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Energy Conservation and Electricity Sector Liberalisation: towards a Green and Competitive Electricity Supply?

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5. Germany

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In this article, the development of wind energy, cogeneration and demand-side management in the German electricity sector are analysed to see what lessons could be learnt for the Dutch electricity sector. Wind energy development in Germany turns out to be much more successful than in the Netherlands. The analysis suggests that stimulation of private investments through a legally prescribed pay-back tariff as well as a preferential treatment of wind turbines in local zoning policy could remove existing hurdles to wind energy development in the Netherlands. Cogeneration and demand-side management on the other hand appear more prosperous in the Netherlands. It is argued that some factors which have contributed to the development of these energy conservation options in the Netherlands are absent in Germany.

Electricity sectors in Europe are on the edge of a new age. The 1996 European Union directive on liberalisation of the electricity market will bring about organisational changes or reinforce the reorganisation process that is already taking place in all EU countries. Triggered by the present climate change debate, energy conservation is becoming a key issue in the electricity sector of many of these countries. A crucial question is therefore if energy conservation and electricity sector liberalisation can be reconciled within the future framework of electricity supply.

In this article, which is part of a larger research project in which the developments in several countries are examined, the German electricity sector is analysed to see what lessons could be learnt for

integrating energy conservation and electricity sector liberalisation in the Netherlands.

Method of Analysis

Energy conservation in this article is defined as *a reduction in the use of fossil fuels and nuclear energy as primary energy sources for electricity supply*.

With this definition, three broad areas of energy conservation within the electricity sector can be identified¹:

1. a reduction in end-user demand for electricity;
2. an increasing use of renewable primary energy sources in electricity generation; and
3. more efficient fossil fuel generation.

As these three broad fields of energy conservation each in turn consist of many individual options, in the following for each a single case-study is examined. These are the development of *demand-side management*, of *wind energy* and of *cogeneration* respectively. In each case-study, first the development of the energy conservation option in question is described, subsequently underlying issues of this development are analysed and finally the influence of the liberalisation process is discussed. The case descriptions are based on literature, documents and in-depth interviews with persons working in the German electricity sector and independent experts.

Particular attention is paid to six variables: *ownership*, *vertical structure* and *market position* of utilities ('sector-internal factors') and *policy makers*, *primary-energy suppliers* and *end-users* ('sector-external actors'). The former three variables were selected, as changes herein are key elements in the liberalisation process in many countries, including the Netherlands. The latter three were chosen as these variables represent in general terms three groups of actors which are of vital importance to the position of utilities in all electricity supply systems.

Before turning to the case-studies, a general overview of the existing structure of the electricity sector and the liberalisation debate in Germany will be given. The situation as of 1997 is taken as a basis.

¹ Although nuclear energy is promoted by some with reference to its contribution to saving fossil fuels and reducing CO₂ emissions, it remains a controversial technology due to its waste problems and risk of accidents. It was therefore chosen to exclude nuclear energy from the energy conservation options examined here.

Subsequently, the development of wind energy, cogeneration and demand-side management examined. Finally, it will be discussed to what extent the conclusions of the case-studies can provide recommendations for reconciling energy conservation and liberalisation in the Netherlands.

The German Electricity Sector

The electricity sector structure in Germany is very complex, with utilities varying substantially in degree of vertical integration, size and ownership. This situation is made even more heterogeneous by the problems of integrating the electricity sector of former West and East Germany into one system. However, as the reunification process appears less relevant for the Dutch context it will not be discussed in detail here.

Sector-External Actors

Policy Makers; The Ministry of Economic Affairs, or *Bundesministerium für Wirtschaft* (BMWi) is responsible for overall regulation of the electricity sector on a federal level. Current basis of this regulation are the 1935 *Energiewirtschaftsgesetz* and the 1958 Anti Trust Law, together defining monopolies in public electricity generation and supply for the utilities. Individual *Länder* have passed supplementary legislation which mainly relates to the construction of plants and networks (Cross, 1996). Energy conservation takes place within the larger framework of climate policy, for which the Ministry of the Environment - *Bundesministerium für Umwelt* (BMU) - is responsible. Overall goal of German climate policy is a reduction of emissions by 25% over the period 1990 to 2005 (BMU, 1996).

