LIBERALISING THE DUTCH ELECTRICITY MARKET: 1998-2004

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1. INTRODUCTION

Since 1998, the Dutch electricity sector has been restructured in line with the two EU-Electricity Directives with Dutch policy being somewhat ahead of the European average. Recently, the European Commission praised the Netherlands for being one of the two countries that had implemented the second directive by the deadline of July 1, 2004. The government memo "*Stroomlijnen"* that was published in 1996 anticipated the EU electricity market liberalisation Directive 96/92/EC and outlined the essentials of the "*Electricity Law 1998*". The *Elektriciteitswet 1998*, of which the first articles became operational on August 1, 1998, created the framework for the liberalization of the Dutch electricity market. The law created the electricity regulator, DTe, that oversees the market and that regulates network tariffs, as well as the system operator and manager of the national transport grid TenneT. Finally, the law also proposed gradual liberalization of the demand side of the market: the 650 largest users (representing some ⅓ of demand) were free to choose supplier as of 1998, the middle segment (again some ⅓ of demand) as of January 2002, while the entire market is liberalised as of July 2004. It should also be noted that the greenmarket was liberalized as of July 1, 2002 (see below).

At the time that document was published, municipalities and provinces, directly or indirectly, owned all players in the Dutch electricity sector. There were 4 large-scale producers (responsible for some 80% of supply) and 23 local distribution companies. Large-scale generation was centrally coordinated by SEP, a cooperative joint venture of these producers. In addition to imports, domestic production involved small-scale self-generation by industrial units and distribution companies. In line with Directive 96/92/EC, the Electricity Law proposed gradual liberalisation of demand and stressed the importance of non-discriminatory access to the transport and distribution networks. In this paper we discuss the developments in the various market segments (production, transport, distribution and supply) since the 1998 law was passed.

2. GENERATION

Until 1998, various lower levels of government, i.e. municipalities and provinces, owned the players on the Dutch electricity market. There were four large-scale producers, UNA, EPON, EPZ/Essent and EZH that cooperated through their joint venture SEP, that coordinated generation. With respect to generation, the (draft) 1998 law was based on the idea of creating a "national champion", by merging the four large-scale producers and with the government facilitating the merger by providing subsidies for stranded assets. In the spring of 1998, however, the producers could not agree on how to share the remaining costs, and the merger plans were abolished. Subsequently, during 1999, Elektrabel bought EPON, EZH was bought by E.On, while Reliant bought the assets of UNA. The fourth generator remained in the hands of Essent, a vertically integrated energy company. In the generation segment, the law did not impose any sector specific restrictions on asset sales; if anything, privatisation was encouraged, the only constraints being that buyers had to commit to honour the obligations with respect to stranded assets and not to exert any influence on the national grid company TenneT (see below). Indeed, based on the idea that efficient scale in generation is relatively small and that the wholesale market would be competitive, the production sector has been left unregulated since 1999, hence, only the general competition and environmental laws apply.

In 2003, Reliant announced its intention to leave the Netherlands again. It reached an agreement with Nuon that the latter energy company (which was mainly active in distribution) would buy the generation assets. At the end of 2003, the Dutch competition authority, NMa, ruled that a license was required and that the merger could be approved provided that 900 MW of capacity was divested by means of a VPP-auction; see below.

Installed production capacity in the Netherlands is slightly over 20 GW, of which some 14 GW consists of 'centralized production'. Elektrabel owns slightly over 4 GW of capacit of which 85% is gas fired. Reliant has 3.5 GW of capacity, of which 80% is gas fired. Essent also has about 3.5 GW of capacity, of which 60% is gas fired. E.On owns 1.8 GW of capacity, 60% of which is coal fired, the remainder gas fired. EPZ, a joint venture of Essent and Delta, another distribution company has 805MW of capacity. Before the merger with Reliant, Nuon owned 900 MW of capacity, while it had also contracted the Intergen unit (800 MW) that will come on line in 2005.

The remainder of the Dutch generation system consists of distributed (or 'decentral') generation, which is mainly CHP and is co-owned by distribution companies and industry. In total, this is roughly 7 GW. The Dutch electricity network is interconnected with Belgium and Germany. Total available transfer capacity on the German-Netherlands interconnector is some 2200 MW, most of which is allocated through auction. Capacity on the Belgium-Netherlands interconnector is 1150 MW and again this is made available by means of auctioning. NMa (2003, table 1, p. 32) reports that before the Nuon/Reliant merger, the HHI on the Dutch market was 1754, and that the HHI will increase to 1974 after the merger. (The assumption underlying the calculation is that each local player has 400 MW of interconnector capacity.)

