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

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9. Evaluation

In this chapter, the key empirical research results are evaluated. Based on an overall analysis of the case studies, eleven hypotheses on the relationship between electricity sector liberalisation and cogeneration-, wind energy- and demand-side management development were formulated (Table 9.1).

Together with three open questions, the hypotheses were presented to a panel of fourteen Dutch and ten international electricity sector experts. The Dutch respondents were interviewed in person, whereas the international forum was invited to respond to a questionnaire (Table 9.2). Governmental specialists of the Netherlands and the United Kingdom gave their opinion to the hypotheses and questions asked, as well as experts from different categories of utilities, several non-governmental organisations involved in energy and environmental matters and researchers from universities and other research institutions. The international forum consists of persons from the three case study countries and two further OECD countries with liberalising electricity sectors: Belgium and the United States.

The low number of respondents from utilities and non-governmental organisations in the international group has to be accounted to a relatively poor response here. Fourteen out of fifteen Dutch experts addressed agreed to an interview (response: 93%). However, only ten of nineteen experts contacted in other countries responded to the questionnaire (response: 53%).

Evaluation Results

In the following sections, the experts' opinions on the hypotheses and questions are outlined. The empirical research results that had led to each hypothesis were summarised in the questionnaire and interviews as an explanation to the respondents. These summaries are given here as well. The answers are categorised to reflect the views of the interviewed Dutch experts on one hand, and the opinions of the international experts on the other hand.

Some respondents circled more than one box, whereas others did not give their opinion to all hypotheses as they did not consider themselves sufficiently knowledgeable in all three case study topics.

Table 9.1 Hypotheses on the Relationship between Electricity Sector Liberalisation and Energy Conservation

Cogeneration

1. 'The development of industrial and small-scale space heating cogeneration is stimulated by an organisational unbundling or by further liberalisation.'
2. 'If unbundling takes place *simultaneous* to the introduction of competition then industrial / small-scale space heating cogeneration could be expected to become a niche option rather than a dominant option for electricity generation.'
3. 'Unbundling *prior* to introduction of competition could particularly stimulate cogeneration development.'
4. 'District heating cogeneration is not likely to prosper in a liberalised situation without additional Governmental support.'

Wind Energy

6. 'In a liberalised situation, various regulatory support systems for wind energy and renewables can be maintained.'
7. 'Wind energy development is dependent on a regulatory support system rather than on the liberalisation process.'
8. 'Voluntary 'green electricity schemes' cannot replace regulatory support for wind energy and other renewables yet.'
9. 'Systems with a fixed remuneration for wind turbine investors so far are more effective in stimulating wind energy development than systems without such a fixed remuneration.'

Demand-Side Management

11. 'Demand-Side Management activities of utilities are dependent on the regulatory support system set up rather than on the liberalisation process.'
 12. 'Integrated Resource Planning as an instrument to stimulate demand-side management is not likely to be fit for a liberalised situation.'
 13. 'Commercial demand-side management and energy efficiency activities are not likely to be able to replace regulatory supported demand-side management activities in the near future.'
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Note: numbers 5, 10 and 14 refer to open questions asked in the interviews and questionnaire

Table 9.2 The Expert Panel (Number of Persons per Category)

Experts working at	Dutch	International	Countries	
Government	1	1	Netherlands	14
Utilities	4	1	Denmark	2
NGO's	3	2	Germany	3
Research Institutions	6	6	United Kingdom	2
			United States	2
			Belgium	1
Total	14	10		24

Cogeneration

Hypothesis 1. 'The development of industrial and small-scale space heating cogeneration is stimulated by an organisational unbundling or by further liberalisation.'

Explanation: In the Netherlands, a large growth of industrial and small-scale space heating took place after the 1990 unbundling of distribution and generation. Distributors were main initiators of this boom. Although the development was initially financially supported by Government, the scale of this development was not anticipated. Similarly, in the United Kingdom the installed industrial and small-scale space heating cogeneration capacity rose sharply after the 1990 liberalisation, which involved the introduction of competition in generation and in supply to large end-users, an unbundling of transmission, generation, distribution and supply as well as a privatisation of most utilities. However, in Germany, without liberalisation the level of small-scale cogeneration capacity installed grew substantially as well in recent years. Hence, unbundling and further liberalisation appear to be stimulating, but not absolutely necessary factors for the development of industrial and small-scale space heating cogeneration.

Table 9.3 Opinions of Respondents, Hypothesis I

	<i>agree completely</i>	<i>agree</i>	<i>agree nor disagree</i>	<i>disagree</i>	<i>disagree completely</i>	<i>total</i>
<i>Interviews NL</i>	1	4	5	4	0	14
<i>Internat. panel</i>	1	7	0	2	1	11

The views of the Dutch interviewees on this hypothesis are ambivalent. Whereas four agree and four disagree to the statement, the majority does not have a clear preference to either side. Some say that unbundling in the Netherlands has been corollary to a market transformation by making cost structures more visible and opening the eyes of utilities to the needs of their customers, others refute the hypothesis pointing to cogeneration developments in completely integrated electricity sectors.