Primary Energy Suppliers; The most important primary energy source for electricity generation in Germany is nuclear energy (35.5%), followed by lignite (27%), coal (25%), gas (6.4%) and hydro power (4.1%) (IZE, 1998). The importance coal and lignite as the traditional domestic primary energy sources, and consequently the role of their producers, is declining. Previously utilities had to buy a certain percentage of these domestic energy sources, the costs of which they could finance by charging a levy - the so-called *Kohlepfennig* - to end-users. However, after a legal decision of the Federal Court asked for by the utilities this legislation had to be changed (GS, 1996). Domestic coal and lignite production is now subsidised directly by Government. As policy makers

already have announced to reduce these subsidies, in the near future the share of domestic coal and lignite in total electricity generation will further decrease.

By far the most important renewable energy source in Germany is hydro-power. Whereas the share of wind power in total electricity generation is still marginal - less than 1% in 1995 (VDEW, 1996a) - it contributes for more than 4% to total net demand in the three coastal federal states. In one of these *Länder*, Schleswig-Holstein, its share in net demand is already more than 12% (Rehfeldt, 1998).

End-users; Particularly industrial end-users play a role in German electricity supply as autoproducers of electricity and heat by way of cogeneration. Increasingly, small end-users are also supplied by electricity from cogeneration plants. Furthermore, a small percentage of wind turbine operators are simultaneously end-users who produce electricity primarily for their own demand.

Sector-Internal Factors

Vertical Structure; The transmission network is operated by eight (previously nine) large electric utilities, the so-called *Verbundunternehmen* ('VBUs'), which all have their own network territory. They generate some 80% of all electricity, and supply in their network area partly directly to end-users, partly to other utilities (Walz, 1994). Apart from the VBUs there are about 70 *Regionale Versorgungsunternehmen* ('RVUs') that generate and supply electricity in non-urban areas, some 50 generators that supply electricity only to other utilities and about 900 municipal *Kommunale Versorgungsunternehmen* ('KVUs'). The latter are mainly distributors though sometimes they have own generation capacity as well, including district heating plants which are of ten operated in a co-generation mode (Riemer, 1995).

Ownership; There is a large variation in property rights of utilities. Most utilities are mixed private and public property. Only 7% of the electricity is supplied by completely privately owned companies (VDEW, 1996a). KVUs are usually public property owned by municipalities. Regional utilities are also predominantly owned by municipalities as well as regional councils. Cross-ownership between utilities is widespread. The VBUs partly own the RVUs and KVUs in their transmission area, as well as part of each-others shares. In addition, some *Verbundunternehmen* belong to a larger holding which contains subsidiary companies in various areas (Cross, 1996).

Market Position; Utilities hold monopolies in public electricity generation and supply. The boundaries of the supply areas are set in demarcation agreements between utilities. By signing concession agreements with local authorities, utilities get the right to use public grounds for the transmission lines needed to supply end-users with electricity. The concession fees involved here are an important source of income for local authorities.

The Liberalisation Debate

In September 1996, the Government presented an outline of the new *Energiewirtschaftsgesetz* ('Energy Act'). The concept allowed for negotiated access to the grid, and would introduce competition in generation and supply in a one-step process. Neither vertical structure, nor ownership of utilities were planned to be changed, only an administrative unbundling of generation, transmission and supply was envisaged. Demarcation agreements would become invalid, and concession agreements would lose their monopoly character. Municipalities would be obliged to grant concessions to any utility willing to pay a concession fee (Bundestag, 1996).

The concept gave rise to a lively political debate in which VBUs, RVUs and KVUs as the three main groups of utilities held different positions. The municipal utilities expected a reduction of income from the concession fees if these no longer would imply a monopoly right to use public grounds in a certain area. Hence, their reaction to the proposed legislation was more sceptical than that of the RVUs and VBUs, who expected to improve their competitive position in a market. The *Bundesrat*, in which the federal states are represented, shared the objections of the KVUs and rejected the Governmental concept in first reading (*Bundesrat*, 1996).

In March 1997 a reaction of the Government to this resolution was published which partly gave in to the objections of the *Bundesrat* (*Bundesregierung*, 1997a). The revised act was passed in Parliament in November 1997. As Government held the position that the revised act did no longer require approval of the *Bundesrat*, it was sent to the *Bundespräsident* for formal signature and came into force in May 1998. However, the *Bundesrat*, in which the present opposition holds a majority, still objects to this reading and has announced to let the procedure be checked by the Federal Court. With elections coming up in Autumn 1998, the further fate of the *Energiewirtschaftsgesetz* is therefore quite uncertain.