Since 2001, after the expiration of a transition period, needed to unwind the cooperative SEP agreement that blocked competition between domestic generators, the generators have competed for the liberalised market segment. As domestic competition is gas based, there is room for cheap imports and indeed 15% of total supply is imported. Annual consumption of electricity in the Netherlands is some 107 TWh. In 2001, domestic units produced 90 TWh, while net imports were 17 TWh. In 2001 most of the imports were from Germany, over 16 TWh. Flows with Belgium were more balanced, with imports being 4.5 TWh and exports being 3.5 TWh. Since that time, imports from Belgium have increased however.

2.1 Markets and Liquidity

Various market places facilitate competition. In addition to the somewhat informal OTC-market, the APX (see www.apx.nl) has offered a daily spot market since May 1999. At the borders with Belgium and Germany, the import capacity is auctioned, so as to ensure efficient use of this capacity; see www.tso-auction.org. As a result of these organised markets, the Dutch electricity market is reasonably transparent. In retrospect, the possibilities for exerting market power on the wholesale market might have been underestimated at the time the law was drafted, and there might have been insufficient awareness of the potential pitfalls involved. After the California crisis, it has been discussed whether, to guarantee the public interest, some type of licensing of generation would not be desirable. In any case, the wholesale market is monitored closely, among others by the Market Surveillance Committee that was set up by the Dte.

[To be added, based on the liquidity report}

2.2 The evaluation of the Nuon/Reliant Merger and remedies proposed

In 2003, after having been active on the generation market for less than 4 years, Reliant has left the country again, with Nuon, a large integrated energy company, buying its assets. With this merger creating a market structure with two large vertically integrated energy companies, and wholesale markets that are not very liquid, the NMa was concerned that this is another step on the road to a tight oligopoly with three or four integrated players. It decided that the concentration can be allowed provided that 900 MW of capacity is divested by means of a VPP-auction (NMa, 2003), a decision that Nuon has appealed. Very recently, a court decided that Nuon indeed will have to divest 900 MW, but that the requirement imposed by NMa, that the capacity contracts should be long-term (i.e. 5 years), should not be implemented at the moment. The NMa-decision is noteworthy as it stresses that, in delineating the relevant market, the time dimension is important: when the market is tight, players (even those with small market shares) may have substantial market power. We now briefly discuss this decision of the Nma.

In 2003, the NMa evaluated the proposed takeover of the Reliant assets by Nuon. In NMa (2003) it is argued that as a result of the merger, Nuon, instead of being a price follower, will become a strategic, price setting player. After the merger there would be three players (Electrabel, Essent and Nuon) that would be determining the price most of the time, especially so during periods of peak demand. To investigate the effect of the merger, NMa has commissioned two market studies, one by Frontier Economics, the other by ECN, the Dutch energy study center.

The Frontier-model is a supply function equilibrium model. Before the merger, (only) Essent, Electrabel and Reliant are assumed to be strategic players; after the merger Electrabel, Essent and Nuon are the strategic players. For each of the players, the model contains information about marginal costs and capacity. Of course, interconnector capacity is included as well. On the demand side, a range of several levels (with steps of 200 MW) is distinguished.

Each strategic player is assumed to have 17 strategies which correspond to bidding a certain multiple of the assessed marginal cost, ranging from competitive bidding (multiple 1) to 15 times the marginal costs. (Is it assumed that the same multiple applies to all units that the player controls?) The German interconnector is added as a non-strategic player, while on the interconnector with Belgium various scenarios are calculated. Each strategy of a strategic player translates into an individual supply function. Intersecting the resulting aggregate supply function with the market demand yields the market price. Units that were bidding less than the market price receive the market price.

The Frontier model starts from a given level of demand, that is assumed to be known by all the players. For each level of demand, the model calculates which strategy combinations constitute Nash equilibria. It is found that for many levels of demand, there might be multiple equilibria. The Nash equilibria given rise to different prices, there is a price range and one can calculate the maximum, minimum and median prices. As a point predictor, Frontier then uses the median price. Using the information about the empirical distribution of demand, then allows one to calculate a price duration curve. This price duration curve can then be compared with the price duration curve that will result after the merger. The next table provides a summary of the results as reported by NMa.

		Minimum (EUR/MWh)	Maximum (EUR/MWh)	Median (EUR/MWh)
Pre Merger	Average (volume weighted)	29.9	82.1	43.7
	Average (time weighted)	27.9	70.7	39.4
Post Merger	Average (volume weighted)	29.5 (- 1.33%)	127.6 (+ 55.42%)	49.5 (+ 13.27%)
	Average (time weighted)	27.7 (- 0.72%)	108.8 (+ 53.89%	44.4 (+ 12.69%

Table 1: Merger simulation (Source Nma)

The model can also be used to check for the frequency of high prices. Table 2 provides the details.

