



Appendix II: National report for the Netherlands

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International Energy Agency Demand-Side
Management Programme
**Task VIII: Demand-Side Bidding in a Competitive
Electricity Market**

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1 Summary

This report presents the investigation of the strengths, weaknesses, opportunities and threats of Demand Side Bidding (DSB) in the Dutch liberalising electricity market.

The investigation is executed by the kind contribution of several Dutch organisations and companies that are active in different roles. A number of the contributing persons were also interviewed. The conclusions drawn from the questionnaires that finally are filled in are presented in the following chapters.

Large opportunities for Demand Side Bidding exist in the developing Dutch competitive environment:

- balancing and frequency control
- spinning/operational reserve
- black start and incident management
- congestion management (operational)
- postponement of network reinforcement investments
- voltage and reactive power control
- energy trading
- peak shaving
- program responsibility control
- gas and electricity switching
- portfolio management
- risk management

The main barriers for application are:

- uncertainties due to the introduction of the New Electricity Act
- the early stage of liberalisation
- the lack of knowledge about costs and revenues
- the lack of knowledge about possibilities of reducing and shifting demand

There is no specific DSB organisation at present. DSB is directed to the market, which is only in its first development stage.

The main aim for DSB is to shift demand from periods with high prices to periods with low prices. The prices, charges and fees are dependent on the benefits that the creator of the DSB products expects.

When green taxes and other environment friendly products are introduced, it is believed that also demand reduction comes in sight.

2 Structure of the Electricity Market

Starting from approximately July 1, 1999, the first legal step of the liberalisation of the electricity market has come into effect. This step is based on the ratification of the New Electricity Act 1998. In preparation on the legal liberalisation, the present electricity industry has already organised several mechanisms that will facilitate and realise wholesale electricity trading.

2.1 General structure

The general structure of the electricity market is as follows:

Free customers, suppliers and traders and brokers are allowed to trade electricity through several market mechanisms. The system operator and the transmission network operator are obliged to facilitate the electricity trades by reliable transportation, power balancing and operation of the cross-border interconnections.

The customers are liberalised in three stages, starting from 01-01-1999 until 01-01-2007. New market mechanisms are continuously developed. The number of free market participants will rapidly increase. Foreign companies are setting up affiliates in order to get market share before the expiration of the protocol.

2.2 Market participants

The following participants take part in trading electricity:

- Producers:
The producers are organised in four large production companies. A pool executes the production of electricity: the Dutch Electricity Generation Board. By contract, they are not allowed to take part in the trading of electricity until the expiration of the so-called Protocol (see: Market mechanisms). They are obliged to produce electricity by order of the suppliers in a cost-effective way, which includes import and export and load management.
After the expiration of the Protocol, the Generation Board will be finished, three companies are able to produce and trade separately, and one company will be vertically integrated.
- Suppliers:
The suppliers are the original distribution companies. They are obliged to deliver the demand of the captive customers. The major part of the purchase is done by use of the Protocol. Furthermore, they are able to trade bilaterally with other suppliers, traders and brokers, domestic as well as foreign companies.
- Customers:
The customers are liberalised in three stages:
- Large industries (> 2 MW demand)
About 600 large industries and the railway company are legally liberalised as soon as the New Electricity Act has come into effect. In the meantime, all participants act as if. About 15% of the customers have chosen another supplier than the historical one.
- Small industries and business (> 3 x 80 A connection)
About 65,000 customers are liberalised in 2002.
- Very small industries and business and households (rest)
The rest (about 5 million) is liberalised in 2007.

Liberalised customers are free to choose their supplier. They are able to act on the electricity market in the way they like. They are therefore exposed to the market prices. The risk can be hedged by options.

Captive customers are not exposed to the market prices.

- Traders:
Traders are companies that trade electricity independent from demand and generation. Some are affiliates of traditional distribution companies, and have their first priority in fulfilling the distribution company's demand in the cheapest way. Some are affiliates of foreign electricity companies, and perform bilateral trades for free customers.
- Brokers:
Brokers negotiate for trading companies, but do not trade themselves. One broker is recognised presently.
- Transmission network operators:
The transmission operators are responsible for fair, non-discriminator and independent transport of electricity within the Netherlands. They are not allowed to trade on the market, except for the purchase of losses. Their main problems, congestion management and voltage and reactive power control, are executed by redispatching of the pool generators.
- System operator (SO):
The system operator is responsible for maintaining the power balance and the operation of the cross-border interconnections. The SO should also act independent, fair and non-discriminator. The SO is also not allowed to operate on the market, but it is expected that a market for regulating power and reserve power will be developed.