Many respondents mark that unbundling of generation and distribution companies is only one factor which has contributed to the Dutch cogeneration boom in the early nineties. Other supportive factors mentioned are direct subsidies for cogeneration, the foundation of an independent project office for cogeneration, covenants on energy efficiency with industry and environmental action plans of distribution companies.

The specific details of legislation which limited capacity of distribution companies to plants of at maximum 25 MW, and the remuneration for surplus electricity delivered to the grid by cogeneration plants are also considered to have contributed to the boom of cogeneration. One respondent points to the business climate within the newly unbundled distribution companies which, in his opinion, was conducive to cogeneration development. As many employees formerly were involved in electricity generation activities, these new power plants fitted very well into the culture of the new distribution companies.

Some interviewees regard the tariff system for electricity in the Netherlands in the early nineties as a decisive factor behind the successful development. As production costs of the four generation companies were pooled, and the production capacity to be owned by distributors was legally limited to small plants, initiating cogeneration joint-ventures with industry provided the only strategic alternative for distributors to electricity purchase from the large-scale power generation companies. Due to the cost-pooling system, a vicious circle in favour of cogeneration was created. The more 'decentral' cogeneration plants were constructed, the fewer kWh remained for pooling of costs of 'central'

electricity generation by the four power producers. As a result, prices for centrally produced electricity increased - making further cogeneration plants even more attractive to distributors.

Apart from the specific national context, the Dutch respondents see decreasing gas prices and technological development - in particular the substantial reduction in scales of plants - as supportive factors for cogeneration development. They are generally cautious about the effects of further liberalisation in the Netherlands. Some mention that recent developments show a reintegration of the unbundled generation and distribution companies, and hence a removal of the previous incentive for cogeneration. In addition, in a liberalised market other options would become available to investors. The importance of relative prices of the various options and their contribution to uncertainty reduction for utilities therefore would increase.

Others point to the decreasing potential for further development in the Netherlands, since the most attractive options have already been realised and an overall power generation surplus could result. Environmental benefits of cogeneration are furthermore regarded to be decreasing, since other equally efficient options, such as heat pumps, now increasingly become available.

The international respondents in majority agree to the hypothesis. However, one respondent holds that it is perhaps rather true for the Dutch case than a general truth. Several respondents mention that a just account of costs of the transmission system is another major factor that is important. Cogeneration should receive a benefit for reduced-, non-, or partial use of the wires system, and costs for stand-by power and grid connection as well as profits of selling electricity to the grid should be properly defined.

Hypothesis 2. 'If unbundling takes place *simultaneous* to the introduction of competition then industrial / small-scale space heating cogeneration could be expected to become a niche option rather than a dominant option for electricity generation.'

Explanation: In the United Kingdom, the growth of industrial / small-scale space heating cogeneration after the 1990 liberalisation was dwarfed by the boom in the construction of electricity producing combined-cycle gas turbines. This became known as the 'dash for gas' in the UK. The 1990 liberalisation in

the United Kingdom involved a simultaneous introduction of competition in generation and in supply to large end-users, a privatisation of most utilities and an unbundling of generation, transmission, distribution and supply. No restrictions were set to the kind of power plants constructed, nor to the fuel to be used.

Table 9.4 Opinions of Respondents, Hypothesis 2

	agree completely	agree partially	agree nor disagree	disagree partially	disagree completely	total
<i>Interviews NL</i>	1	2	9	1	0	13
<i>Internat. panel</i>	1	4	4	1	1	11

Most Dutch interviewees are in doubt if this statement holds in general. They are sceptic if this is a one-to-one relationship, and suggest that other factors might have been more important in the British dash for gas. Particular factors mentioned are the artificially high pool prices in England due to the practically existing duopoly of electricity generators shortly after liberalisation, decreasing gas prices, and overall prices of the various power generation options. However, two persons indicate that unbundling is likely to cause a new 'mindset' for distribution utilities, which will focus them on finding out what is their most important business. Their priorities then will be determined by the market.

The international panel also expresses some doubts as to the general applicability of the hypothesis, and the relative importance of unbundling in cogeneration development. Some respondents see the abundance of inexpensive gas as a more important factor in explaining the dash for gas in the United Kingdom.

Several interviewees agree that industrial and small-scale cogeneration are likely to remain a niche option in the near future. One person argues that capital intensive technologies have disadvantages in a short-term oriented liberalised system, another suggests that cogeneration development will take place as part of energy services packages of utilities to large end-users. A different opinion is put forward by a respondent who, with reference to the Danish situation, remarks that with proper public service obligations for utilities cogeneration does not necessarily have to become a niche option.

Hypothesis 3. 'Unbundling prior to introduction of competition could particularly stimulate cogeneration development.'

Explanation: The 1990 unbundling of generation and distribution utilities in the Netherlands took place prior to the formal introduction of competition in generation or supply. Access of third-parties to the power market at that moment was legally restricted, and generation capacity to be owned by distributors limited to plants of 25 MW. Only the size of cogeneration plants used by industry was not restricted. Hence, in the absence of third-parties and with their own generation capacity limited to small plants, the only option available to the newly unbundled distributors looking for structural access to power plants independent from the large-scale electricity generators and larger than 25 MW was setting up cogeneration joint-ventures with industry.