	Minimum			Maximum			Median		
	>EUR50/ MWh	>EUR100/ MWh	>EUR200/ MWh	>EUR/50/ Mwh	>EUR100/ MWh	>EUR200/ MWh	>EUR/50/ Mwh	>EUR100/ MWh	>EUR200/ MWh
Pre	1%	1%	0%	37%	17%	9%	19%	4%	1%
Post	1%	1%	1%	46%	30%	25%	29%	5%	1%

Table 2: Merger simulation (Source Nma)

The second model used by NMa to simulate the effects of the merger is the COMPETES model of ECN. COMPETES is a Cournot model that contains information about production units in the Benelux, Germany and France, as well as information about the electricity network in these countries. It is based on a linear demand curve, where 12 different demand curves are being distinguished: 3 different seasons (summer, winter and fall/spring) and for each of these super peak, peak, shoulder and off-peak periods. For each of these periods, one point on the demand curve is determined from historical data while at that point an elasticity of –0.2 or –0.1 is assumed, hence, there are two scenarios. Given information about marginal costs of different units, the above determines a well-defined (quantity constrained) Cournot game of which the Nash equilibria are computed. NMa (2003) reports the analysis of the case with $\varepsilon = -0.2$. The results are as in table 3.

Period		Pre Merger EUR/MWh	Post Merger EUR/MWh	% Increase
Winter	super peak	62.5	65.4	4.7
	peak	59.8	64.5	7.9
	shoulder	43.6	46.4	6.6
	base	40.0	42.2	5.5
Fall/Spring	super peak	59.4	61.9	4.3
	peak	47.4	50.4	6.3
	shoulder	42.5	44.9	5.7
	base	39.1	41.1	5.2
Summer	super peak	49.8	52.9	6.2
	peak	49.1	52.2	6.3
	shoulder	42.7	45.1	5.6
	base	42.5	43.9	3.4
	Average	44.9	47.5	5.9

Table 3: Merger Simulation (Source Nma)

Even though the merging parties pointed out several weak points and drawbacks of the simulation models, such as

(i) calibration of the model: the pre-merger prices are not in line with the actual observed prices,

(ii) inelastic demand is unrealistic, demand side bidding is neglected

(iii) the modeling of the interconnector is inappropriate

(iv) the specification of the strategy space is arbitrary, and may influence the results

(v) the model assumes complete information,

NMa argues that the results remain largely intact of different, more realistic assumptions are made, hence, the conclusion of the Frontier analysis is robust. On the basis of this analysis, NMa concludes that the merger would lead to a significant price increase, hence, cannot be allowed.

To relieve the concerns of NMa, Nuon offered to divest 900 MW of capacity through a VPP-auction. NMa accepted a commitment in which the 900 MW would be offered in 90 blocks of 10 MW, for a period of 5 years, with reevaluation after 5 years. NMa proposed that Electrabel, Nuon and Essent would not be allowed to participate in this auction. Under these conditions, the 900 MW would be offered competitively, and as a simulation by Frontier showed, this would indeed do away with the concerns.

Specifically, NMa proposed

(i) 90 blocks of 10 MW each of capacity would be offered in a multi unit auction;

(ii) a buyer of a block has the right to call the capacity during 5 years, i.e. from January 1, 2003 until 2010;

(iii) each buyer can acquire at most 23 blocks, Electrabel, Essent and Nuon are excluded from the auction;

(iv) the price for electricity is $p = 13.37 + 0.082\ P_{q,y} + 0.116\ K_{q,y}$ where $P_{q,y}$ is an index for gas and $K_{q,y}$ is an index for coal;

(v) buyers are committed to take or pay 75% of the capacity on average, while they have to continually take at least 50%. (It is possible to reduce the demand to 0, but each time this is done, cost of € 125 are incurred.)

Nuon has appealed this decision. The court of Rotterdam has recently decided that the imposition that the contract length be 5 years is disproportionate as is the requirement that

Essent is excluded from the auction. It is now clear that the capacity will first be made available on a one-year basis. As the decision is not yet published, I cannot comment on it any further; it seems, however, that the court may not have incorporated all economic arguments.

2.3 Market integration

[To be added]

3. TenneT AND THE TRANSPORT GRID

The requirements of non-discrimination and accounting separation imposed by Directive 96/92/EC were implemented by insisting on legal unbundling between production, network services and supply, as well as by certain other procedural safeguards. Consequently, the 1998 Dutch Electricity Law went already much further than what the First Directive demanded; in fact, most of the requirements of the second Electricity Directive (2003/54/EC), that should be implemented by July 2004, were already met by that Law. The 1998 Law forces the economic owners of the networks to appoint independent network managers, with the appointment to be approved by the Minister.

