small-scale production capacity up to a maximum of 25 MW. Energy distributors used this option for small-scale generation to strengthen their bargaining power in negotiations with the large electricity-generating companies (changing social conditions). At the same time, small-scale renewable energy production was a way for energy distributors to fulfil their CO_2 targets, set in the first National Environmental Policy Plan (NEPP) in 1989. This NEPP issued by the Ministry of Housing, Spatial Planning and the Environment (1989, 2000a, b) (VROM), contained CO_2 emission targets for different industrial branches and economic sectors (Dinica and Arentsen, 2001). The 1989 Electricity Act and the NEPP changed the configuration of institutional conditions and by doing so also changed the configuration of social conditions, which enlarged the implementation capacity of the system with regard to wind energy implementation by energy distributors. This was one of the things that started a trend of dominance by energy distributors in wind energy production during the first half of the 1990s, as shown in Fig. 1.

In 1989, a new Electricity Act (Dutch Parliament, 1989) separated centralised electricity production from electricity distribution. In keeping with the 1989 Electricity Act and the first NEPP, energy distributors decided to voluntarily adopt the 'Environmental Action Plan' Milieu Actie Plan (MAP) for the energy sector (EnergieNed, 2001). This plan was the practical result of a covenant signed in 1990 between the national government and the energy industry to comply with its CO_2 emission reduction targets set out in the NEPP. The 3% renewable energy target set out in the MAP created another incentive for energy distributors to invest in wind energy.

By issuing an environmental 'MAP levy' on consumer tariffs, energy distributors were able to support the generation of renewables (improved economic conditions). Energy distributors themselves as well as both private and industrial energy generators could apply for subsidies from this MAP levy. How the MAP subsidies would be distributed and the actual conditions for the pay-back tariffs had to be agreed upon by the regional energy distributor and a potential renewable energy generator. This self-regulatory element in the Electricity Act (an institutional condition) created a strong bargaining position for energy distributors (a social condition), and left little room for other wind power entrepreneurs (market formation). The MAP levy fit well into the strategy of energy distributors. It allowed them to comply with their CO_2 reduction targets in a less expensive manner (an economic condition). It also allowed them to become more independent of conventional electricity generators and to improve their environmental image (both social conditions). In other words, institutional and social conditions were favourable for energy distributors during this period, and in keeping with this they dominated the market in terms of the number of turbines and total capacity installed. However, in terms of projects this was not the case.

As part of MAP, in 1989 eight energy distributors agreed upon 'Windplan': a cooperative scheme with the aim of installing 250 MW of wind power in 1995. Windplan was in line with the preference of the central authorities—the Ministry of Economic Affairs—that electricity companies should be the main implementers of wind technology. The Ministry of Economic Affairs devoted an investment subsidy to Windplan, provided that it would purchase a large number of turbines from Dutch manufacturers (Verbong, 1999; Slingerland, 1999; Johnson and Jacobsson, 2002). A strong correlation can be seen between institutional conditions (the 1989 Electricity Act and MAP), social conditions (the foundation of Windplan), and the performance of this entrepreneurial group on the market.

Windplan was suddenly abandoned in 1993. Several reasons for its breakdown have been put forward in the literature. First, energy distributors started to believe that, on their own, they could purchase turbines more cheaply abroad. Second, energy distributors made very high and unusual technical demands on turbines, which Dutch manufacturers could not easily satisfy (Brugeman, 2002; Kamp, 2002; Gipe, 1995). Third, the attention of energy distributors to wind power projects waned because of siting problems such as long spatial planning and permitting procedures, which caused lead

[6] Energy utilities were owned and controlled by provincial and municipal authorities.

[7] After the separation, five large power producers were formed, which merged 1 year later into four public electricity generators. Distributors started to extend their activities beyond their traditional domains (gas supply, waste management and telecommunications). The number of distribution companies dropped from more than 70 in 1981, to 35 in 1995, to 20 in 2002 (Slingerland, 1999) (http://www.nma-dte.nl/, 27-08-2002).

times of an average of more than 5 years for this group of entrepreneurs (Gipe, 1995; Johnson and Jacobsson, 2002; Kamp, 2002).[8] A fourth reason is connected to the fact that the core business of the electricity sector was—and still is—retailing both fossil- and non-fossil-fuel electricity in accordance with the market (in other words, in a large-scale and centralised manner). Energy distributors came from the electricity sector, being a sector that was never in favour of decentralised production and in which concerns like diversification of energy sources and reducing environmental degradation were traditionally of minor significance. This lengthy tradition of structural beliefs was an important impeding social condition at that time (Wolsink, 2000).

In spite of the fact that Windplan had been dissolved (deteriorating social conditions), the government continued to try to facilitate market formation by way of investment subsidies. In 1993, the 'Wind Energy Subsidy Decree' was introduced, which was the first investment support scheme for wind turbines. This scheme merged into the broader energy investment support programme known as the 'Decree on Subsidies for Energy Programmes' (BSE) in 1994, which included a variety of renewable energy technologies. In addition, VROM paid a production subsidy for the period 1991–1993. Until the middle of the 1990s, investment subsidies remained the main form of financial support for wind power projects.

At the start of 1996, the government financial incentive system switched abruptly from a subsidy to a fiscal system. This changeover was an important breaking point and caused the implementation peak of 1995. The situation was such that although subsidies were being awarded by Novem (1996) (an executive office of the Ministry of Economic Affairs), construction permits were not yet being awarded by local authorities, which was a clear inconsistency in government policy on different levels (social and institutional conditions). All projects realised after 31 December 1995 were no longer eligible to submit claims to the subsidy scheme. The threat of losing the subsidies (combined with ignorance of and uncertainty about the new fiscal arrangements) led entrepreneurs to force their projects through. This was an interesting phenomenon. It seemed that the threat of changing institutional and subsequently economic conditions enabled entrepreneurs to break through other impeding conditions like siting problems and lengthy permit procedures. Entrepreneurs seem to have successfully used the argument of inconsistent policy (which would cause their projects to die an early death) as a means of increasing pressure on local permit-issuing authorities. Installed capacity of the electricity sector peaked, resulting in a temporary increase in the implementation capacity for this type of entrepreneur in that year.

5.2. Interbellum (1996–1997)

As we have already said, the start of 1996 saw the first important turning point. The emphasis on subsidies shifted with the greening of the fiscal system (Vermeend and van der Vaart, 1998). Subsidies were abandoned, and two fiscal schemes were put into place. The first scheme, known as the 'Accelerated Depreciation Scheme on Environmental Investments', or VAMIL scheme, offered entrepreneurs a financial advantage by way of accelerated depreciation on equipment like wind turbines.[9] The scheme had a positive effect on financing conditions for wind projects. The second scheme, known as the 'Energy Investment Deduction' or Energie Investering Aftrek (EIA), made it possible to offset investments in technologies against taxable profit, and was meant to increase a company's after-tax profits.