Table 9.5 Opinions of Respondents, Hypothesis 3

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
<i>Interviews NL</i>	0	7	5	2	0	14
<i>Internat. panel</i>	1	6	3	0	0	10

Many interviewees agree conditionally to this hypothesis, stating that this holds very specifically for the Dutch situation, and cannot be generalised without further clarification. Other factors in their opinion might be important as well, or even more important.

One non-Dutch respondent regards unbundling as a key organisational change, because it allows new companies to enter the electricity sector, and competition among companies can boost the construction of new power plants. Another person refers to the situation in Germany, where unbundled utilities ('Stadtwerke') have been major drivers for district-heating cogeneration. In this respondent's view, unbundling can particularly stimulate local utilities to engage in cogeneration and district heating. A third interviewee notices that unbundling prior to introduction of competition contributes to a larger investment safety, which in turn could stimulate cogeneration development. On the other hand, it is mentioned that in Denmark cogeneration development has been stimulated 'prior to anyone hearing about unbundling or competition'.

Hypothesis 4. 'District heating cogeneration is not likely to prosper in a liberalised situation without additional Governmental support.'

Explanation: In neither the United Kingdom nor the Netherlands, an increase in district heating development initiated by utilities could be observed after the organisational changes. The district heating development that took place is mostly financially supported by Government. In Denmark and Germany, a protected position for district heating was claimed and obtained in legislation preparing for liberalisation. A similar exception to protect district heating was recently made in Dutch liberalisation legislation.

Table 9.6 Opinions of Respondents, Hypothesis 4

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
<i>Interviews NL</i>	5	6	1	1	0	13
<i>Internat. panel</i>	2	7	1	0	0	10

This hypothesis is positively received by most interviewees. At the existing price levels, they do not expect a further development of district heating without support. Main reason are the high initial investment costs for infrastructure networks needed. Profits of district heating plants are only to be obtained in the long run, whereas in a liberalised situation short-term profits and uncertainty reducing options increasingly become important. Stricter environmental standards for housing insulation also potentially conflict with district heating profitability. On the other hand, one respondent points to the lighter regulation of the heat market as compared to the electricity and gas market in the Netherlands, which could be an incentive for utilities to use heat supply as a 'foot in the door' to increase other market shares.

The reaction of the international respondents is similar to that of the Dutch panel. One person further states that in a market without very significant energy taxes to compensate for the negative environmental externalities of power generation district heating will not prosper. Another respondent marks that in the long run, if existing overcapacities have vanished and energy prices are much higher than today, district heating might have a chance.

Question (5.) What other factors do you consider important for the development of cogeneration?

Respondents are asked to mention and motivate any economic, social, technical or other factors that they consider important for the development of cogeneration.

The opinion of the majority of the respondents is that cogeneration development is determined particularly by its price relative to other options. Views about what factors determine this price, however, are subject to considerable variation. Whereas some regard autonomous technological development and Governmental policy measures as crucial, others mention the fuel- and electricity prices, pay-back tariffs for electricity delivered to the grid, and prices for stand-by and top-up electricity. A fair access to the grid and benefits for non- or partial use of grid are also important according to several interviewees, and dominance of a limited number of players in a new market structure should be avoided.

Further policy support could consist of premium prices and preferential grid access for energy efficient power plants, as well as taxes on heat loss. Synchronisation of heat and electricity demand by further development of heat pumps and electricity- and heat storage systems could also provide benefits for cogeneration. However, some respondents claim that policy support should be conditional to its environmental benefits relative to other 'green' options, such as renewables and heat pumps.

Further factors regarded important by the international forum - in addition to those mentioned by the Dutch panel - are heterogeneous as well: no overcapacity in electricity production, increased user awareness of cogeneration as a successful option and improving long-term planning security for district-heating are mentioned. The relatively easy installation and operation of cogeneration plants is furthermore regarded as one of the factors explaining its success so far.

A point of concern expressed by one respondent is that the use of district heat from cogeneration - large as well as small - in the Danish situation has in effect blocked further efforts to reduce energy demand in that country. Hence, in his opinion, 'from an environmental point of view cogeneration is not only a blessing'.

Wind Energy

Hypothesis 6. 'In a liberalised situation, various regulatory support systems for wind energy and renewables can be maintained.'

Explanation: In the United Kingdom, main elements of the regulatory support system set up by policy makers are the non-fossil fuel levy charged to captive end-users and the competitive bidding for the renewable energy funds generated in this way. In the Netherlands, important elements are the 'MAP-levy' and the recent 'green label' system. In Germany and Denmark, a key element is the fixed remuneration paid to wind turbine investors feeding electricity into the grid. The variation in these systems was not reduced by the liberalisation process in the four countries.

Table 9.7 Opinions of Respondents, Hypothesis 6

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
<i>Interviews NL</i>	6	7	0	2	0	15
<i>Internat. panel</i>	2	6	1	0	0	9

The level of agreement of Dutch and international respondents to this hypothesis is high, although some interviewees are sceptic about systems with a fixed pay-back tariff such as employed in Germany and Denmark. Systems need to be 'market conform' according to some, meaning that they should not interfere with competition in the electricity sector. Two persons disagreeing with the statement notice that not all systems are equally market conform, and that any regulatory support system should be directed at being abolished as soon as a technology has proven to be competitive to other options.