In what is probably best seen as an attempt to block network investments that could be used to expand imports, hence, increase competition, SEP, the joint venture of the generating companies that owned the transport grid, at first refused to delegate important investment decisions to the national transport grid manager, TenneT. As a result, it took until 2000 before the Minister could approve the appointment of TenneT as manager of the national grid. When dealing with this issue, the question came up whether government ownership would be necessary to ensure non-discriminatory access to the transmission grid. The original law was based on the idea that, to guarantee independence of the network company, it would be sufficient for the State to temporarily acquire the majority (50% plus 1) of the shares: after the transition period, full privatisation could take place. However, during the summer of 1999, the Christian Democrats changed their position on the privatisation issue to conclude that all essential grids, hence, also the national transport grid, should be owned by the State. Over time, other parties, with the exception of the Liberal Party, also came to adopt this position. In October 2001, the State fully acquired TenneT as well as Saranne BV, the legal owner of the grid, with the State paying slightly over € 1 billion. Interestingly, the 2001 government memo

on state participations expresses some regret that Parliament forced the cabinet to make this acquisition; one can see a clear reluctance of the Ministry of Finance to take the ownership role, or maybe it just regrets having had to pay € 1 billion. With the Christian Democrats being in the government at the moment, it is unlikely that the State will soon sell any of its shares in the national grid, or in the systems operator TenneT.

Since then, there have been further interesting developments with respect to the national grid manager and system operator TenneT. In 2003, TenneT bought a lower voltage grid that also has a transport function. In May 2001, TenneT bought the power exchange APX, the day ahead spot market on which approximately 15% of all energy consumed in the Netherlands is traded. In turn, in 2003, the APX bought APX (UK), a UK spot market for electricity. In June 2004, TenneT bought an auction house on which long-term energy contracts are traded (2.3 TWh in 2003). While it does make sense for TenneT to operate the APX (as, in its capacity of system operator, it also operates a balancing market, which can be used for last minute adjustment), it is less clear or what is the driving force behind the other acquisitions, in particular the foreign expansion. The DTe has published a consultation document on how TenneT should be regulated.

4. DISTRIBUTION

In this section, we discuss regulation and privatisation.

4.1 Regulation and yardstick competition

DTe regulates distribution rates and, in setting the network charges, DTe is making use of yardstick competition, hence, network charges of different distribution companies are compared to each other and inefficient companies are forced to reduce their charges more than others. While in the first regulation period (2001-2003) there was regulation only on price, in the second period (2004-2006), network quality will be regulated as well. DTe claims that, as a result of regulation, in the period 2001-2006 network tariffs decrease by 17% on average, leading to cost savings of come € 1.9 billion in total; see NMa (2004, p. 62).

Until 1999 captive consumers paid a price for electricity in which tariffs for network services and supply were integrated. The price had to be approved by the Minister of

Economic Affairs, hence, it was regulated; in effect, cost were passed on. At the end of 1999, distribution companies had to propose, for 2000, separate tariffs for transport services and supply, which had to be approved by DTe. The Electricity Law 1998 stated that as of 2001 there would be price cap regulation, specifically, the law contains, in article 27a, the following formula for upper bound of the price of network services in year *t*

$$p_t = \left(1 + \frac{cpi - x_t}{100}\right) p_{t-1}$$

with a similar formula being specified, in article 41, for the electricity price. Here *cpi* denotes the consumer price index, while x_t is an efficiency component that, according to the law would be fixed for 3 to 5 years.

DTe had the authority, subject to certain guidelines in the law, to fix the starting price, i.e. the one valid for 2000, as well as the efficiency component x_t. The idea underlying the law was that distribution companies would be benchmarked against each other, that is, every new regulation period (every period of 3 to 5 years), the new efficiency factor would be the average of the realized productivity improvement over the previous period. Of course, starting from different initial positions, the proposal would penalize firms that were already relatively efficient, while it would reward inefficient firms as the latter would find it relatively easy to implement productivity improvements. To deal with this issue, the law envisaged that the first regulatory period would be used to bring the various distribution companies to a comparable efficiency level, hence, companies would be benchmarked against each other and more inefficient firms would be confronted with a higher *x*. DtE proposed to use DEA to compare the firms and gauge their relative efficiencies and it came up with the *x*'s as in the first column of the Table 4 for the various companies. The reader may note that the efficiency factors for different firms are quite different.

	I 1st	I 2nd	I 3rd	CBB	II
COGA	3.8	-1.1	-10.4	3.2	-3.6
DELT	-4.3	-2.9	-3.1	3.2	6.8
EDEL	9.6	6.7	7.1	3.2	2.7
EDON	1.9	--	4.7	3.2	3.8
ENBU	8.4	6.5	0.4	3.2	?
ENEC	8.1	7.8	7.8	3.2	2.7
ENET	4.8	4.4	7.3	3.2	1.9
EZKE	9.8	7.9	7.0	3.2	3.8
FRIG	9.7	--	7.5	3.2	3.8
INFR	6.3	--	7.7	3.2	3.8
MEGA	-1.5	--	6.9	3.2	?
NMHO	6.4	3.3	2.3	3.2	1.3
NUON	7.7	7.2	6.8	3.2	1.3
ONSN	9.8	7.1	7.2	3.2	4.8
PNEM	-3.5	--	3.2	3.2	3.8
REND	9.8	-6.9	-3.0	3.2	0.6
WEER	4.3	-0.6	1.5	3.2	?
WEST	-4.7	-10.5	5.8	3.2	2.5
CONT			6.1	3.2	1.3
EWRN			6.8	3.2	1.3
NWNE			7.6	3.2	1.3

Table 4: *x*-factors

Companies objected to both the individual *x*-factors, as well as to the overall methodology. To deal with the individual objections, DTe was forced to revise the efficiency factors, and the various columns of the table indicate the revisions that took place. One notices that some of these adjustments were considerable: one company moved from an *x* of 4 (first column) to an *x* of –10 (third column), while another company moved from an *x* of 10 to an *x* of –3. Hence, while the initial proposal forced COGA to reduce its real prices by 4% per year, the adjusted proposal allowed the company to increase its real price by 10% per year, which, in the third year of the first regulation period would imply a price difference of 50%.