Wind Energy

Development

Wind energy in Germany is booming at present, despite the limited share this renewable still has in total electricity supply. In seven years time the installed capacity rose from virtually scratch (less than 50 MW in 1990) to 2080 MW at the end of 1997, which now has made Germany the country with the largest installed total wind turbine capacity world-wide (Rehfeldt, 1998).

Underlying Issues

The history of this very successful development started with a failure. In 1976 the *Bundesministerium für Forschung und Technologie* ('Ministry of Research and Technology') as the responsible policy maker on a national level announced plans for a large experimental turbine to create a lift-off for large scale application of wind energy. In 1981 this led to the construction of the 'Growian', a 3 MW turbine owned by several utilities and financed by the Ministry. Although this turbine supplied many useful data, the technical problems made this turbine an economic disaster. In 1988 the turbine was dismantled, after only 500 hours in full operation (DGW, 1991).

In 1989 the Ministry decided to grant subsidies with the goal to install 100 MW of wind power. New subsidies were based on the amount of electricity produced per turbine rather than on the installed capacity (Li *et al.*, 1996). Two years later the *Stromeinspeisungsgesetz* ('Electricity Feed Law') became operative. Based on this law, utilities became obliged to pay a fixed remuneration for electricity from certain renewables fed into the grid. For wind energy, this remuneration was set at 90% of the end-user tariffs. In addition, favourable loans were provided. Several *Länder* started programmes providing additional subsidies, and the Federal '100 MW programme' was continued in order to realise a 250 MW target (Bräuer & Hemmelskamp, 1996).

The *Stromeinspeisungsgesetz* stimulated particularly third parties to finance turbines which fed most or all electricity into the grid. Hardly any electricity produced by these investors was used for own purposes. At the end of 1994, only 220 of the 2466 turbines in operation at that moment were owned by utilities. 2.6% of the electricity generated by private turbines was used by the investors themselves (Grawe & Wagner, 1996). The rapid growth of installed capacity in recent years was also influenced by the development of technology. Although the 3 MW of the Growian turbine is still beyond the horizon, the average size

of installed turbines increased in a few years tenfold, to more than 500 kW in 1997 (Rehfeldt, 1998).

Despite the high installation rates, there are also some problems with the development of wind power. All utilities independent of ownership and vertical structure, though principally in favour of renewables and wind energy, are heavily opposed to the *Strom-einspeisungsgesetz*. Several utilities, KVUs, RVUs as well as VBUs, have started legal procedures to achieve that this way of financing wind power is declared unconstitutional by the Federal Court. The remuneration, in their opinion, is too high and regionally unbalanced. Wind energy should preferably be financed by direct governmental subsidies (Grawe, 1996; Leuschner & Uhlmannsieck, 1996). In 1996 the European Commission added to these protests by also objecting to the height of the remuneration (IZE, 1997).

As a result of the uncertainty for investors caused by utility resistance and continuing legal procedures, the installation rate of wind turbines dropped in 1996 (Allnoch, 1997). One year later, however, wind energy development had already partly recovered. Although the number of turbines in 1997 was still lower than in 1995, due to the ever increasing size of turbines the total installed capacity in MW was larger than in all previous years (Rehfeldt, 1998).

Another impediment to the growth of wind power until recently was the uncertainty concerning building permits for turbines. In 1994 a legal preferential treatment of wind turbines in spatial planning had to be abolished as a result of a court decision. The result was that in many cases the granting of permits was substantially delayed (Scholz, 1996). A change in legislation that became effective on January 1st, 1997 reintroduced this preferential treatment by obliging municipalities to include zones for wind turbines in their zoning schemes within two years. According to the new regulation, the municipalities are obliged to approve a request for construction of turbines on a site if the legal conditions for the building permits are fulfilled, unless this is evidently against public interest (Mengers, 1996).