This new situation was accompanied by uncertainty and unfamiliarity.[10] One major shortcoming was the fact that non-profit organisations (among them energy distributors) could not make use of these new fiscal arrangements. It took the national government 2 years to repair this shortcoming: the 'Energy Investment Regulation for Non-Profit and Special Sectors' (the EINP scheme) was introduced in 1997 (Dinica and Arentsen, 2001; Boomsma, 2002; Littel, 2002).

Economic conditions for energy distributors to invest in wind energy strongly deteriorated during the first 2 years following the shift to the fiscal system. This, combined with severe siting problems and a weak green demand by customers, implied a weak implementation capacity for this type of wind power entrepreneur from 1995 to 1998. Indeed, during these years a sharp decline in the number of turbines and capacity installed by energy distributors can be seen. The peak of 1995 was a one-time event: the threat of deteriorating economic conditions caused by unstable government policy enabled energy distributors—one way or the other—to overcome other impeding conditions during only a very short period of time.

[8] Recently, an enquiry into the passage duration and the rate of success of the different authorisation procedures showed, that once the formal juridical permission process is started, the probability that a wind power project succeeds is 93%. The average passage duration is 46 weeks, which however seems to increase with the size of a project. In practice, the authorisation process will last longer: time needed for informal pre-deliberations is not included in the research (Koeslag, 2002).

[9] The types of projects that can qualify for this fiscal arrangement have been set out by the Ministry of Housing, Spatial Planning and the Environment (1989, 2000a, b) and ROM (Dinica and Arentsen, 2001).

[10] Novem—an executive office of the Ministry of Economic Affairs—initiated information sessions and produced information material on the use of the new fiscal stimulation scheme (Ministry of Economic Affairs, 2001a, b).

5.3. Free market (1998–2002)

In addition to the two fiscal schemes mentioned above, another important fiscal instrument was implemented, which prepared new conditions for the third period. Since 1996, household and small- and medium-sized enterprises have paid an environmental energy tax on electricity. At first, the tax had to be paid on both fossil-fuel-based and renewable electricity. However, this changed with the first of three fundamental institutional changes that originated during this period.

First, since 1998 renewable electricity and physical imported renewable electricity have been exempted from the 'Regulated Energy Tax' (what is known as REB tax—Regulerende Energiebelasting—or eco-tax). Due to an increase in the amount of tax from 2.6 to 7.1 eurocents per kWh over the period 1999–2001, electricity companies were able to offer renewable electricity at the same or at even lower prices than those for electricity from fossil-fuel sources (Junginger and Agterbosch, 2003). Such favourable economic conditions for wind energy had never before been realised in the Netherlands, and they were comparable to economic conditions in Germany at that time.

The second important change came with the liberalisation process, which took off in 1998. Just like in most member states of the EU, the regional monopolistic electricity sector in the Netherlands had to make way for the coming liberalised free market. Energy distributors began to make the transition to private companies without regional constraints.

As a result, the third essential change took place: on 1 July 2001 the market for green electricity was liberalised, which meant that consumers and small- and medium-sized enterprises were free to choose their green energy companies. Since qthen, many new suppliers have entered the market, offering different types of green electricity at nearly the same or at even lower prices than those for grey electricity (Energeia, 2002/2003; GreenPrices, 2002/2003).[11]

As a result of the REB tax (improved economic conditions), and additionally stimulated by the liberalisation of the green electricity market (changing institutional and social conditions), energy distributors decided to change their strategy (a social condition). They changed their policy from 'just' meeting their targets for a share of green electricity in the total electricity supply, to actually marketing green electricity.[12] They started to attract customers by using advertising campaigns and television commercials. There was a lot at stake for these companies—consumers spend about 19 billion Dutch guilders (about 8.6 billion euros) on electricity each year. By January 2003, about 1.4 million customers had switched to green electricity (the Netherlands has approximately 7 million households) (GreenPrices, 2002/2003). In terms of the model, changing economic and institutional conditions led to adaptive behaviour by energy distributors, which resulted in a large consumer market for green electricity and enlarged the implementation capacity for wind power entrepreneurs in general. Nowadays, attracting customers is not the problem in the Netherlands, but actually supplying them with renewable electricity is. Energy distributors do not have enough domestic renewable electricity in stock. Therefore, pressure on energy distributors to increase both installation of new domestic capacity and imports of green electricity has risen tremendously since the green electricity market was opened up.

The REB tax is divided into two parts: a tax exemption for green energy purchases (Art. 36i of the Environmental Tax Act) and a payment to support green energy producers (Art. 36o). Up to the end of 2002, energy distributors used the proceeds of Article 36i mainly for the import of foreign green electricity. Imported green electricity also qualified for this tax exemption, and imported biomass from the Scandinavian paper industry and electricity from small-scale (<15 MW) hydroelectric power stations in France were easier and cheaper to obtain than green electricity from domestic, newly installed wind power plants. Consequently, in recent years the Dutch green electricity market has been flooded with cheap foreign green electricity, with most of it being generated by power stations that have already been written off (Reijnders, 2002). During a number of months at the end of 2002, about 80% of all green electricity consumed in the Netherlands was imported (Energeia, 2002/2003). This is a paradoxical situation, in which favourable economic conditions for domestic wind power installation (enlarging the implementation capacity for domestic wind power entrepreneurs) are cancelled out by the availability of cheap imports.

At the same time, the liberalised green electricity market caused the disintegration of the monopoly powers of the energy distributors. New decentralised producers no longer had to sell their electricity to the local energy distributor—from now on they were permitted to sell it to the highest bidder. This new

[11] At the beginning of 2003, 26 different retailers offering 28 different green electricity products (various portfolios of wind, solar, hydro- and biomass electricity) were active on the Dutch green electricity market (GreenPrices, 2002/2003, http://www.greenprices.com/nl).

[12] Essent, in cooperation with the environmental organisation WWF, was the first Dutch distributor that offered green electricity in 1995 (Reiche, 2002, p. 187). In that sense, regarding the marketing of green electricity, Essent was ahead of the other distributors.

institutional condition (additionally stimulated by the tight green electricity market) caused a shift in existing power relations on this market. The bargaining power of decentralised wind power entrepreneurs increased considerably, at the expense of the bargaining power of energy distributors. The practical result of these changes in social and institutional conditions was a decline of the implementation capacity for energy distributors during this period. Despite favourable economic and technical conditions for Dutch wind power exploitation, importing cheap green foreign electricity seemed to be more in their interest than installing new wind power capacity. In line with this, Figs. 1–3 show a decrease in the contribution of energy distributors with regard to the number of projects, number of turbines and total capacity installed.

A final important institutional change during this period was the demand for clustering turbines. This demand was inserted in part one (draft document) of the Fifth National Policy Document on Spatial Planning by VROM (2000). However, in part three of the document (revised document), the demand for clustering was no longer included. In spite of this, most provinces adopted it in their regional land use plans and soon a continued effect could be seen at the local administrative level. This relatively new institutional condition was not only at odds with national spatial planning policy, but also with the initial provincial spatial planning policy laid down in the first wind power covenant by VROM in 1991 with the seven provinces that have suitable wind conditions (Novem, 1991).[13] Here we see the continued effect of a possible institutional change at a national level resulting in a new institutional condition at local level.