One international respondent sees the statement within the larger context of the clash of two 'drivers': On one hand, deregulation and competition lead to higher costs of capital and discount rates, and as a result less weight on the future. On the other hand, sustainable development would mean giving more weight to the future and thus lower discount rates. Policy therefore must 'square a circle'.

Hypothesis 7. 'Wind energy development is dependent on a regulatory support system rather than on the liberalisation process.'

Explanation: In all four countries examined, a regulatory support system for wind energy is in operation which involves Governmentally induced financial support either specifically for wind energy or for renewables in general. In the UK, this system operates parallel to a fully competitive electricity generation and a largely liberalised supply. In Germany, the existing system is also largely maintained after the April 1998 liberalisation. In the Netherlands and Denmark, the support systems are in operation within partly liberalised electricity sectors as well.

Table 9.8 Opinions of Respondents, Hypothesis 7

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
Interviews NL	5	6	1	2	0	14
Internat. panel	2	6	1	0	0	9

Many respondents agree to this statement as long as wind is more expensive than other options available. Although cost price of wind energy production has substantially decreased over the years as a result of technological development, liberalisation may contribute to lower prices for the alternatives as well - and thus exert a negative influence on wind energy development.

In one respondent's view, it is not a question of either policy support or liberalisation, as liberalisation can be used deliberately as an instrument to support wind energy development. However, another respondent considers that 'at the moment everybody is only concerned about liberalisation, and much less about how that could be reconciled with renewable energy development'.

An international respondent marks that 'in the English situation, some generators and developers are now building wind farms outside the NFFO process, which shows that industry now believe that it is financially possible to develop wind farms without regulatory support in a liberalised market'. It is also noticed, by another person, that 'support should stimulate technological and organisational improvement that makes it superfluous, which is better taken care of in the British than in the German system'.

Hypothesis 8. 'Voluntary 'green electricity schemes' cannot replace regulatory support for wind energy and other renewables yet.'

Explanation: Green electricity schemes, in which end-users voluntarily pay a surcharge on their electricity bill in order to support the development of renewables, now operate in the Netherlands, the United Kingdom and Germany. These schemes are set up by utilities or third-parties, and could be regarded as a 'market based' instrument to support renewables, including wind energy. In Denmark, green electricity schemes are in discussion. However, involvement in the schemes operated by utilities was at best 1% of the total number of customers in 1997. The share of these schemes in total supply was on average far less than one percent.

Table 9.9 Opinions of Respondents, Hypothesis 8

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
<i>Interviews NL</i>	5	7	0	2	0	14
<i>Internat. panel</i>	1	7	0	1	0	9

Whereas the majority of the respondents agrees that the present level of support for renewables created by voluntary green electricity schemes is low, the opinions about future prospects vary: some interviewees expect the contribution of green electricity schemes in future to be limited to at maximum 1 to 2% of total electricity supply, others say that 5 to 10% might be feasible. Several respondents remark that in the Netherlands the green electricity schemes are in fact supported by regulation, as for green electricity no energy tax has to be paid.

It is suggested to expand the green electricity schemes to all energy forms: by obligatory labelling of all primary-energy sources, customers could decide what kind of primary-energy they want to buy. On the other hand, it is argued that having to pay extra for a product which is not different in practical value to a customer would be a paradox. In this view, collective arrangements to stimulate renewables would be preferable since society as a whole benefits from renewable energy.

Answers of the international panel to this statement vary between 'green electricity schemes are still a new mechanism and will continue to

be minor compared to other options' on one hand, and 'case studies of green electricity schemes show promise' on the other hand. One respondent remarks that customers in Germany sometimes doubt if their voluntary rates are serving the right purpose, and that voluntary schemes might become more attractive to companies in particular if the right marketing instruments are employed.

9. 'Systems with a fixed remuneration for wind turbine investors so far are more effective in stimulating wind energy development than systems without such a fixed remuneration.'

Explanation: The wind energy growth rates in Denmark and particularly Germany in recent years have by far exceeded those in the United Kingdom and the Netherlands. In Denmark and Germany, the remuneration paid to wind turbine investors for feeding electricity into the grid is legally set to a certain percentage of the end-user price for electricity. The remuneration in the other two countries is negotiated between utilities and investors (Netherlands) or the result of a competitive bidding process for available funds (United Kingdom). So far, the German and Danish approach has resulted in a higher remuneration than in the Netherlands and the United Kingdom. It has also provided a long-term investment security to investors in wind energy.

Table 9.10 Opinions of Respondents, Hypothesis 9

	agree completely	agree nor disagree	disagree	disagree completely	total
<i>Interviews NL</i>	1	7	4	2	14
<i>Internat. panel</i>	3	2	4	0	9

Many respondents neither agree nor disagree to this hypothesis. Main concerns expressed are if a system with a fixed pay-back tariff could be continued in a liberalised market, and who in that case should be responsible for paying that remuneration. Investment security, which is regarded very important by almost all interviewees, could also be provided by other systems of support. Moreover, the system might be effective, but is not considered efficient from an economic point of view. Furthermore, it is mentioned that the European Union appears opposed to continuation of such a system in future.