2.3 Market mechanisms

- Protocol
The protocol is a contract between the generation and the distribution companies. The generation companies are obliged to fulfil the demand of the suppliers (former distribution companies) in a cost-effective way. The distribution companies have guaranteed to pay all costs, both variable and fixed. The effect of the protocol is that all suppliers have the same cost-structure and, in general, have the same variable costs at the same moment. Therefore, there is not much bilateral trade between the suppliers.
- Decentralised generation
Most distribution companies have built combined heat and power plants, often in co-operation with industries. These plants are sometimes dispatchable separately from the generation pool, and can therefore be used in decreasing demand and increasing surplus of energy. The surplus of energy can then be sold, because it is often cheaper than the protocol.
- Bilateral trading:
All companies that are allowed to trade, can perform bilateral trades. The market share of bilateral trades is about 10 %.
- Import and export:
Cross-border trades can be performed with foreign companies in countries that also have deregulated their market. Cross-border trades are restricted to the capacity of the interconnections, which are operated by the system operator.
- Day Ahead Market:
From 26-05-1999, a day ahead spot market is in operation. It is a two-sided auction model. The market share is about 2 %. Most sales are from foreign companies, and the

prices are lower than the protocol prices. The traded volume is therefore mainly limited by the cross-border transmission capacity.

- Congestion management:
After expiration of the protocol, the transmission network operators are fully responsible for congestion management. In practice, it means that operational transmission congestions are solved by counter-trading and redispatch.

2.4 Market regulation

- New Electricity Act 1998 and codes:
The New Electricity Act was put into effect on 01-07-1999. It regulates the liberalisation of customers in three stages, and the obligations and responsibilities of the different participants in the market.
Annexed to the Act, regulation codes are developed: the system code, the grid code and the metering code. These codes contain practical directives to facilitate the market.
- Program Responsibility:
In order to maintain the power balance and to solve congestions in the transmission networks, each participant has to arrange his so-called Program Responsibility. It means that for every transaction, a program (e.g. forecast) must be submitted to the system operator and the according transmission network operator. Deviations of these programs are charged. It is therefore important to realise energy exchanges in accordance with the programs as accurate as possible.
- Dienst Toezicht Elektriciteitswet (the Dutch regulator, like Ofgem in the UK):
The DTE regulates monitors and controls the effects of the New Electricity Act. It arbitrages in case of conflicts, and it approves tariffs and codes.

3 Experiences with Demand Side Bidding

This chapter describes the current experiences with DSB.

Presently, the market is continuously developing. The distribution of the roles is not yet completely clear, and numerous discussions are still going on. Therefore, most market participants have difficulties with stating their interest in DSB in detail.

Furthermore, as economic efficiency and profits are becoming more and more important, quantitative information concerning DSB is regarded as “strategic” and is therefore practically unavailable. The following information is based on the information provided by the questionnaires, which is mainly qualitative, overall market views and estimates.

3.1 General

The main products concerning demand side bidding, as it is presently used, are:

- peak shaving;
- operational balancing;
- incident management.

These products were developed during times that network capacity was relatively unlimited, the national power pool took care of the entire national demand, and production costs were dominating.

Market participants participating in DSB are:

- system operator;
- transmission network operators;
- traders, suppliers, brokers;
- customers.

These market participants trade, transport and control energy physically, and therefore burden the system with capacity demands. It is therefore interesting for these participants to optimise their demand and auto-generation in accordance with the capacity and the tariffs.

The market operator is planning to facilitate all public products, such as green certificates, reserve and balancing market and so forth.

The regulator will only stimulate DSB in accordance with the national government’s interests. The law limits its operations.

3.2 Description of DSB products

The following descriptions of DSB products are based on potential interests of the various market participants. A number of aspects are depending on the specific contract, and not on the DSB product. All aspects will therefore be treated one by one, rather than by product.