Companies also objected to the methodology, and to the efficiency factors being company specific in particular. While to an economist, the Explanatory Memorandum to the Law is quite clear and unambiguous, companies argued that it was not and they appealed to the court. The court ruled that since the Explanatory Memorandum mentioned both that tariffs could be different for different companies and since the *x*-factor served to induce firms to operate efficiently, the law had to be interpreted such that the same *x*-factor applied to all companies, hence, in October 2002, it annulled the decisions of the DTe for the first regulatory period. DTe was, hence, forced to implement uniform *x*-factors and in 2003 it agreed with the distribution companies on an *x*-factor of 3.2. Consequently, some firms were allowed to increase their prices after 2002.

Meanwhile, the Law has been clarified and redrafted. The new law makes explicit that the *x*-factor can be different for firms that do not operate at the same level of efficiency. DTe has responded by proposing different *x*-factors for the second regulation period, 2004-2007. The final column of the table specifies the *x*-factors that apply during this period. DTe has announced that as a result of regulation, each electricity consumer has saved €45 over the first period, while total savings during the second regulation period are estimated to be € 344 million.

4.2 Privatisation

Article 93 of the 1998 Electricity Law states that privatisation of distribution companies is possible, subject to Ministerial approval. Since 1999, there has been a heated political discussion on the conditions under which such privatisation could take place, while at the same time a few distribution companies have been sold to German utilities. Each time this happened, the responsible Minister (Jorritsma, Liberals) applauded the developments, but parliament objected, tried to block the sale and, failing to do so, forced the Minister to impose stricter rules on privatisation. As a result, the cabinet has proposed guidelines (Staatscourant 2001) and a draft law on "Privatisation of Energy Distribution Companies" (Kamerstukken, 2001-2002c) that would allow privatisation, provided it was guaranteed that the network manager could and would operate in a way "sufficiently independent" from the rest of the company. Both of these were very complex and did not meet with any enthusiasm. When in 2002, before the privatisation law could be discussed, another distribution company was bought by RWE, parliament was so upset with the fact that it could not block this

privatisation that it forced the Minister to withdraw both the guidelines and the draft law. After the 2002 elections, the new Minister indeed withdrew both, while announcing that he would not allow any further privatisations until the market would be fully liberalised. Since that time, the deadline has been shifted further in the future.

At issue in this discussion is first of all the question of what can be privatised: the vertically integrated company or the distribution network, or just the supply business? The current owners of the companies (local municipalities and provinces) are in favour of full privatisation: they argue that government regulation is sufficient to guard the public interests, that they have no real powers to influence the decisions of the distribution companies in any case (this again as a consequence of the *Structuurregime*) and that they have good use for the money that privatisation would bring. At the same time, it has been argued that there are several risks involved in full privatisation and that regulation might not be sufficiently powerful to deal with these. The main concern is that an integrated (private) company would have an incentive to discriminate against competing supply companies, hence, that it would frustrate supply competition. Other concerns are that it could use revenues from the network business to cross subsidise its supply business (again leading to "unfair competition"), and it might underinvest in the network, with the State not having powerful legal means to intervene in case of mismanagement.

One way of dealing with these concerns is to insist on unbundling of supply and distribution and indeed, to guarantee non-discriminatory access to the grids, the 1998 Law already forces distribution companies to legally unbundle their distribution networks from their supply business. In other words, the 1998 Law already implements an important requirement that, at the EU level, is imposed only by the second Electricity Directive (2003/54/EC). Even though the Law contains some other safeguards that are supposed to guarantee that the network manager operates in a way "sufficiently independent" from the rest of the company, there has been some concern, that network companies have not been able to do this. For example, when one pure supply company, Energy XS, went bankrupt in 2003, each network company switched the consumers of Energy XS to its sister supply company. The 2004 Law implementing the second EU Directive, therefore, imposes even stronger independence requirements, such as that the network company should be the owner of the grid.