In the perception of one international respondent, the initial response might be faster in systems with a fixed pay-back tariff, but such

systems would encourage 'gold plating' of investments and not provide pressure for further cost-reducing innovation. The British system, on the other hand, would also provide investment security and, in addition, result in a fast reduction of subsidies for wind energy over time.

Question (10.) What other factors do you consider important for the development of wind energy?

Respondents are asked to mention and motivate any economic, social, technical or other factors that they consider important for the development of wind energy.

Almost all respondents see availability of locations and further technological development as crucial factors for wind power in the future. Increasing public support for wind energy and removing bureaucratic obstacles are seen as important means to solve the existing siting problems. One person calls for a top-down policy approach in assignment of suitable locations for wind energy similar to the one employed in other large-scale infrastructure projects in the Netherlands.

Fair conditions for grid connection are also mentioned by the international panel as important to wind energy development. In particular, grid connection and pay-back tariffs for electricity fed into the grid are mentioned. Local approval of projects is seen as essential by one respondent. Appropriate siting of wind farms in order to reduce avian mortality and adverse effects to the landscape would furthermore be required.

Some persons suggest that off-shore development should be stimulated. Growing evidence of success of wind energy in operation, more maturity in the wind energy supply industry, learning by Governments and local authorities and the introduction of renewable portfolio standards are mentioned as other factors that could contribute to wind energy development.

Demand-Side Management

Hypothesis 11. 'Demand-Side Management activities of utilities are dependent on the regulatory support system set up rather than on the liberalisation process.'

Explanation: In all four countries examined, utilities are presently involved in demand-side management activities. These activities are either regulatory prescribed (United Kingdom, Denmark), or based on a covenant between utilities and Government (Netherlands and Germany). Activities are financed directly by levies (United Kingdom, Netherlands, Germany) or indirectly through end-user prices (Denmark). The support systems in the Netherlands and the United Kingdom are set up for unbundled, and in future fully competitive electricity sectors. In Germany, the existing support system was maintained after the introduction of competition in April 1998.

Table 9.11 Opinions of Respondents, Hypothesis 11

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
Interviews NL	2	5	4	3	1	15
Internat. panel	2	5	2	0	0	9

Many respondents argue that energy efficiency activities that are commercially viable should be distinguished from activities which need to be supported by policy measures in order to be implemented. In a liberalised situation, commercial energy efficiency would become more important to utilities. Various kinds of companies would develop in this case, some concentrating on low prices, others on billing and trade, installation or on value added services such as energy efficiency. The focus of energy efficiency activities in a liberalised situation is considered to shift from households to business clients for two reasons: savings to be obtained in this customer segment often are presumed to be larger, and binding of this category of customers is of more interest to utilities.

One respondent argues that technical and behavioural demand-side management should be distinguished. For the former, liberalisation as well as policy support would play a role whereas to the latter only policy support would be important.

Various interviewees suggest that after liberalisation additional regulatory support remains necessary on top of commercial energy

efficiency activities in order to achieve a level of activities that is considered desirable from a societal point of view, not in the least because other organisational impediments to energy efficiency remain. For example, as one respondent notices, a hurdle to insulation investments which will not be influenced by liberalisation is the separation between owners as energy efficiency investors on one hand, and tenants - which are the persons who benefit from these investments - on the other hand.

Several Dutch respondents are disappointed about the results of the existing 'MAP system' in the Netherlands. One interviewee calls them 'mere window-dressing', whereas another one notes that the distribution of energy efficient lamps is the only real success of the MAP system. In industry, in this person's view, apart from cogeneration hardly any energy efficiency is realised. A third respondent argues that the system is ineffective since distribution utilities, as the key party collecting the funds, are also responsible for implementation of projects. The English system, with an independent Energy Saving Trust, would be far preferable from an organisational point of view.

It is the expectation of some respondents that the MAP system could not be maintained in a future liberalised situation. Rather, levies on fuels and transport as well as tenders and perhaps tradable emission rights would be appropriate instruments to be employed.

The international respondents are rather sceptical about the present levels of demand-side management and energy efficiency activities. The policy of leaving demand-side management activities to utilities is called 'one big mistake, with only small results' by one person. Another respondent has 'yet to see that distribution companies see it as their goal to sell less, in spite of what you hear about being energy service providers rather than kWh suppliers'. A further person supports the hypothesis, 'based on the data presented and the U.S. experience in which demand-side management dropped dramatically with upcoming competition'.

Other respondents are more optimistic. 'In the current situation, I agree to the statement' says one person 'but, one day, marketing of energy efficiency and demand-side management may become attractive (i.e. profitable)'. Another view expressed is that the most effective demand-side management seems to be done by the commercial and industrial customers themselves.

It is also noticed that in a retail market, demand-side management can be blocked by free-riding customers that first get conservation services from one utility for a low price, and then buy their energy at

another supplier. Furthermore, the difficulty of measuring the performance of demand-side management activities is pointed to by one respondent, 'even when one considers just one single end-use activity and can build upon an extensive database'.

Hypothesis 12. 'Integrated Resource Planning as an instrument to stimulate demand-side management is not likely to be fit for a liberalised situation.'