A recent development finally are the 'green electricity' schemes, in which end-users can voluntarily contribute to development of wind energy and other renewables by paying a surcharge on their electricity bills. Although various utilities have introduced such schemes, their importance on a national scale so far is marginal. At RWE, within one year of introduction of the scheme some 10,000 customers (out of 2,5 million in total) participated (IZE, 1997a). At Badenwerk and EVS just 279 and 701 participated respectively (Janzing, 1998).

Discussion: Wind Energy Development and Liberalisation

The previous analysis suggests that wind energy in Germany is primarily driven by private investors. Only very few of these investors are end-users which use the electricity generated primarily for own purposes. Some end-users who are not wind turbine operators themselves contribute to wind energy development via the 'green electricity' tariffs. Wind energy development is stimulated by policy makers with several instruments, including a preferential treatment in zoning policy and particularly the fixed remuneration for electricity delivered to the grid by the *Stromeinspeisungsgesetz*. Whereas private investors benefit from this regulation, it faces strong opposition from utilities. No evidence was found for involvement of primary energy suppliers in wind power development.

It appears that liberalisation will not fundamentally change this organisational structure of wind power development. The *Stromeinspeisungsgesetz*, as perhaps the most important element of this structure, will be continued. Ownership and vertical structure of utilities will not change according to the new Energy Act.

One change, however, that will take place after the introduction of competition is that a cap will be put on the total amount of electricity fed into the grid which has to be subsidised by utilities. If this amount exceeds 5% of total supply in the area of a utility, the network operating VBU in whose area the utility supplies has to pay the additional subsidies. If the amount of electricity also exceeds 5% of supply in the total area of the VBU, new turbines will no longer be eligible for the remuneration (Bundestag, 1997). It is expected that this double 5% mark will be reached in the year 2000 by the regional utility Schleswig and its network operator PreussenElektra (IZE, 1997b). However, it is unclear how the cap will be applied in practice, as the concept of 'supply area' ceases to exist in a liberalised situation.

Cogeneration

Development

Small-scale decentral cogeneration ('*Blockheizkraftwerke*', short *BHKWs*) is booming in recent years: the installed capacity rose from ca. 200 MWe in 1985 to 1260 MWe in 1996 (IZE, 1998b; Rumpel, 1996a). Also, district heating cogeneration capacity in East Germany increased from 916 MW in 1990 to 1675 MW in 1994. However, in West Germany district heating cogeneration capacity is pending at a level

between 7 to 8,000 MW since the mid-eighties, and industrial co-generation capacity is roughly constant at a level of around 6,000 MW since the 1960s (Rumpel, 1996b).

Underlying Issues

The significant increase of small-scale decentral cogeneration coupled to an - apart from East German district heating - rather stagnating development of district-heating cogeneration and industrial CHP can be linked to several underlying issues.

In the first place, the decreasing price of natural gas relative to coal and lignite since the abolishment of the OPEC price controls in 1985 has been in favour of BHKW development, as 78% of these installations use natural gas for electricity and heat generation (Rumpel, 1996a). District heating and industrial cogeneration plants in Germany on the other hand mainly burn lignite and coal (BMW, 1996a). In recent years also many new gas networks have been constructed, which are an important competitor to district heating in end-user heat supply. Stricter insulation regulation furthermore reduced demand for new district heating capacity, and demand for industrial heat has decreased as a result of efficiency improvements (BMW, 1994).

Policy support for CHP in recent years mainly consisted of subsidies for conversion of East German heat-only district-heating plants to cogeneration. Furthermore, tax reductions for fuel used by efficient cogeneration plants are provided. In some *Länder* energy agencies furthermore support the construction of CHP plants (Cogen, 1997).

Tariffs for electricity delivered to the grid by industrial cogeneration plants are negotiated bilaterally between the industrial end-users involved and utilities. For plants smaller than 5 MW, the basis for the remuneration is an agreement that dates from 1979. It has been changed on several occasions and has given rise to many disputes, since the remuneration initially was lower than avoided costs of utilities. As a result of a Federal Court decision in 1996, however, the remuneration had to be raised (Cogen, 1997).

The position of utilities towards CHP is ambivalent. On one hand they actively support BHKWs, on the other hand there have been cases where industries considering the construction of cogeneration plants have been offered lower electricity tariffs to prevent them from realising this aim (Cogen, 1997). Small-scale, site specific cogeneration such as BHKWs fit very well into the objectives of utilities as they have a 'green' image and can be a way to bind customers in preparation of the anticipated competition in a liberalised market (VDEW, 1996b). Most of these

plants generate electricity and heat exclusively for own demand, and hence they hardly contribute to the overproduction of electricity (BMW, 1994). New large-scale district-heating or industrial cogeneration on the other hand would contribute to this overcapacity.