The demand for clustering, combined with the facts that wind power exploitation is more profitable (changing economic conditions) and the installation of investment-intensive multi-megawatt wind turbines is technically viable nowadays (changing technical conditions), implicates a context in which an increasing amount of capital is needed to be able to build a modern, multi-megawatt wind farm (investment costs were about 1 million euros per MW in 2002) (Middelbos, 2002; Meerkerk, 2002; Windnet, 2002). These new conditions are to the advantage of large, wealthy investors like energy distributors, and an increase in the number of large wind power projects funded by energy distributors might be expected. On the other hand, it is complicated to construct larger wind power plants in the densely populated Netherlands. One of the complicating factors is the participation of more landowners and the involvement of more municipalities in large wind power projects.[14] The emergence of new initiatives is, of course, essential, but on its own is not necessary enough to ensure that wind power projects are realised. The quality of the configuration of conditions on the level of a specific wind power project must also be adequate.

5.4. Energy distributors: summary

Both institutional and social conditions contributed to the implementation capacity for wind power exploitation by energy distributors at the beginning of the 1990s. On the other hand, generation costs of wind power were still too high, and due to its intermittent character it was not expected to be an alternative to conventional, centrally produced electricity. The specific institutional conditions created a small niche market for wind energy produced by energy distributors. At the end of the 1990s, however, the possibility of profitable exploitation of projects combined with large customer demand created a strong incentive on part of the energy distributors to invest in wind power projects. Economic and technical conditions were no longer prohibitive: as the market has grown around the world, production costs for a kilowatt hour of wind power dropped by some 20% over the period 1997–2002 (Greenpeace/EWEA, 2001). While the production costs of wind electricity still are about 8 €ct/kWh versus an electricity price of 2.7 €ct/kWh (Sambeek et al., 2002), due to the tax exemptions of about 7 €ct/kWh in 2000 and 2001 (Junginger and Agterbosch, 2003), wind electricity could compete well with electricity from fossil-fuel sources. However, now institutional conditions (the REB tax exemption for foreign green electricity, and the liberalisation of the green electricity market), followed in the wake by changes in social conditions (changing power relations on the wind power supply market), are hampering the implementation capacity of energy distributors with regard to initiatives taken by them.

6. Small private investors and farmers

Let us now examine the second group of entrepreneurs. In fact, the first actual investors in wind power in the Netherlands were small private investors, who were mainly farmers. Until 1988, about 250 turbines (just over 22 MW) were installed, mostly by these types of

[13] In 2001, a second wind power covenant known as 'Governmental Agreement on the National Development of Wind Energy' or Bestuursovereenkomst Landelijke Ontwikkeling Windenergie was introduced, and now incorporates six ministries of the national government, all of the 12 Dutch provinces and the association of Dutch local authorities. The aim of this covenant is 1500 MW of capacity onshore in 2010.

[14] At the beginning of the nineties, energy distributors preferred to implement projects in 100% ownership. Since halfway the nineties a shift occurred. Wind energy exploitation became more profitable and nowadays landowners often demand to participate (Steen, 2003).

entrepreneurs. Small private investors were good for about 170 turbines, or 68%. Only 67 of these turbines, or 27%, were installed by the electricity sector, 54 of them in the years 1987 and 1988. In this section, we will illustrate that changes in the configuration of systemic conditions during the three periods also affected the performance of this entrepreneurial group on the market, and clearly explains their emerging leading position in the late 1990s.

6.1. Monopoly powers (1989–1995)

As shown in Fig. 3, small private investors predominated this first period with regard to the number of projects realised. However, in Figs. 1 and 3 we can see that this is not the case with regard to the number of turbines and total capacity installed. With regard to the number of turbines installed (in comparison with energy distributors), small private investors decreased in importance from 1989 to 1991. After 1991 they once again started to increase in importance, and in 1994, for the first time the number of turbines installed by small private investors exceeded the number of turbines installed by the electricity sector. This picture is more or less the same with regard to total capacity installed, although measured in MW the gap between the small private investors and the energy distributors is bigger. During this period small private investors never surpassed the electricity sector in importance in this regard, and some years later they were even surpassed by cooperatives.

The 1989 Electricity Act compelled energy distributors to purchase electricity generated by decentralised small private producers located in the area where they had the monopoly on supply rights. This obligation was imposed regardless of the amount of electricity on offer, and for an indefinite period. This institutional condition created a very peculiar market for decentralised small private wind power entrepreneurs. It would seem to have been a favourable situation, but actual conditions for redelivery and pay-back tariffs had to be negotiated between the energy distributor and the private party. The 1989 Electricity Act prescribed that energy distributors had to pay '*the most stimulating compensation*' for renewable energy. However, '*the most stimulating compensation*' is an ambiguous formulation: the law was not clear on this aspect. The Ministry of Economic Affairs, the only actor able to change this section in the law, always kept in the background with respect to the discussions that arose from this formulation.

Pay-back tariffs were based on calculation methodologies set out in the 'Standard Arrangements for Redeliveries' (SAR), part of the Electricity Act, and which were revised annually. The SAR calculation methods included two price components: fuel costs and capacity costs. The first component was based on avoided costs for base-load fuels. The second component had two price levels: one for generators with no uncertainty of continuity and capacity of supply, and one for intermittent sources—the latter being the much lower price (Dinica and Arentsen, 2001, pp. 44–45). SAR is an institutional condition with a strong self-regulatory element. Note that the same applies to the assignment of the MAP levy (see Section 5.1). Both institutional conditions led to a social practice that was very much to the disadvantage of decentralised small private investors: small private investors (who had to sell their electricity to the regional energy distributor) were dependent on this company for both the pay-back tariffs and the MAP subsidy—a company that was also their competitor on the wind power supply and green electricity market. This peculiar configuration of social and institutional conditions was far from ideal for small private investors. The result was a rather weak implementation capacity (compared to the electricity sector) for this type of entrepreneur. This explains why small private investors lagged behind the electricity sector, both with regard to the number of turbines and total capacity installed during this period.

With regard to the number of projects realised, the picture was different. The predomination of small private investors in this area can be explained by the fact that most of them, being farmers, were able to make free use of land to place a solitary turbine. This social condition created an advantage that also explains why this type of entrepreneur was the second most important investor during this period. With regard to the assignment of MAP subsidies and pay-back tariffs, other types of entrepreneurs were in the same disadvantaged position as small private investors, but with the additional disadvantage of not having a site location.

The end of the first period is instructive. The anticipated switchover from the subsidy system to the fiscal system in 1996 also caused the number of projects, turbines and total capacity installed by small private investors to peak heavily. Local impeding conditions (lengthy permit procedures) disappeared temporarily, most likely because of increased pressure on municipalities, both on the part of entrepreneurs and higher government authorities (see also Section 5.2) (Bosch, 2002). This pressure was dictated by the fear of losing subsidies already assigned by the national authorities. The 1995 peak indicated the possibility that considerable tension within the configuration of conditions can result in a sudden and temporary increase of the implementation capacity.