Explanation: In Denmark, demand-side management activities of utilities are carried out based on a legislatively prescribed integrated resource planning process. In this process, utilities have to systematically evaluate how they want to react to projected demand growth: either by building new power plants, or by stimulating energy conservation and improving end-user energy efficiency. This integrated resource planning process is carried out by the two grid operating organisations, based on detailed information provided by the generation and distribution utilities in their area. A close co-operation which resembles the practical vertical integration in Denmark is required for the exchange of these often commercially viable data.

Table 9.12 Opinions of Respondents, Hypothesis 12

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
<i>Interviews NL</i>	2	10	0	2	0	14
<i>Internat. panel</i>	1	5	1	2	0	9

Almost all respondents consider that integrated resource planning on a national level is not compatible with a competitive situation. 'Integrated resource planning is linked to openness of prices and costs which conflicts with liberalisation', as one international respondent remarks. Some interviewees however hold that integrated resource planning in a liberalised market can work at the level of individual companies, particularly if those companies are vertically (e.g., electricity generation, distribution and supply) or horizontally (e.g., gas and electricity distribution) integrated. A transmission company would, from its monopoly position, furthermore be able to continue some aspects of national planning.

One respondent points to the new system currently built up in Denmark, in which an independent Electricity Saving Trust has a central

role in integrated resource planning and demand-side management. Various parties can bid for funds collected by this Trust. The respondent doubts however if utilities should be allowed to bid into the system, considering their conflicting interests. As a minimum, in this person's view, they should form separate and independent units for energy efficiency activities if they want to bid.

Another position is taken by a respondent who believes that, if liberalisation involves full unbundling, integrated resource planning can be done by the distribution companies. They should balance conservation activities, local generation (mainly renewables) or power purchases from the grid: 'Integrated resource planning in the past has been used often to sell central power stations to the public opinion. Limiting integrated resource planning to the distribution utilities will deliver better quality IRP than the current practice of integrated resource planning dominated by suppliers' interests in vertically integrated companies'.

Hypothesis 13. 'Commercial demand-side management and energy efficiency activities are not likely to be able to replace regulatory supported demand-side management activities in the near future.'

Explanation: Apart from the demand-side management activities of utilities which are financed by levies and either regulatory prescribed or based on a covenant, there are also energy efficiency activities of utilities and third-parties (engineering firms, energy service companies etc.) which are offered on a commercial basis to customers. Evaluations in the Netherlands and the United Kingdom show that the level of these activities is very low. Interviews carried out in Denmark and Germany suggest a similar situation in these countries. If prices do drop after the introduction of competition, the role of commercial energy efficiency could be expected to be further weakened.

Table 9.13 Opinions of Respondents, Hypothesis 13

	agree completely	agree	agree nor disagree	disagree	disagree completely	total
Interviews NL	5	5	1	1	1	13
Internat. panel	2	2	1	4	0	9

The majority of Dutch interviewees agrees to the statement; a clear regulation for demand-side management would be needed in the near future, as the level of activities that would be developed by a 'demand pull' in a liberalised market would be insufficient. One respondent mentions that if small enterprises were legally obliged to take all energy efficiency measures with a pay-back time of three to five years, the development of energy service companies would be stimulated.

In contrast to the opinions of the Dutch interviewees, many respondents from the international panel disagree to the hypothesis. Several persons believe that this holds for the short-term only, whereas on the long run commercial energy efficiency activities might take over the present role of policy induced demand-side management. It is expected by one respondent that on the long run prices will converge and therefore demand-side management will become an important option for differentiating suppliers.

Another person adds that 'whatever market structures or regulatory rules are in place, if not firmly supported by a price mechanism (i.e. taxes) they will remain ineffective and inefficient for realising energy conservation targets'. The electricity supply industry is furthermore not considered 'the only source of enlightenment' by a third respondent, since 'much energy efficiency initiative comes from elsewhere, like lighting and domestic appliance manufacturers, labelling schemes and pressure for greener and cleaner products by consumers'.

Question (14.) What other factors do you consider important for the development of demand-side management?

Respondents are asked to mention and motivate any economic, social, technical or other factors that they consider important for the development of demand-side management.

Energy prices and customer demands are mentioned most often by the Dutch respondents as factors important for a further development of demand-side management in a future liberalised situation. Other factors reported are fine-tuned policy support and technological development, particularly by setting efficiency standards for equipment.

One international respondent calls specifically for a wires charge, another for 'full unbundling, training and professionalisation of commercial demand-side management personnel and energy prices that reflect the true and full costs of energy'. Founding an energy saving trust and

setting standards of performance to electricity suppliers is regarded important by a third respondent. It is furthermore marked that 'it is essential to recognise that demand-side management is not a matter of technological improvements only, but also of improving the lifestyles and economic systems in more energy efficient directions. Hence, demand-side management should rank far above the supply options, and be integrated with the national economic-, labour-, education- and other policies.'

Discussion

Various interesting points emerge from the evaluation interviews and questionnaire. In general, the agreement level is relatively high: 64% of the respondents 'agree' or 'agree completely', compared to 10% 'disagree' or 'disagree completely' (Table 9.14). Hence, the empirically derived hypotheses on energy conservation- and liberalisation developments are for the predominant part supported by the expert panel.