Discussion: Cogeneration Development and Liberalisation

The analysis suggests that changes in prices of primary energy sources as well as the position of utilities towards cogeneration are crucial factors in CHP development in Germany. Policy support and end-user influence appear less decisive.

The influence of ownership and vertical structure of utilities on their position towards cogeneration was particularly reflected in the debate about liberalisation between KVUs on one side, and RVUs and VBUs on the other side. The municipal KVUs, as the main owners of district-heating capacity, stressed the expected negative influence of introduction of competition on district-heating. The funds needed for maintenance and construction of district-heating networks would be very difficult to raise if large customers could switch to a competitor (VKU, 1995). Therefore, they supported a single-buyer model for municipal utilities (the 'City Gate Ansatz'), which would allow for limited competition but preclude such switches (Attig, 1997). VBUs and RVUs on the other hand argued that competition in generation of electricity might provide advantages for industrial CHP. They claimed that introduction of competition would result in up to 5000 MW of new industrial cogeneration (ARE & DVG, 1996).

The debate about the future of cogeneration was one of the points which led to the already mentioned revision of the new *Energiewirtschaftsgesetz*. Although the model supported by the KVUs was not followed, the revised act now contains a section which makes it possible for utilities to preclude access to the grid for competitors if this would impede economical operation of renewables and CHP plants, including district-heating cogeneration (Bundestag, 1997).

Demand-Side Management

Development

Demand-side management (DSM) activities of utilities in Germany are undertaken by representatives from VBUs, RVUs as well as KVUs. The degree of involvement largely varies: whereas some utilities are engaged in all kinds of activities, others are not or hardly involved at all.

By 1995, utilities were involved in total in 193 projects, in which in total DM 800 million was spent (BMU, BMWi, BDI, 1996). Most common activities are information and advice as well as promotion of efficient appliances, particularly lighting. Some examples of demand management projects are the 'Kunden-Energiesparservice' at RWE (which is one of the VBUs), loans for energy efficient appliances at Schleswig (a regional utility) and the 'CO₂-Minderungsprogramm' at MVV Mannheim (a municipal utility). A comprehensive study into integrated resource planning, which investigated in detail possibilities for demand-side management, was carried out by the Stadtwerke Hannover (a municipal utility) from 1992 to 1995.

Underlying Issues

The demand-side management activities of the utilities are undertaken in the light of a covenant signed by the Environment Ministry, the Ministry of Economic Affairs and the Federation of German Industry, in which the umbrella organisation of German utilities, VDEW, participates. As a contribution to the national policy goal for CO₂ reduction (25% in the period 1990 to 2005), VDEW has committed itself to a target of 25% reduction in the year 2015 compared to 1987. This implies a 8 to 10% reduction in the period 1990 to 2005 (BMU, BMWi, BDI, 1996).

Demand-side management is also part of this covenant, but its exact contribution is not specified. The covenant period furthermore includes the date of reunification of former East and West Germany, which by itself has brought about a large emission reduction. A study carried out for the Ministry of Economic Affairs revealed that most of the 13% emission reduction obtained in the period 1990 to 1995 had to be ascribed to reunification (BMW, 1996b).

VDEW registers the DSM activities of utilities and provides assistance and advice, but does not co-ordinate activities on a national scale. The participation of individual utilities takes place on a completely voluntary basis. This means that often the commitment of local and regional policy makers is important for utility involvement in DSM. End-users are not commonly directly involved in decisions of utilities whether or not to initiate demand-side management measures.

The present regulation does not include a levy on a national level to finance any activities. If utilities wish to initiate any DSM activities, however, in some *Länder* a limited surcharge on end-user electricity tariffs is allowed.

Discussion: Demand-Side Management and Liberalisation

In the foregoing it was argued that particularly voluntary commitment of utilities, partly induced by local and regional policy makers, is important for demand-side management in Germany. The influence of national policy makers as well as end-users appeared limited. No evidence was found for influence of primary-energy suppliers.