6.2. Interbellum (1996–1997)

The new fiscal system implemented in early 1996 was accompanied by uncertainty, unfamiliarity, and scepticism about government financial policy. The second period should be seen as an interbellum. It resulted in

non-responsiveness on the part of small private investors during the first 2 years following the shift to this system. Furthermore, the unfavourable institutional and social conditions (SAR and MAP) of the previous period still existed. In keeping with this, the number of projects, turbines, and total capacity installed by small private investors declined during these years. Instability of government financial policy, combined with hampering institutional and social conditions, caused the implementation capacity to decrease for small private investors. It took them some years to 'discover' the newly created—and in fact, favourable—investment climate (Littel, 2002; Bosch, 2002), and to take advantage of the new fiscal incentive instruments (the VAMIL and EIA schemes, the EINP scheme and in particular the REB tax scheme) (see Sections 5.2 and 5.3). Some farmers stated that under the new fiscal scheme they were at a disadvantage compared to large investors, for the simple reason that they had lower profit margins (van der Knijf, 1999). However, more important for the position of this entrepreneurial group on the wind power supply market was the future liberalisation of the green electricity market, as we will see in the next section.

6.3. Free market (1998–2002)

The liberalisation of the green electricity market caused the disintegration of the monopoly powers of energy distributors (see Section 5.3). Small private entrepreneurs were no longer obliged to sell their electricity to the regional energy distributor, which meant that the bargaining power of small private investors increased considerably. This is an important change in institutional and subsequently social conditions, which resulted in increasing implementation capacity for small private investors. This went hand in hand with a decline in implementation capacity for energy distributors. And indeed, for the first time small investors started to surpass the electricity sector in importance (Figs. 1 and 3).

The liberalisation of the green electricity market also brought with it a number of disadvantages. The liberalised green market, together with the REB tax exemption for foreign green electricity, in fact created an uneven playing field. New, still to be installed, domestic wind power had to compete with cheap, already written-off renewable energy stations all around Europe (see Section 5.3). This disadvantage affected all types of wind power entrepreneurs in the Netherlands. However, compared to energy distributors (who were both producers and retailers of portfolios of renewable energy sources), small private investors that only produced wind power were more vulnerable on the green electricity market. This uneven playing field created a green electricity market based on cheap imports, which increased the pressure on green electricity prices (deteriorating economic conditions). This situation caused the implementation capacity for small private investors to decrease. At the same time, this decrease seemed to be nullified by the economic condition of large customer demand, which again increased the pressure on the green electricity market. In addition, some (new) retailers[15] tried to distinguish themselves (and also attract customers) by offering domestic green electricity as a special and even more environmentally safe product, which increased the pressure on the market even more. All in all, it can be concluded that the pros of the liberalised market exceeded the cons for small private investors, with an increase in the overall implementation capacity.

We also have to discuss another important change during this period: the demand for clustering. A changing institutional condition, which was diametrically opposed to the fact that most turbines (about 86%) that were installed by small private investors were solitary turbines (van der Knijf, 1999). However, in most of the Dutch provinces, solitary installation is no longer allowed (see Section 5.3). Two important consequences of this need to be mentioned here. First, the demand for clustering forces small private investors, being landowners, to cooperate with each other (changing social conditions) in order to meet the requirements of the local land use plan.[16] Second, the demand for clustering led to an increase in the scale of wind power projects with a corresponding increase in (pre-)investment costs.[17] Small investors may have more problems adapting to this economic condition. The possibility of 'green financing' alleviates this problem somewhat. Banks are able to grant loans for environmentally safe projects at interest rates that are 1–2% below the market interest rate. This applies, however, to all types of

[15] Nuon, a Dutch distributor sells 'Natuurstroom' (Natural Electricity), which consists mainly of wind and solar energy (both domestic and imported); biomass is explicitly excluded. In contrast, Essent, another Dutch distributor, sells 'Groene Stroom' (Green Electricity), which consists of domestic green electricity (mainly biomass) and explicitly excludes imports. Yet, other companies use other terms for green electricity, such as 'Eco Stroom' (Eco-electricity) and 'Windstroom' (Wind Electricity).

[16] In their regional land use plans, provinces indicate areas suitable for wind energy and the corresponding policy guidelines. However, actual spatial zoning—including all required details—takes place at municipal level. Local land use plans have to comply with the provincial zoning scheme, but Dutch municipalities are somewhat autonomous. Building permits can only be issued based on municipal zoning schemes, which means that municipalities are crucial actors in the wind turbine siting process.

[17] Turbine costs amount to about 70–80% of total investment costs. Therefore, an increase in the number of turbines brings with it a relatively sharp increase in total investment costs (Beurskens and Jansen, 1998). In addition, the local grid is usually not adequate for connecting large wind power plants, which brings with it higher connection costs (van der Knijf, 1999).

entrepreneurs. The first consequence (the need for cooperation) also places large investors like energy distributors at a disadvantage because they have to deal with more landowners in the development of projects, and in addition, they often do not have any local roots. On the other hand, compared to small private landowners they are more flexible with regard to the exact location of the site and the required capital needed (Meerkerk, 2002). Comparatively speaking, clustering is more of a disadvantage for small private investors than for energy distributors. This negative institutional condition seems, however, to be compensated for by the positive social condition, that most small private investors have a land location, something that energy distributors lack.

The described changes in institutional and social conditions are crucial to small private investors. They are more vulnerable on the green electricity and wind power supply market than large, wealthy investors, at least with respect to capital and the expertise needed to adapt to rapidly changing market conditions, namely, depersonalisation of the market, increase in competition and increase in the scale of wind power projects. To strengthen their position, small private parties united in several national and regional umbrella organisations: one national association—Particuliere Windenergie Exploitanten (PAWEX)—'Private Wind Turbine Operators' and five regional associations of private wind turbine owners existed at the beginning of 2003.[18] The birth of these associations (a social condition) enhances the implementation capacity of this type of entrepreneur.

Finally, the 1998 Electricity Act (Dutch Parliament, 1998)—which regulates the guaranteed and immediate access to the grid for decentralised producers—needs to be mentioned within this context. This new institutional condition, combined with the liberalisation of the green electricity market, enables decentralised producers to serve end users themselves. Due to these new institutional conditions, the 'Association of Wind Turbine Owners in North Holland' (Vereniging van Windturbine-eigenaren in Noord Holland) established 'Windunie' in 2002.[19] Windunie is a cooperative made up of wind turbine owners with the aim of jointly selling their green electricity on the electricity market. Windunie is a joint venture of a distribution company in the region of Maastricht and the VNWH. Windunie strengthens the bargaining power of small private investors in comparison to that of the electricity sector. Here we can clearly see the origination of a new social praxis (increasing the implementation capacity) because of changing institutional conditions.

6.4. Small private investors: summary

Here again, changing configurations of systemic conditions offer a good explanation for the changing performance of this entrepreneurial group during the subsequent periods. Institutional and social conditions were far from ideal for small private groups at the beginning of the 1990s, when small private investors found themselves in the peculiar market position of being chained to regional energy distributors. This implied a rather weak implementation capacity. Instability of government financial policy in the middle of the 1990s, combined with the continuation of impeding institutional and social conditions, caused the implementation capacity to deteriorate even more. Nevertheless, small private investors were the second most important type of entrepreneurs during these years, and this can only be explained by the availability of land at their disposal—a crucial positive social condition.