3.2.1 Name, purpose, creator, buyer

The following DSB products can be recognised in the near future (i.e. within 2 years):

- Balancing market, frequency control:
 Maintaining the scheduled energy interchange with the foreign countries. Part of it is also the frequency control.
 Creator: system operator
 Buyer: generators, large industries, traders, suppliers.
 Successfully in use, about 10 participants (mainly large industries). Daily operation
 Use will be increased as the system operator has to operate market-conform.
- Reserve:
 When the notification time is short (max. 15 minutes), DSB can be used as spinning reserve.
 Creator: system operator
 Buyer: generators, large industries, traders, suppliers.
 Presently part of the balancing market and frequency control.
 In the future, a separate reserve market will develop, as all market participants are charged for imbalances.
- Transmission constraints:
 Responsibility of the transmission network operators (TNO). Both the supplier and the customer have to co-operate since the TNO is not allowed to trade energy.
 Creator: transmission network operators
 Buyer: generators, large industries, traders, suppliers.
 Successfully in use for postponing network reinforcements, about 10 participants, used only a few times a year.
 Use will be increased, as TNO's have to balance investments and costs.
- Energy trading, risk management, portfolio management:
 DSB can be used to optimise the portfolio of an energy purchaser or trader.
 Creator: traders, brokers, suppliers
 Buyer: customers.
 Strong development, DSB can improve purchase contracts with suppliers and are therefore valuable.
- Environmental benefits:
 Not yet used.
 Creator: none
 Buyer: none
 Will be developed as soon as various energy sources are charged. Will then be part of portfolio-management because it is cost-effective to change the energy source.
- Reactive power and voltage control:
 Not yet used.
 Creator: none

- Buyer: none
No intentions to use.
- Incident management:
Successfully used in case of emergencies.
Creator: system operator and transmission network operators
Buyer: customers
System operator and transmission network operators can send directives to all market participants. The use of this product will be charged or claimed.
 - Reduction of losses:
Not used, and will not be.
Creator: none
Buyer:
Transmission network operators state that a reduction of losses is ignorable compared to the costs market participants have to make.
 - Peak shaving:
Reduce investments in production capacity by shifting demand from peak to valley.
Creator: traders, suppliers, brokers
Buyer: customers
Successfully in use, several hundreds of participants.
Will be part of portfolio management.

3.2.2 Contractual issues

The following issues are contract dependent instead of product dependent. The contracts are based on the desires of the creator of the product and the opportunities that the buyers have.

The demand reductions are mainly from the following customers:

- co-generation and gasturbines from large and medium-size industries (diverse products)
- steel works
- large chemical industries
- farmers owning greenhouses
- Contract duration:
Although some long-term contracts are present, especially the large industries with the production pool, the normal contract duration is one year. Generally, contract duration of DSB is the same as the contract duration of the delivery.
- Notification period:
This depends heavily on the character of the demand and the auto-generation that is available. Large industries are able to schedule load management during the operational planning (notification period: 1 day), as well as reduce load within 15 minutes. Small industries and greenhouses have notification periods from 1 hour down to practically immediate.
- Frequency and duration limitations:
Normally once a day.
No minimum duration, maximum duration a couple of hours. With large industries, there are arrangements that the number of hours that load management is performed is limited to 300.

- **Size:**
Normally variable in steps. No principal minimum size, although it is practical for the creator to have a certain amount available.
- **Availability and trigger fee:**
Normally, a reduction in the energy purchase price is offered in advance. Contracts are known that there is a refund of charges when measurements have shown that voluntarily DSB has been performed after a signal from the creator.
- **Firmness and non-compliance penalty:**
When there is price reduction in advance, the bid is firm. Non-compliance will result in claims from the creator when clauses have been included in the contract.
When refunding is the fee, demand reduction is optional. Non-compliance is not charged.
- **Energy reclaimed:**
When production of industries is decreased during execution of a DSB-block, it is assumed that 100% of the decreased energy is taken at a later time.
When DSB is performed by increasing auto-generation, the electricity demand is (partly) covered by this auto-generation and will not be purchased from the normal supplier.

3.2.3 Techniques

The following techniques are used to trigger and control DSB:

- The large industries are informed with the normal SCADA communication system of the national power pool and the system operator. This system contains optical fibres, radio frequencies, PLCs and so on.
The operators of the industries perform execution.
Verification and billing are done via the normal accountable measurements.
There is no special infrastructure for this type of customer. The normal infrastructure is used.
- Small industries are triggered and controlled by apparatus reacting on ripple control. The decrease of demand can be automatically performed, or by hand. Starting of auto-generation is done by hand. Verification and billing is done via the normal accountable measurements.
- There are situations that small industries and greenhouses can voluntarily react on signals from the creator, normally the local supplier or transmission network operator. The signal is transmitted through ripple control.
Verification and billing is done via checking the historical data from the SCADA system of the creator and the operating status of the customer.