All groups of utilities were found to be involved to some extent in DSM. Similar to the cogeneration case-study, however, differences in ownership and vertical structure between *KVUs* and *RVUs/VBUs* showed up in the discussion about the influence of liberalisation on demand-side management. Whereas municipal utilities feared that demand-side management in the context of more comprehensive municipal energy plans would become very difficult in a future competitive market, the two other parties pointed at possibilities for commercial energy services in a market situation (VKU, 1995; ARE & DVG, 1996).

The outcome of this discussion was that the existing situation regarding demand-side management will be largely continued. In the new *Energiewirtschaftsgesetz* no new measures to stimulate demand-side management were announced (Bundestag, 1997).

Lessons for Reconciling Energy Conservation and Liberalisation in the Dutch Electricity Sector?

Although care has to be taken when trying to draw general conclusions from the limited number of cases and variables examined in this article it is held that, comparing the three case-studies and sector-internal and external variables identified previously, some conclusions can be drawn which can provide the basis to a further discussion.

Liberalisation in the Netherlands has developed different from Germany. In 1990 already, distribution and generation were unbundled into separate companies. In early 1998, a new Electricity Act was accepted by Parliament. It is scheduled to introduce competition in generation in 1999, and competition in end-user supply in three steps from 1999 on, starting with very large consumers. Furthermore, it is planned to merge the four generation companies which were formed in 1990 into one large Dutch generation company in 1998. So far, however, no agreement between the parties could be obtained.

Comparing cogeneration developments, it has to be noted that small-scale decentral, but particularly industrial cogeneration in the

Netherlands in recent years is booming. By far the largest part of newly installed cogeneration capacity, and indeed the largest part of totally installed generation capacity in recent years, is decentral, mainly industrial CHP set up as a joint-venture between industry and distribution companies. In this way, the share of cogeneration in total generation capacity rose from 13% in 1990 to 23% in 1996 (PW/K, 1997). In a previous analysis of the Dutch situation (Slingerland, 1997a), it is argued that the unbundling of generation and distribution companies in 1990 was very important for this boom. It gave distribution companies an incentive to look for access to power plant independent of the large generation companies. As the size of generation capacity to be owned by distribution companies was legally limited to 25 MW, and third parties were not allowed to enter the generation market at that time, cogeneration joint-ventures with industry proved to be a very attractive way around the legal restrictions of generation capacity for distributors.

In Germany at the introduction of competition no organisational unbundling of distribution and generation is envisaged. Hence there will be no party created to which the stimulation of cogeneration is particularly important. Policy support for cogeneration in Germany also appears more limited than in the Netherlands, where cogeneration development in the past has been supported by favourable loans and grants. Even despite the claims of VBUs and RVUs, who expect 5000 MW of new industrial CHP, a boom of industrial cogeneration similar to the Netherlands therefore seems not very likely in Germany.

Regarding demand-side management, activities of distribution utilities in the Netherlands are listed in a covenant of distributors with policy makers (the '*Milieu Actie Plan*', short MAP - Environmental Action Plan) in which the distributors agree to carbon-dioxide emission reductions of 17 million tonnes, or 3% of projected emissions, in the period 1990-2000. The costs of these activities are financed by charging a 'MAP' levy to end-users. Quite contrary to the overall CO₂ emission reduction target in the Netherlands, these activities so far appear to be fairly well on schedule (EnergieNed, 1996). The covenant includes cogeneration and renewables activities, but about half of the emission reduction has to be achieved by demand-side measures which are listed in detail in the action plan. For each measure the CO₂ effect is quantified, and each distribution company takes part in the overall reduction obligations based on its share in total supply to end-users. The activities are co-ordinated, and their progress is monitored by the national umbrella organisation of distribution companies.

In Germany, there is also a covenant of utilities with policy makers in which they agree to a CO₂ emission reduction. The target set is far more ambitious than in the Netherlands (25% compared to 3%), but the period over which the target has to be attained is much longer as well (1987-2015 versus 1990-2000). In addition, the emission reduction period includes the date of reunification, which by itself has brought about a large emission reduction. Neither are, contrary to the situation in the Netherlands, the demand-side management activities in Germany closely co-ordinated on a national level. This means that involvement of utilities is left to their own motivation, or to initiatives by local and regional policy makers, which apparently is not sufficient for all utilities to participate.