Very recently the Minister has argued that even these additional measures might not be going far enough, hence, he has argued that full privatisation of the integrated company poses too great risks and that legal unbundling between distribution and supply is insufficient to deal with the concerns. The current proposal (Ministry of Economic Affairs, 2004), hence, entails full (ownership) unbundling of the distribution company from supply and generation; it is thus proposed to fully separate the competitive parts of the value chain from the monopolistic elements. Such unbundling would have to take effect before 2007, where the non-network part of the company is allowed to be privatised immediately after the unbundling has taken place. The Minister argues that this plan offers the best of all worlds: generation and supply can remain together, hence, allowing companies economies of scale and scope, while separation will effectively deal with the anti-competitive concerns. He also argues that full structural separation does not destroy any value, hence, that current owners should be happy as well. The vast majority of parliament supports these plans, but current owners have not yet been convinced. In part this is because the Minister has not yet made up his mind on the privatisation of the network companies; it is clear that, in the future, they cannot be sold to firms that are also active in supply or generation (i.e. line of business restrictions will remain in place), but it is not clear whether they can be sold at all. We thus see a major change in policy: while five years ago privatisation of distribution companies was considered to be unproblematic, it is now judged to be impossible.

5. LIBERALISATION

The demand side of the market is liberalized in four steps, and liberalisation proceeds at a faster pace than the Second Electricity Directive (2003/54/EC) requires. Large users, representing about 1/3rd of demand, were given freedom of supplier in 1999 and the middle group, again representing about one-third of demand, in January 2002. Immediately after liberalisation, some 30% of the middle segment switched supplier, and it turned out that the sector was not very well prepared for this. In July 2001, the market for green electricity was opened for all consumers, and the entire market will be open as of July 2004 when supply will be unregulated. As a result of relatively generous subsidies, a large number of small consumers (about 1 in 3 at the moment) are consuming green energy; see www.green-prices.com, where one also sees that there are a large number of suppliers of such energy, that the market is transparent and that there is still considerable price dispersion. At present, it is predicted that the full liberalisation as of July 1, 2004 will not lead to much switching; hence,

one may infer that, just as in the UK (see Waddams Price, 2004), retail competition will probably not be very effective.

5.1 Switching

On January 1, 2002, the middle segment of the market, consumers with annual demand at least 1 GWh, became free to choose its supplier. In response, some 20 new supply companies entered the market. This included companies that were already well-established, such as EnBW and Vattenfall, new start ups, such as Energy XS and companies that before had only been active on the gas market, such as Cogas. In a survey done 19 months later, it was revealed that up to 60% of these power users had since then switched supplier at least once, hence, the level of churn in this segment of the Dutch market is very high. Indeed, immediately after market opening, the number of desired switches was so large that the systems could not adequately deal with this. As a result, to prevent similar problems with the opening of the retail segment, full market opening was delayed by half a year, until July 2004.

The survey, reported on by Datamonitor (DTM.L) in July 2003 reveals interesting results. Upon contract renewal, 50% of the large users had chosen a different supplier, resulting in almost 60% of the users having switched at least once since market opening. Switching seemed to be driven by extreme price sensitivity (with 75% of the volume being prepared to switch at a unit price savings of 2%) as well as dissatisfaction with quality of service. Indeed, Datamonitor reports that the industry average of overall satisfaction in the Netherlands is only 88%, where comparable figures for France and Germany are 95% and 96%, respectively. The survey also revealed that large Dutch power users are especially dissatisfied with quality of service related to billing and account management, the rating here being as low as 62%.

Since the market for green electricity was liberalised in July 2001, there have also been relatively many switches there, however, small users appear not to be that price sensitive. On June 30, 2004, EnergieNed, the Federation of Energy companies in the Netherlands, reported that roughly 2.5 million households (36%) had switched to green energy, 18% had switched away from the incumbent supply company, either on the first switch (6%) or later (12%). Consequently, a rather large percentage (82%) of the switchers have stayed with the incumbent company. As the incumbents were typically charging the

same price for their green electricity as for their gray electricity, the vast majority of the households have not profited from the price savings that were available. Indeed, 3 years after market opening, still 93.5% of Dutch households are buying electricity from their local incumbent, which suggests considerable incumbency advantages.

The entire market was opened on July 1, 2004 and households could indicate their willingness to switch as of May 17, 2004. In the 6 weeks leading up to market opening some 150.000 households (2%) requested to be switched. This percentage is definitely much lower than the similar percentages observed in the market segments of the larger users. It thus remains to be seen whether full retail competition will become a success. Given the chaos surrounding the market opening of the middle segment, discussion in the Netherlands has focused on the question whether system operators would be able to handle the switching requests. The systems are able to handle 5% switchers per month, hence, they are easily able to deal with the technical aspects. Of course, success should preferably not be defined as "switching proceeds in an orderly fashion" but as "consumer surplus increases".