At the end of the 1990s, the liberalisation of the green electricity market was a very positive change in institutional conditions, which caused the implementation capacity to increase considerably for small private investors. At the same time, the demand for clustering was a new negative institutional condition for this entrepreneurial group during this period. This, however, seemed to be nullified by positive conditions like landownership and cooperation in umbrella associations. All in all, the implementation capacity for small private investors increased in comparison to that of the energy distributors during these years.

7. Cooperatives

The third group of entrepreneurs in our analysis are the cooperatives. They have been of minor importance as far as the statistics on the number of projects, turbines, and total capacity installed are concerned (Figs. 1–3). The highest market share—20% in 1994—was in fact a clear exception, and in most years, their market share was less than 10%. All 28 Dutch wind cooperatives were founded during a relatively short period, from 1986 to 1992. In the meantime, 14 of these have been disbanded or have merged. The origin of the Dutch wind cooperatives is strongly linked to the Dutch

[18] In the Dutch wind energy sector, there are three branch organisations who are linked in a so-called Wind Network (Windkoepel). First, Nederlandse Windenergie Vereniging—'Dutch Wind Energy Association' being a pressure group of individuals and organisations/companies, among them energy distributors and new independent wind power producers. Second, FME-CWM Group Windenergy, which is the Dutch branch organisation for wind turbine suppliers. And third, PAWEX, representing private parties in the wind energy sector. Members are not allowed to be involved in the retail of electricity or in grid management, thus exluding energy distributors from PAWEX (Reiche, 2002, p. 187).

[19] Already in 1998, three wind cooperatives founded Samenwerkende groene energieproducenten (Samenwerkende groene energieproducenten)—'Cooperative of Green Energy Producers'. SGEP supplies its members with green electricity without going through distribution companies or green retailers.

organisation for Renewable Energy (ODE), an anti-nuclear power movement. In the 1980s, workers from ODE visited all kinds of local groups, including environmental groups, to explain and promote the concept of wind cooperatives. As a result, several cooperatives were established, especially in what are known as 'wind-abundant areas'. The founders had purely idealistic motives: they were against nuclear power and wanted to offer an alternative. This idealistic background clearly distinguishes this type of entrepreneur. Their main interest is not to make money by wind power exploitation, but to promote a sustainable society based on renewable sources. Cooperatives try to achieve this aim, by among other things[20] developing wind projects based on strong local support and public participation. Most of the cooperatives work with volunteers, although four of them did professionalise and now work with a paid staff.[21]

In this section we will show that this group was relatively immune to changing systemic conditions during the three periods, largely due to their specific character.

7.1. Monopoly powers (1989–1995)

From 1987 until 1994, cooperatives installed 44 turbines (about 5.5 MW), and in 2002, this number reached a total of 73 turbines (9.3 MW). This means that about 60% of the turbines and 53% of total capacity ever installed by cooperatives was realised during this first period. Institutional conditions during this period were, however, very much to their disadvantage, with cooperatives finding themselves in the same peculiar position as that described for small private investors (Sections 5.1 and 7.1). In terms of the model, looking at the total configuration of economic, institutional and social conditions, the same conclusion must be drawn as for small private investors during this period, that of a rather weak implementation capacity. This conclusion seems at odds with the fact that it was precisely during this period that cooperatives put into place most of the turbines they would ever implement.

How can we explain this? First of all, cooperatives do not follow the same rationality as the other types of entrepreneurs. They do not need to make money out of their wind projects, and as a consequence they are not greatly concerned about hampering conditions. Their idealistic background makes them rather insensible to low profits, or even no profits at all. Cooperatives were a new phenomenon in the Netherlands, and they were youthful associations with enthusiastic volunteers. The expansion in membership that took place between 1986 and 1995 applies to all cooperatives.[22] After 1995, membership stabilised or declined slightly. Research into associations shows a correlation between increase in membership and dedication or level of activities undertaken by members (Meadowcroft, 2002). This period of membership growth, combined with idealistic tendencies, constituted a social context that seemed to nullify other impeding conditions in a certain sense.

Nevertheless, even during this relatively successful period, cooperatives were of minor importance with regard to the number of turbines and capacity installed.

At the end of this period, at a moment when all the other types of entrepreneurs peaked (1995), cooperatives did not. This seems amazing considering the fact that they had to deal with exactly the same shift to the new fiscal system. Social conditions—namely, some of the characteristics specific to cooperatives—can clarify this. Cooperatives had to keep their operations running on a volunteer basis. Lack of time and knowledge (volunteers often also had full-time jobs) made it more difficult to lobby and to increase pressure on local permit-issuing authorities. Another clarifying factor is that some cooperatives, after having realised their first wind turbines, did not start any new wind power projects.

7.2. Interbellum (1996–1997)

Non-profit organisations, like cooperatives, were unable to make full use of the fiscal arrangements introduced in 1996. This institutional condition caused the competitiveness of cooperatives on the wind power supply market to deteriorate. As we already discussed, it took the national government 2 years to repair this gap in the fiscal scheme, and in 1997 the EINP scheme was introduced (see Section 5.2). All in all, it was a period of limited changes for this type of entrepreneur, and resulted in a weak implementation capacity. The contribution of cooperatives to total installed capacity remained low at below 10%.

7.3. Free market (1998–2002)

As for small private investors, institutional and social conditions improved considerably for cooperatives during this third period. They were able to take advantage of the EINP and REB tax schemes[23] (improved economic conditions) and compared to distribution companies, their bargaining power

[20] In addition to developing wind power projects, most cooperatives also developed other activities—like providing information and promotion—to a greater or lesser degree.

[21] Professionalised cooperatives: Zeeuwind (first employee hired in 1989, four employees in 2002), Noordenwind (first employee hired in 1996, two employees in 2002), Kennemerwind (one employee hired in 1998) and Deltawind (one employee hired in 2000).

[22] In 2003, the number of members of the different cooperatives varies between 72 and 1150.

[23] By using special fiscal constructions, they were able to use the EIA and VAMIL schemes to a lesser degree.

increased as a result of the liberalisation of the green electricity market (improved institutional and social conditions).

The guaranteed and immediate access to the grid arranged by the 1998 Electricity Act enabled some cooperatives to find the 'Cooperative of Green Energy Producers' (SGEP).[24] SGEP supplies it members with green electricity without having to go through distribution companies or green retailers, a social praxis that again increased their implementation capacity.

In reference to the demand for clustering, the situation for cooperatives is more problematic. Specific characteristics of the cooperatives, such as the limited capacity of volunteers, make it difficult for them to deal with bottlenecks brought about by the demand for clustering, namely the increase in required investment capital and the increased complexity of project development (see Sections 5.3 and 6.3). Also, the favourable economic and technical conditions for domestic wind power implementation during this period, had a reverse side effect for cooperatives, and brought about increased competition on the wind power supply market. Different entrepreneurs are more frequently competing for the same location, a situation for which cooperatives seem less well equipped than professional entrepreneurs.