Might the developments in cogeneration and demand-side management seem more prosperous in the Netherlands than in Germany, this certainly does not hold for wind energy. The development of Dutch wind power is far behind schedule. Although the target to install 1000 MW of wind turbines by the year 2000, which has been formulated more than a decade ago, is still maintained in theory, policy makers already have acknowledged that at best three quarter of this goal can be realised (EZ, 1997). Even this target is not likely to be met however, since at the end of 1997 only 325 MW were installed (Erp, 1998), and the installation rates in 1997 were lower than ever before (net 30 MW, *ibid.*).

Two important impediments to wind energy in the Netherlands are spatial planning and the uncertainty regarding financial support, including the pay-back tariff to be paid by utilities for electricity from wind turbines supplied to the grid. In 1991 in the Netherlands on a Provincial level zones have been designated for the installation of wind turbines through an agreement of the central Government with seven of the twelve Provinces. Municipalities, who have to issue the final building permits for turbines, were not involved in this agreement.

As the actual installation of turbines in many Dutch municipalities meets local opposition, with resulting delays and cancellation of projects, involving municipalities and local communities in decision-making regarding wind turbines seems wise. Attempts to increase support of local citizens and policy makers are already undertaken in a national campaign set up by the national Bureau for Wind Energy (Janse, 1997a). Furthermore, regional consultation groups were set up in which Provincial policy makers can discuss problems regarding implementation of wind energy with their local counterparts. The interest of local

authorities to take part in these consultation groups, however, is low (Tielen, 1997).

Hence, given the very low present installation rates trying to create support on a voluntary basis might not be sufficient to attain the 1000 MW goal set. As a more forceful approach, a similar preferential treatment for wind turbines in local zoning policy as in Germany might be necessary. If Dutch municipalities, similar to their German counterparts, would have to designate zones in which turbines could be installed they would at least have to consider where wind turbine installation in their area is possible, or otherwise risk that investors could simply claim such space to be made available.

A second impediment to wind turbine development in the Netherlands is the uncertainty regarding financial support for wind energy, and particularly the remuneration for electricity supplied to the grid. This remuneration has to be negotiated between distributors and private investors. In this way, distributors as a party with an own interest can determine profit rates of private wind turbine investors. Furthermore, the fact that the remuneration has to be renegotiated yearly makes long-term profit calculations difficult. In 1997, an agreement on a national level could not even be attained, so that private investors were dependent on contracts with individual distributors for remunerations (Janse, 1997b). Contrary to the situation in Germany therefore, distribution utilities rather than private parties so far are the main investors in wind energy in the Netherlands (Slingerland, 1997).

A recent development in the Netherlands is the system of tradable 'green labels'. In this system, distribution companies have agreed to supply 3% of their electricity to end-users in the year 2000 from renewable energy sources. This has to be proved by the number of 'green labels' a distributor holds, which can be obtained either by generating electricity from renewables itself, or buying labels from other renewable energy generators, such as private wind turbine investors. It is hoped for that this system will provide new incentives for renewables, including wind energy.

Looking at the situation in Germany however, where the pay-back tariffs are legally guaranteed and utilities do not have possibilities to change these tariffs unilaterally, it appears that particularly these arrangements have been responsible for the large growth rates in installed wind turbine capacity. The resulting relatively high remuneration and long-term investment security showed to be very effective means to attract private investors and hence to stimulate the development of wind energy. This is also affirmed looking at the situation in Denmark, where

quite similar regulations as well as high growth rates of installed wind turbine capacity are found (Slingerland, 1997b).

Although the Dutch system is certainly more 'market conform' in allowing for individual arrangements between utilities and private investors, and results of the tradable green label system still have to be awaited, the comparison suggests that for high growth rates in installed wind turbines a system similar to the fixed remuneration of the *Stromeinspeisungsgesetz* might be needed in the Netherlands as well.

Finally, the comparison of the three energy conservation case-studies has shown that where lessons could be learned for the Netherlands from the German situation, these have to be found particularly in the field of wind energy. The analysis showed that the existing arrangements in Germany which contributed to the remarkable wind energy boom will be continued largely unchanged in a future liberalised situation. That might be useful to remember if the present direction for stimulating wind energy in a liberalised electricity sector in the Netherlands turns out to be less successful than hoped for.

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