Table 9.14 Overview of Evaluation Results (% out of 24 Respondents)

	Hypothesis	agree / agree completely	neither agree nor disagree	disagree / disagree completely
CHP	1.	52	20	28
	2.	33	54	13
	3.	58	34	8
	4.	87	9	4
CHP total		57	29	14
Wind	6.	88	4	8
	7.	83	8	9
	8.	87	0	13
	9.	57	34	9
Wind total		78	12	10
DSM	11.	58	25	17
	12.	78	5	17
	13.	64	9	27
DSM total		67	13	20
All cases total		64	26	10

Differences between the Dutch and international experts generally are low: only for three out of eleven hypotheses the difference in agreement exceeds 30%, whereas for 5 hypotheses this difference is below 10% (Table 9.15). This can be interpreted as support for a more general applicability of most of the hypotheses, beyond a specific national context.

Table 9.15 Agreement and Disagreement by Dutch and International Respondents (% out of 14 and 10 respondents respectively)

	Hypothesis	agree / agree comp.		disagree / disagree comp.	
		NL	Int.	NL	Int.
CHP	1.	36	73	29	28
	2.	23	45	8	18
	3.	50	70	14	0
	4.	85	90	8	0
Wind	6.	86	88	13	0
	7.	79	88	14	0
	8.	86	88	14	11
	9.	57	55	14	0
DSM	11.	47	78	27	0
	12.	86	67	14	22
	13.	77	44	15	44

Note: 'NL' refers to the interviews with experts in the Netherlands, 'Int.' are the non-Dutch respondents that answered to the questionnaire

Cogeneration

The following observations are important for the discussion of the evaluation results in the cogeneration case:

- The hypotheses on the relationship between cogeneration development and liberalisation show the lowest overall level of agreement compared to the other cases (57%);
- A particularly high disagreement level is found at hypothesis 1 ('unbundling and further liberalisation', 28%), whereas the level of uncertainty is relatively high for hypothesis 2 ('simultaneous unbundling and competition', 54%) and 3 ('unbundling prior to competition', 34%). Most respondents, on the other hand, agree with hypothesis 4 ('district-heating', 87%);

- Far more international- than Dutch respondents agree to hypothesis 1 (73 respectively 36%).

From the results it can be concluded that many respondents are not sure about the importance of unbundling in stimulating cogeneration development. Although they generally acknowledge that unbundling of generation and distribution companies has played a role in stimulating cogeneration in the Netherlands, it is questioned if the specific Dutch context can be generalised.

The respondents furthermore point to a large number of other factors which, apart from unbundling, have played a role in stimulating cogeneration in the four countries examined. These factors generally coincide with empirically found underlying factors for developments which are described in Chapters 3 to 8.

In contrast to the opinion of the Dutch interviewees, most international respondents think that unbundling and further liberalisation indeed could stimulate cogeneration development. A possible explanation for the generally more affirmative views of the international respondents to this hypothesis could be that their agreement is generally subject to several conditions, such as fair access to the grid and just prices for use of the wires system. If these conditions were not fulfilled however, their overall level of agreement would have to be considered much lower - and closer to the Dutch level.

As to the influence of further liberalisation on cogeneration development, the answers of the respondents point to various important matters:

Heat demand, and the degree to which this demand is already supplied by cogeneration plants, is seen as an important limiting factor to further development. In the Netherlands, the recent boom in industrial cogeneration has limited the number of further sites where heat demand would allow for new projects. In Denmark, with the completion of the conversion of existing heat-only district-heating plants, options for further expansion are also decreasing.

The price of cogeneration relative to other options available to investors is also regarded as a very important determinative factor for further cogeneration development in a liberalised situation. Particularly technological development, electricity and gas price developments, fair grid access and fair prices for grid-based services are mentioned here. The latter include costs of stand-by and top-up power as well as pay-back tariffs for surplus electricity delivered to the grid.

The further development of cogeneration linked to district-heating is seen to be dependent on Governmental support by a large majority of

respondents. Main reason for this are the large initial investment costs required to construct networks. In a market situation, with uncertainty about the number of customers and level of demand no such large voluntary investments could be expected. Some respondents suggest that further support could consist of premium prices, preferential grid access or taxes on heat loss. Others hold that this support should be made dependent on an assessment of the benefits of cogeneration compared to other environmental options available.

Finally, opinions about the future of industrial and small-scale cogeneration are mixed. Whereas some respondents support the hypothesis that these applications are more likely to become 'niche'-rather than 'dominant' options in electricity generation in a fully liberalised situation, others have higher expectations for the future.

Wind Energy

In the evaluation results of the wind energy case, the following features are important:

- Compared to the other two case studies, overall agreement to the wind energy hypotheses is very high (78%);
- The lowest agreement is found at hypothesis 9 ('effectiveness of fixed remuneration': 57%);
- The overall pattern of answers of Dutch and international respondents is very similar.

There is a large degree of consensus between Dutch as well as international respondents about factors important for further wind energy development, as well as about the relationship between wind energy development and electricity sector liberalisation.

Most respondents think that wind energy development in a liberalised electricity sector will remain dependent on Governmental support provided. They consider that the detailed regulation of this support could vary, but are rather sceptic about support systems based on a fixed price paid for all electricity fed into the grid.