7.4. Cooperatives: summary

All in all, it can be concluded that in spite of improvements in economic and technical conditions over the past few years, cooperatives remain marginal on the wind power supply market. Compared with other professional entrepreneurial groups, they are less well equipped to deal with the depersonalisation of the wind power supply market, increased competition, and the increase in the scale of wind power projects. Their strong local roots and, in theory, large degree of public support when compared to energy distributors seem of less importance. On the other hand, cooperatives, in particular the more professional ones, are still present on the wind power supply market and continue to realise wind power projects. In contrast to the other types of entrepreneurs, they are probably a more stable type of entrepreneurs on the wind power supply market during periods that are potentially less attractive economically. Cooperatives do not follow the rationality embedded in our analytical model. Also, in periods of low implementation capacity they will continue to fight for wind power implementation. One should furthermore keep in mind that the limited impact of cooperatives in terms of statistics on the number of projects, turbines and capacity installed, in principle says nothing about their impact on the wind power market through their other activities like providing information, promotion and lobbying.

[24] SGEP was founded in 1998 by three wind cooperatives: Meerwind, Windvogel and WDE.

8. New commercial independent wind power producers

The possibility of commercially attractive exploitation of wind turbines is a prerequisite for the emergence of new investors (mainly distinguished by an economic rationality) on the wind power project and green electricity market. In this, free access to these markets is an important precondition.

Looking at the development of the Dutch wind power supply market, one can see new independent wind power producers emerging at different points in time. A number of new investors started developing and utilising wind power energy projects during the first period (1989–1995). Most of these entrepreneurs were and are engaged only as consultants for third parties like landowners, utility companies or government authorities, both in the Netherlands and abroad. Today, about 60 Dutch consultancies are specialised in one or more aspects (technical, legal, financial or local planning aspects) related to renewable energy project development (including wind project development). A few of these entrepreneurs also develop wind projects at their own expense, and in the end own and operate the wind turbines themselves. In this paper, the focus is on this last, relatively small, group of independent wind power producers.

Approximately 15 independent wind power entrepreneurs are active on the Dutch wind power supply market today. They emerged mainly during two different periods. Until the middle of the 1990s, four independent wind energy producers were either active on or emerged onto the wind power supply market. Three of them came from the (renewable) energy sector, and included a wind turbine manufacturer, a subsidiary company of a distribution company and an early innovative consultancy in the field of environmentally sound projects, particularly renewable energy projects. Nowadays, they all are relatively small companies with no more than 10–15 employees. At the end of the 1990s (1997–1999), another 10 new independent wind power producers emerged, including both one-person companies and large companies like Siemens, Shell, and a holding company with contracting work as its core business. When considering absolute numbers of total capacity installed by these newcomers, we can see record years in 1995 (20 MW), 2001 (13 MW) and 2002 (26 MW). With regard to market shares, we can see record years in 1992 (23%), 1995 (19%) and 2001 (29%), with 1992 as a year in which total capacity installed was among the lowest during the 1990s.

In this section, we will analyse the performance of this entrepreneurial group and show that both its emergence and position on the market can be explained by the dynamic configuration of systemic conditions. This entrepreneurial group emerged on the market in essentially two periods, during the first and the third periods. Therefore, we will focus on these two periods in this section.

8.1. Monopoly powers (1989–1995)

Fig. 3 shows that the share in the number of projects and turbines installed by new wind power producers during this period is respectively 5% and 6%, which is less than any other type of entrepreneur. With respect to the configuration of social and institutional conditions, the situation for new wind power producers is comparable to that of small private investors during this period, that of a rather weak implementation capacity in comparison to the electricity sector (see Sections 5.1 and 6.1). To be able to explain the large gap in the number of turbines and capacity installed between small private investors and new wind power producers, some important differences between both types of entrepreneurs need to be considered.

First, small private investors usually have a site location, which is a social condition that new wind power producers lack. Second, whereas for small private investors wind power exploitation is a supplementary source of income, for new wind power producers it is part of their core business. New wind power producers probably need a more promising commercially attractive market in order to emerge, so a better configuration of conditions is required. A third difference is that small private investors by far outnumber the new wind power producers. Therefore, comparatively speaking, there is less of a gap between both types of entrepreneurs with regard to the number of turbines and total capacity installed.

The switchover to the fiscal system (see Sections 3 and 5.2) also caused the number of projects, turbines, and total capacity installed by new wind power producers to peak. Like all other types of professionalised entrepreneurs with a clear rational behaviour with respect to changes in the configuration of conditions, new wind power entrepreneurs were able to force their projects through. In 1995, 67 turbines (32 MW) were installed by precisely four new wind power producers.[25] This is a considerable achievement for such a small number of entrepreneurs. They were clearly well equipped to be active in the field of wind energy project development, and they were able to cater to changing institutional and social conditions.

8.2. Interbellum (1996–1998)

The switchover to the new fiscal system ushered in a new era for new wind power producers. This favourable investment climate, in combination with a future free market, paved the way for the emergence on the market of a new group of independent wind power producers during the third period.

8.3. Free market (1998–2002)

During this period, a new group of independent wind power producers once again emerged. The entrance of these entrepreneurs precisely at this moment can be explained to a large extent by the new favourable investment climate (the new fiscal arrangements) and the liberalisation of the green electricity market (a better bargaining position for decentralised producers). The entrance of particularly large wealthy companies with a strong focus on large wind power projects fit well within this configuration of conditions.

First, large for-profit companies were able to make full use of the fiscal support schemes (the EIA and VAMIL schemes). Second, the bargaining power of these independent producers increased considerably at the expense of the bargaining power of their competitors on the market, the energy distributors. Third, large for-profit companies were able to arrange the large amount of investment capital required to develop and build modern, multi-megawatt wind power plants that resulted from the demand for clustering (see Sections 5.3 and 6.3). And fourth, during this period a large consumer market for green electricity appeared as a result of the advertising campaigns conducted by energy distributors. In other words, during this last period the implementation capacity improved for this type of entrepreneur. Their market share of 29% in 2001, a record year, is in accordance with this.

8.4. New wind power producers: summary

New wind power producers follow the rationality embedded in the analytical model. The first few new wind power producers emerged during the first period and mainly had their roots in the (renewable) energy sector. The second group emerged during the third period, at what was clearly a moment of improving economic (fiscal scheme), institutional (liberalisation) and socio-economic (large consumer market) conditions. This last group consists of truly new players in the new established free market.

[25] Lagerwey de Windmaster BV, E-Connection BV, WEOM BV (Wind Energy Development Company) and De Wolff Nederland Windenergie.