4 Views towards Demand Side Bidding

Most participants are seriously considering the application of DSB. Because of the decentralisation, as a consequence of the liberalisation, each market participant has to consider its position and its responsibilities and tasks. As soon as DSB can take part in these responsibilities and tasks, prices and products will be developed.

For each market participant, the potentially successful products are:

- system operator:
 - balancing and frequency control
 - spinning/operational reserve
 - black start and incident management
- transmission network operator:
 - congestion management (operational)
 - postponement of network reinforcement investments
 - voltage and reactive power control
 - risk management
- supplier, trader and broker:
 - energy trading
 - peak shaving
 - program responsibility control
 - gas and electricity exchange
 - portfolio management
 - risk management

The market operator has no opinion on specific DSB products. However, it is able to develop a market place for each product. The market place offers both one- and two-sided auctions, bilateral dealing, options and futures. It treats long, medium and short-term contracts. It trades gas and electricity, garbage concessions, green certificates and so forth.

The regulator's concern is the fair participation of all participants. Therefore, it has no opinion on the products of DSB.

All participants feel that environmental issues will play a role in the future. Important aspects are:

- green taxes: the pricing of environmental burden
- image: especially for competitive players, image is an important selling mechanism; the environment will play a role in image-building

Due to the developments in the economies, the governments and the laws, environmental issues will become more and more important. DSB, energy saving and environmental friendly use and production of electricity are the main features.

5 Barriers to Demand Side Bidding

Although all participants have the feeling that DSB will become an important market mechanism, the following barriers are detected:

- technical:
The technique is sufficiently developed for applying DSB. Large, medium and small loads can be managed, both individually as well as aggregated. The problem is the character of the load: what is the notification time, what is the size of the load reduction.
- structural:
none
- legal barriers:
Because the liberalisation has just started, numerous issues are not yet addressed or unclear. This slows down the development of DSB. The exact distribution of tasks and responsibilities is still under discussion. Investments are therefore not performed at this very moment.
- ignorance:
Because all market participants are reorienting and not yet completely aware of their own responsibilities, an enormous potential of DSB product is still undeveloped. It will take approximately two year before there is a mature situation.
- financial:
The value of DSB is not well investigated in financial terms. It is therefore very difficult for creators to stimulate customers to decrease or shift their demand. Only after the comparisons that creators have to make between investments and operational solutions like DSB, the value will be known.
- traditional:
DSB is relatively new and not wide-spread. Customers expect a continuous delivery, and they have not yet investigated the possibilities of decreasing or shifting load. Exposure to market prices is completely new. Only the large industries, that are liberalised, have knowledge and experiences in that area.
- uncertainties:
Due to the implementation of the New Electricity Act, a large number of uncertainties are present. In particular, the system operator and the transmission network operators have more and more difficulties to estimate the behaviour of the commercial market participants. It is therefore difficult to introduce DSB at this moment.
- measurements:
If DSB is considered, the offered blocks have to be monitored and billed, which invokes a measurement system. It is possible that:
 1. the demand reduction cannot be recognised because it is part of a large demand; or
 2. the investment is too costly compared to the savings in energy purchase.

6 Discussion and Conclusion

As presented previously, there are large opportunities for Demand Side Bidding.

The main reasons for the presently limited application are:

- the continuous developments and discussions due to the introduction of the New Electricity Act:
tasks and responsibilities have to be distributed, and will probably be re-distributed;
risks and uncertainties are therefore introduced;
after about two years, the market environment will become more or less stable;
- the early stage of liberalisation:
only a small number of customers participate in rather simple DSB products;
- the lack of knowledge about costs and revenues:
all creators are just beginning to develop cost schemes, which are of main interest in a competitive environment;
- the lack of knowledge about possibilities of reducing and shifting demand:
customers are unaware of the possibilities to save energy, or to shift demand in accordance with their production and work schedules.

DSB will be stimulated if:

- governments introduce energy saving programmes and green taxes;
- system operators, transmission network operators and suppliers, traders and brokers are able to estimate the costs and revenues of introducing and implementing DSB products;
- customers are made aware of their flexible production processes in order to reduce or shift demand;
- market operators create easy access market places for the various products.