Although it is generally acknowledged that the latter kind of systems has been very effective in stimulating wind energy in the past, it is questioned if they are efficient from an economic point of view: a fixed-price system would not differentiate between more and less efficient locations, and would not provide pressure for further cost-reducing innovation. Neither is it clear to the respondents who in a completely liberalised situation would have to pay the fixed price, as utilities could no longer be obliged to accommodate all electricity produced.

An influence of electricity sector liberalisation on wind energy development suggested by the respondents could be that prices for electricity from conventional, non-renewable primary-energy sources are expected to decrease. This could negatively affect the economics of wind energy.

The rise of green electricity schemes, in which end-users voluntarily pay an additional amount on top of their electricity bill to stimulate renewables' development, can be seen in a liberalisation context as well. In some cases, these schemes are additionally supported by regulation. In the Netherlands for instance, green electricity schemes are supported by an exemption from the energy tax.

Generally, respondents do not expect that green electricity schemes alone will be able to replace the other regulatory support systems (fixed-price, green label, competitive bidding). Nevertheless, they are seen to hold promises for expansion in the future: in the long run, respondents consider a 1 to 10% share of green electricity schemes in total electricity demand feasible.

However, it is also remarked that the concept of green electricity schemes stands in contrast to the 'polluter-pays-principle' of environmental policy: persons who contribute to mitigating adverse environmental effects in this case have to pay extra, whereas society as a whole benefits. In this perspective, people who buy cheaper 'grey' electricity are seen as free riders, who use the fact that the adverse environmental effects of fossil and nuclear electricity generation are not incorporated in the prices. To increase customer awareness of environmental effects of electricity generation, it is therefore suggested by one respondent to label all electricity generated with a 'primary-energy tag' denoting the origin of the electricity bought.

Finally, the siting problem of wind turbines is recognised by almost all respondents as a non-liberalisation related limiting factor to further wind energy development. Improving support on a local level, removing bureaucratic obstacles to siting as well as development of off-shore locations are seen as key options which could contribute to overcome this impediment.

Demand-Side Management

The following features are important for the discussion of the evaluation results in the demand-side management case:

- The overall level of agreement in the demand-side management case is intermediate compared to the other two cases (67%), but the level of disagreement is high (20%);
- The level of agreement to hypothesis 11 is relatively low ('regulatory support more important than liberalisation', 58%), the level of disagreement to hypothesis 13 is particularly high ('commercial demand-side management', 27%);
- Far more international than Dutch respondents agree to hypothesis 11 (78 respectively 47%), whereas far more Dutch than international respondents agree to hypothesis 13 (77 respectively 44%).

Most respondents agree to the hypothesis that at present most demand-side management measures are the result of Governmentally induced policies rather than commercial interests of utilities. Nevertheless, in a liberalised situation the interest of utilities and other parties in commercial energy efficiency is anticipated to increase. Various kinds of companies are believed to develop, some concentrating on low prices, others on billing, trade, installations or on value added services such as energy efficiency.

Respondents expect that the main part of energy efficiency services will be provided to large customers such as business and industry. It is argued that energy efficiency services could be an instrument to bind these important customers and savings to be obtained here would be larger than for small-scale customers like households.

However, most respondents consider that the level of commercial energy efficiency activities in a future liberalised market will not be sufficient to replace regulatory supported demand-side management. As other organisational impediments to energy efficiency remain, and the interest of end-users in energy efficiency is expected to decrease if prices drop in a liberalised electricity sector, many respondents still consider Governmental support necessary to obtain a level of activities sufficient in the light of energy conservation and emission reduction targets set.

Considering the way in which such regulatory support would have to be organised in a liberalised sector, some respondents mention that an 'energy efficiency levy' should be charged on top of transmission tariffs. Partly as a reaction to the present level of activities by utilities, which is considered disappointing by some, it is suggested to let an

independent 'Energy Saving Trust' organise a competitive bidding procedure for the funds generated. In this way, commercial energy service companies and other parties could compete on an equal level to utilities for carrying out energy efficiency projects.

A large majority of respondents considers organising demand-side management via integrated resource planning on a national level in conflict with a competitive situation. Nevertheless, it is expected by some that integrated resource planning could work on the level of individual companies in a liberalised market. Horizontal integration of companies, for instance integration of electricity- with gas distribution, would increase the number of options available to companies. Also, some aspects of national planning could be continued by the organisations responsible for the transmission grid.

A final interesting point in the evaluation of the demand-side management case are the answers of Dutch respondents to hypotheses 11 and 13. They are on one hand far more than the international respondents opposed to the observation that 'demand-side management activities of utilities are more dependent on regulatory support than on the liberalisation process' (hypothesis 11), on the other hand far less convinced that commercial energy efficiency activities could replace regulatory support in the near future (hypothesis 13).

Hence, despite an apparent scepticism about the existing regulatory support system expressed in hypothesis 11, confidence of the Dutch respondents in commercial energy efficiency activities to be developed in a liberalised situation is also low. The results therefore could be interpreted as an implicit call for a more efficient system of regulatory support for demand-side management activities in the Netherlands.