9. Main findings

Several conclusions can be drawn from this analysis. First, the analysis shows that a change in the configuration of existing conditions can cause a chain of both foreseen and unforeseen effects, eventuating in the end in an improvement or worsening of the implementation capacity for different types of wind power entrepreneurs. The change in implementation capacity for energy distributors (deterioration) as compared to that for small private investors and new wind power producers (improvement) during the third period (1998–1999) explains both the changing positions of energy distributors and small private investors on the wind power supply market and the emergence of new wind power producers on this market in the late 1990s. Thus, the performance and position of different entrepreneurial groups on the wind power supply market can be explained largely by the dynamic configuration of systemic conditions. However, a change in this configuration may implicate an improvement for one type of wind power entrepreneur, while at the same time implicating a worsening for another type of wind power entrepreneur. This implies the existence of different implementation capacities for different entrepreneurial groups, and no overall implementation capacity exists. The system perspective must be coupled with concrete possibilities for entrepreneurial groups with different entrepreneurial features.

A clear example of this is the immunity of cooperatives to changing systemic conditions during the three periods. They do not follow the rationality embedded in the system, which can be explained by their specific idealistic character. This once again indicates the importance of specific entrepreneurial features, along with systemic conditions, to understanding the market performance of different entrepreneurial groups and subsequently understanding the development of the market. With this, our analysis shares the view of those theoretical approaches that say the analysis of economic change and market development should include a focus on the presence of differential adaptations of individual agents (Metcalfe, 1989 in Carlsson and Stankiewicz, 1995, p. 25).

Second, despite a national policy preference for large-scale centralised applications developed by the electricity sector (Wolsink, 1996, 2000) and a continuous top-down policy style (which resulted in some unfavourable institutional and social conditions for small private investors until the end of the 1990s), this entrepreneurial group turned out to be a major investor during this decade. A lesson to be learned from this for policy-makers is the importance of being both conscious of the interdependent nature of all relevant systemic conditions and the segmentation of the market. This is necessary to prevent governmental steering from eventuating in a worsening of the implementation capacity of promising entrepreneurial groups. Take, for instance, the demand for clustering, which in some Dutch provinces is currently resulting in the exclusion of all potential small private investors. Clearly, wind energy implementation policy is not just about stimulating the wind power supply market in general, but should also involve explicit considerations about who exactly should be stimulated to actually carry out wind power implementation.

Third, what can be said about the relative importance of the different systemic conditions? Technical and economic conditions seem to be particularly important with respect to the origin of a market. A technology needs to be technically viable and commercially attractive exploitation must be possible in order for investors to appear and for a market to emerge. However, these conditions do not really discriminate between different entrepreneurial groups, while on the other hand, institutional and social conditions do. It is not only the question of whether a new market emerges, but also and in particular, the way it develops in terms of entrepreneurial groups, that seems to be dictated by the configuration of institutional and social conditions. This dynamic configuration facilitates some and hinders other types of wind power entrepreneurs. This once again points to the importance of government policy. Government policy, being a main driver of institutional and social change, is crucial not only for market development in general but also for specific possibilities for different types of investors.

Finally, by liberalising the green electricity market, the Ministry of Economic Affairs aimed for an increase in demand for green electricity. With this, the Dutch policy for renewable energy focused on strengthening the demand side, placing a strong emphasis on voluntary action in line with this new setting of a liberalised market with full competition and free customer choice. With approximately 1.4 million customers at the beginning of 2003, the demand side did not prove to be a problem in the Netherlands. The problems clearly lie on the energy-supply side. When considering the wind power supply market from the perspective of the model, we can conclude that technical and economic conditions are not prohibitive these days. The configuration of institutional conditions is, however. The liberalised green market combined with the REB tax exemption for foreign green electricity has created an uneven playing field. Domestic wind power implementation is hindered by competition from cheap, already written-off renewable energy stations all around Europe. The Dutch incentive system is not in accordance with other European countries, which causes the implementation capacity to decrease for all types of wind power entrepreneurs in the Netherlands. A common European electricity market clearly requires

some harmonisation of (fiscal) incentives in order to protect the domestic supply of green electricity. The partial replacement of the fiscal incentive scheme with what is known as an MEP feed-in tariff system (expected in June or July of 2003) will provide for this need for harmonisation. With this, the focus of Dutch renewable energy policy will most likely shift back to the supply side, in keeping with most other European countries.

Acknowledgements

Susanne Agterbosch is a Ph.D. researcher in environmental policy at the Copernicus Institute for Sustainable Development and Innovation at Utrecht University in the Netherlands. Dr. Walter J.V. Vermeulen and Prof. Dr. Pieter Glasbergen are associated with the Copernicus Institute.

The authors would like to thank G.J. van Mulekom of KEMA Nederland BV for putting the KEMA wind monitor data at our disposal for the research.

This research was carried out within the framework of the *Stimuleringsprogramma Energieonderzoek* (Programme for the Promotion of Energy Research), which was set up by the Netherlands Organisation for Scientific Research (NWO) and the Netherlands Agency for Energy and the Environment (Novem—Nederlandse Organisatie voor Energie en Milieu). Neither NWO nor Novem guarantees either the accuracy or the completeness of the research data and results. The financial support provided by NWO and Novem is gratefully acknowledged.

References

Berenschot, J.H.M., Paardekooper, K., 2000. Windenergiebeleid; De wil is er, nu nog de weg. WindNieuws 17 (6), 18–19.

Beurskens, H.J.M., Jansen, L.G.J., 1998. Windenergie. In: Handboek energie en milieu. Samson bedrijfsinformatie, Alphen aan de Rijn.

Blom, M., Klimbie, B., et al., 2002. Besluiten over energieprojecten. Knelpunten bij realisatie van gaswinnings—en windprojecten. Delft, The Netherlands, CE.

Boomsma, H.W., 2002. Personal communication. Senior Policy Advisor of Ministry of Economic Affairs, The Hague.

Bosch, G., 2002. E-mail communication. Chairman of the Commission Implementation, NEWIN, Dutch Wind Energy Association.

Brugeman, D.I., 2002. Personal communication. Managing Director of Joule Consult BV, Consultancy in the field of renewable energy projects.

Carlsson, B., Jacobsson, S., et al., 2002. Innovation systems: analytical and methodological issues. Research Policy 31 (2), 233–245.

Carlsson, B., Stankiewicz, R., 1995. On the nature, function and composition of technological systems. In: Carlsson, B. (Ed.), Technological Systems and Economic Performance: The Case of Factory Automation. Kluwer Academic Publishers, Dordrecht.

Cleijne, H., Ruijgrok, W., et al., 1999. Duurzame energie in de race naar 2050. Winnende paarden en talenten in prijs, aanbod en duurzaamheid. Arnhem, The Netherlands, KEMA Sustainable, p. 69.

Dinica, V., Arentsen, M., 2001. Green electricity in the Netherlands. Center for Clean technology and Environmental Policy (CSTM), University of Twente.

Dutch Parliament, 1989. Electricity Act of the Netherlands. Staatsblad 1989, No. 535.

Dutch Parliament, 1998. Electricity Act of the Netherlands. Staatsblad 1998, No. 427.

Edquist, C., 1997. Systems of innovation approaches—their emergence and characteristics. In: Edquist, C. (Ed.), Systems of Innovation—Technologies, Institutions and Organizations. Pinter, London.

Energeia Energienieuws, 2002/2003. http://www.energeia.nl/index.