5.2 Liberalization of the green market

The Kyoto agreement specifies targets for efficient and environmentally friendly production and consumption of energy. EU directive 2001/77/EG (European Commission, 2001) has translated the Kyoto goals in certain target levels for EU-countries for green electricity consumption (i.e. consumption of electricity that is produced from renewable sources, such as wind, water and the solar system, as opposed to 'conventional' gray electricity). For the Netherlands, the target is that in 2010 9% of consumption is green, with there being an intermediate level of 5% in 2007 and an ultimate goal of 17% in 2020. It should be noted that the Directive leaves some ambiguity whether the target levels concern production or consumption. The EC has recently made clear that, at the EU-level, the targets concern consumption, but it has also proposed that imports can only be counted towards the obligation of the importing country if the exporting country does not object to this; see Algemene Rekenkamer (2003, p. 33)

While the Dutch government has been pursuing a green energy policy already since 1996, with producers of such energy receiving subsidies since January of that year and with consumers not having to pay the energy tax (REB) since January 1998, policy became

substantial only as of 1999. The first *"Energierapport"* that was published that year proposed that the goals would be reached primarily by means of demand side subsidies, competition between supplies and tradable green certificates; see Tweede Kamer 26898, nr. 1, p. 8. Since that time the system succumbed to its own success: the subsidies were very generous leading suppliers to offer green electricity at prices that were comparable to those of gray electricity; as seen above consumers switched, with 35% of Dutch households consuming green electricity around July 2004 and with 13% of consumption being green in 2002. At the same time, a considerable part of the subsidies ended up with foreign existing generation units, hence, the subsidies did not lead to much additional capacity. In 2003, the government changed the system: the demand side subsidies are gradually reduced (they will be zero as of January 1, 2005), while generators will receive, for a period of at most 10 years, a subsidy related to the cost difference. We now describe the evolution of the system.

The tax system

On January 1, 1996 the exotax (REB) was introduced. Consumers with a total electricity demand not more than 50 MWh had to pay a tax of 13.40 €/MWh. At the same time, domestic producers of green electricity could receive a subsidy of 13.40 €/MWh for green electricity sold to domestic consumers. Over time, the tax rate would change, while as of January 1, 1998 consumers did not have to pay the REB, or they did have to pay a reduced rate if they choose to consume green electricity. The next table provides the details of the rates for the period 1999-2003.

Year	REB (€/MWh)	Demand level (MWh)
1999	22.50	*d* # 10
	13.40	10 # *d* # 50
2000	37.25	*d* # 10
	13.40	10 # *d* # 50
2001	58.40	*d* #10
	13.40	10 # *d* #50
2002	60	*d* # 10
	20	10 # *d* # 50
	6.10	50 # *d* # 10.000
2003	63.90	
	20.70	
	6.30	

Table 5: ecotax

During the years 1999-2002 a consumer of green electricity did not have to pay the REB. As of January 1, 2003, the REB-reduction for green energy was 46.4 €/MWh for consumers with a demand less than 10 MWh. As of July 1, 2003, the REB-reduction was reduced to 29 €/MWh, as of July 1, 2004, the subsidy is reduced further to 15 €/MWh; as of January 1, 2005, the demand side subsidies will be eliminated completely.

Year	Demand side subsidy (€/MWh)
1999	22.50
2000	37.25
2001	58.40
2002	60.10
2003H1	46.40
2003H2	29
2004H1	29
2004H2	15
2005	0

Table 6: Demand Side Subsidies for green energy;
rates applicable if demand # 10 MWh.

The following remarks should be made

(i) Suppliers of energy could claim the subsidy if they could show that they had bought green energy to that amount.

(ii) The market for green energy was liberalised on July 1, 2001.

(iii) As of January 1, 2002, the REB-subsidies could also be gotten for imported green electricity. This move followed a lobby by the distribution companies, who argued that (potential) demand for green electricity outstripped domestic generation capacity, the "Regeling groencertificaten" was modified, and also imported electricity became eligible for the consumer subsidy; see Staatscourant (2001b).

(iv) As of January 1, 2002, hydropower was no longer eligible for the REB-subsidy. (This holds for both imported and domestic such power.)

Moving now to the supply side, we can state the following. The next table gives the tax subsidies that producers of green energy would receive for energy consumed in the Netherlands.

Year	Producer Subsidy
1999	13.40
2000	16.00
2001	19.40
2002	20.00
2003H1	20.70
2003H2	0 (new system)

Table 7: producer subsidies

As we see from the table generators of green electricity could get a subsidy of around € 20/MWh for each MWh of green electricity that was produced and consumed in the Netherlands. Note that, compared to the average commodity price for electricity traded on the APX in 2001, of € 35/MWh, the size of the subsidy is considerable; of course, compared to the total end user retail prices for domestic consumers of over € 200/MWh, the impact seems smaller. This subsidy was available for domestic producers, but, under certain conditions, also for foreign producers. In essence, the latter had to provide sufficient proof that they did not receive other types of subsidies for their electricity and that they transported the electricity to

the Netherlands, so that it was consumed there. As evidence, the exporters had to demonstrate their E-programs to the relevant Dutch tax authority, hence, one had to show the contract path for the electricity and one had to buy the transport capacity that was needed to carry out this E-program. We note that small-scale (< 15 MW) hydropower was eligible for this subsidy, but that larger hydropower production units were assumed to be competitive without subsidies and, hence, were excluded from the subsidies. Kroon (2002) notes that these subsidies are also very attractive for small-scale hydro installations and he estimates that in Europe some 2400 MW of capacity may be ready to export to the Netherlands. As of January 1, 2003, under the new system, green electricity that is produced abroad is no longer eligible for the producer subsidies.