EnergieNed, 1998. Prognose electriciteit 1997–2008. Arnhem, The Netherlands.

EnergieNed, 2001. Environmental Action Plan MAP 1990–2000 Eindrapportage. Arnhem, The Netherlands.

Enzensberger, N., Wietschel, M., et al., 2002. Policy instruments fostering wind energy projects—a multiperspective approach. Energy Policy 30 (9), 793–801.

Gipe, P., 1995. Wind Energy Comes of Age. Wiley, New York.

Greenpeace/EWEA, 2001. Wind force 12. A blueprint to achieve 12% of the world's electricity form wind power by 2020.

GreenPrices, 2002/2003. Green energy in Europe, http://www.green-prices.com.

Hilten, O.van, Beeldman, M., et al., 1996. De ECN-Bijdrage aan de derde Energienota, Uitgebreide Energieschetsen 2020. Petten, The Netherlands, ECN.

Jacobsson, S., Johnson, A., 2000. The diffusion of renewable energy technology: an analytical framework and key-issues for research. Energy Policy 28 (9), 625–640.

Johnson, A., Jacobsson, S., 2002. The Emergence of a Swedish Growth Industry: A Comparative Analysis of the Wind Turbine Industry in Sweden, Germany and The Netherlands. Chalmers University of Technology, Gothenburg.

de Jong, M.I.C.A., 1999. WIN-WIND Regionale besluitvorming over wind gesimuleerd. The Netherlands, HASKONING Resource Analysis Novem.

Junginger, M., Agterbosch, S., et al., 2003. Renewable electricity in the Netherlands. Energy Policy, in press.

Kamp, L., 2002. Learning in Wind Turbine Technology. A Comparison Between the Netherlands and Denmark. Utrecht, Utrecht University.

KEMA, 2002/2003. Dutch windmonitor, http://www.windmonitor.nl.

van der A. Knijf, 1999. Windenergie in de agrarische sector. Meewind of tegenwind? Landbouw Economisch Instituut, The Hague, The Netherlands, (LEI), 2.99.08.

Koeslag, J., 2002. Vergunningtraject van windenergie. Een onderzoek naar de doorlooptijd en de slagingskans van de juridische procedures voor het plaatsen van windturbines. Rotterdam, The Netherlands. CEA.

Krohn, S., Damborg, S., 1999. On public attitudes towards wind power. Renewable Energy 16 (1–4), 954–960.

Littel, A., 2002. Personal communication. Senior Policy Advisor, Ministry of Housing, Spatial Planning and the Environment, The Hague.

Meadowcroft, 2002. Lecture as part of the course Sustainable Development at the Department of Environmental Studies and Policy. Faculty Geographical Sciences at the Utrecht University, 16 September 2002, Utrecht, The Netherlands.

Meerkerk, 2002. Personal communication. Managing Director, Wilde Wind BV, Windpower Project Developer.

Middelbos, A., 2002. Message on Windnet, http://groups.yahoo.com/group/windnet/message/1422, December 2002.

Ministry of Economic Affairs, 1995. Derde Energienota. Ministry of Economic Affairs, The Hague, The Netherlands.

Ministry of Economic Affairs, 1997. Duurzame energie in opmars, Actieprogramma 1997–2000. Ministry of Economic Affairs, The Hague, The Netherlands, p. 58.

Ministry of Economic Affairs, 2001a. Bestuursovereenkomst Landelijke Ontwikkeling Windenergie (BLOW). Ministry of Economic Affairs, The Hague, The Netherlands, p. 30.

Ministry of Economic Affairs, 2001b. Programma Evaluatie TWIN-2 Amersfoort. DHV Milieu en Infrastructuur BV, The Netherlands.

Ministry of Economic Affairs, 2002. Investeren in energie, keuzes voor de toekomst. Energierapport 2002, Ministry of Economic Affairs, The Hague, The Netherlands, p. 102.

Ministry of Housing, Spatial Planning and the Environment, 1989. Eerste Nationaal Milieubeleidsplan (NMP). The Hague, The Netherlands.

Ministry of Housing, Spatial Planning and the Environment, 2000a. Fifth National Policy Document on Spatial Planning. The Hague, The Netherlands.

Ministry of Housing, Spatial Planning and the Environment, 2000b. Changes in fifth national policy document on spatial planning. The Hague, The Netherlands.

Novem, 1991. Bestuursovereenkomst Plaatsingsproblematiek Windenergie (BPW). Utrecht, The Netherlands.

Novem, 1996. Toepassing van Windenergie in Nederland 1996–2000 (TWIN-2). Utrecht, The Netherlands.

Reiche, D., 2002. Netherlands. In: Reiche, D. (Ed.), Handbook of Renewable Energies in the European Union. Case studies of all Member States. Peter Land GmbH, Frankfurt am Main.

Reijnders, L., 2002. Imports as a major complication: liberalisation of the green electricity market in the Netherlands. Energy Policy 30 (9), 723–726.

van Sambeek, E.J.W., de Lange, T.J., et al., 2002. Invulling van wetsvoorstel MEP voor duurzame electriciteit, Samenvattend overzicht van een mogelijke categorisatie en producentenvergoedingen. Petten, The Netherlands, ECN.

Slingerland, S., 1999. Energy Conservation and Electricity Sector Liberalisation. Towards a Green and Competitive Electricity Supply? University of Amsterdam, Amsterdam.

van der Steen, G., 2003. Personal communication. Senior Project Manager, Nuon Renewable Energy.

Verbong, G.P.J., 1999. Wind power in the Netherlands. Centaurus 41 (1–2), 137–160.

Verbong, G.P.J., van Selm, A., et al., 2001. Een kwestie van lange adem. De geschiedenis van Duurzame Energie in Nederland. Boxtel, Aeneas.

Verheij, F.J., Hoeve, R.J., 2002. Route naar een hoog implementatie-tempo windenergie op land. Beleidsadvies, Arnhem, The Netherlands, KEMA Sustainable 50160991.100-KPS/SEN 02-3001.

Vermeend, W., van der Vaart, J., 1998. Greening Taxes: The Dutch Model; Ten Years of Experience and the Remaining Challenge. Kluwer, Deventer.

Voogt, M.H., Uyterlinde, M.A., et al., 2001. Renewable energy burden sharing REBUS. Effects of burden sharing and certificate trade on the renewable electricity market in Europe, Petten, The Netherlands, ECN, Risoe, Serven, ESD, p. 113.

Wind Service Holland, 2002/2003. Internetsite of Wind Service Holland, http://home.wxs.nl/~windsh/.

Windnet, 2002/2003. The realisation of renewable energy and wind energy in particular (Dutch), http://groups.yahoo.com/group/windnet/.

Wolsink, M., 1996. Dutch wind power policy. Stagnating implementation of renewables. Energy Policy 24 (12), 1079–1088.

Wolsink, M., 2000. Wind power and the Nimby-myth: institutional capacity and the limited significance of public support. Renewable Energy 21 (1), 49–64.

Ybema, J.R., 1999. De bijdrage van duurzame energie in Nederland tot 2020. Petten, The Netherlands, ECN, p. 94.