The essence of the new policy that is in place as of July 2003 is to reduce the demand side subsidies and to increase the supply side subsidies, but to limit the latter to newly or recently installed domestic production. Generators of green electricity located within the Netherlands will, for a period of 10 years, receive a subsidy related to the difference in cost of their technology and the cost of producing gray electricity, where technologies that are not much more costly will be compensated in full. Specifically, biomass will receive a subsidy of € 29/MWh, wind-power on land will receive a subsidy of € 49/MWh, and other forms of green power, including wind at sea, will receive the maximal subsidy of € 68/MWh.

Total Tax Subsidies

Recently, the General Accounting Office calculated how much the subsidies have cost the Dutch taxpayer. On the basis of information from the tax office, they come to the following table.

Year	Demand side subsidies	Supply Side	MEP-regeling	Total
1999	€ 1.4	€ 15.6		€ 17.0
2000	€ 10.0	€ 35.6		€ 45.6
2001	€ 22.4	€ 176.1		€ 198.5
2002	€ 215.1	€ 340.7		€ 555.8
2003H1	€ 208.4	€ 79.9		€ 288.3
2003H2	€ 162.0		€ 55.0	€ 217.0
2004	€ 72.9		€ 161.0	€ 233.9
2005			€ 304.0	€ 304.0
2006			€ 378.0	€ 378.0
2007			€ 437.0	€ 437.0
Total	€ 692.2	€ 647.9	€ 1335.0	€ 2675.1

Table 8: tax subsidies for green electricity

As one sees from this table, the interesting year is 2002, when foreign generators could profit from both the supply and demand side subsidies. Van Damme and Zwart (2003) estimated who profited from these subsidies. We here reproduce (and update) their analysis. Table 9 provides information on the composition of green electricity consumed in the Netherlands.

Green Energy

Source	2000	2001	2002	2003
Hydro	142	117	110	72
Wind	829	825	910	1302
Solar	8	13	17	30
Biomass	1713	1951	2535	2248
Total-Domestic	2692	2906	3572	3650
Hydro	?	?	4232	652
Wind	?	?	80	250
Biomass	?	?	6118	8629
Total-imported	1500	7645	10430	9530
Total	4192	10551	14002	13180

Consumption				109777

Table 9: Green electricity consumed in the Netherlands

Who benefited from the green policy?

We next turn to estimating what players have benefited from this scheme in 2002.

Recall that at the end of 2002, 1.4 million Dutch households had signed up for green electricity and that the average household consumes 3.2 MWh of electricity per year. If we estimate annual demand of green energy at 4.5 TWh (which coincides with the estimate provided in CBS (2003) and which more or less coincides with the number of redeemed green certificates as of January 2003), and value all consumer subsidies at € 60/MWh, the value for delivery to small consumers, we can conclude that € 270 million was spent on the demand side subsidies (€ 60/MWh times total consumption of 4.5 TWh). Note that table 8 provides a slightly smaller number, hence, some larger users also found it attractive to buy green energy. From Table 9, we can conclude that the supply side subsidies amounted to slightly more, € 280 million (€ 20/MWh times total production of 14 TWh), hence, the total subsidy is € 550 million. Where does this money end up?

The producers can claim the producer subsidies. Domestic producers can claim this subsidy in full; after all they do not need the cooperation of another party. Table 9 allows us to conclude that this amount is approximately € 72.5 million. In order to access the subsidies, green electricity producers from abroad have to pay increased prices for interconnector capacity. A rough estimate, based on the difference between the interconnector price in 2002 and those in later years, see table 10, is that the interconnector price is € 10/MWh higher than it otherwise would be. At total imports of 10.35 TWh, this amounts to increased auction revenue of € 103.5 million, which (by the rules governing the auction) is shared equally between TenneT and the auction organizers (RWE-Netz and Eon-Netz) on the German side. With total production subsidies for foreign production of € 207 million, this leaves € 103.5 million for the foreign producers, which we assume they can keep in full (hence, we assume that they do not have to share with Dutch supply companies; in other words, the € 103.5 million is an upper bound for the amount received by foreign producers).

	2004	2003	2002	2001
Elia	1.10	0.25	2.90	3.00
RWE	6.15	6.75	17.75	10.90
E.On	6.00	6.90	18.35	10.50

Table 10: interconnector prices (€/MWh)

The consumer subsidies are divided between consumers, producers and suppliers. During 2002, consumers benefited only a little, since, despite the huge subsidies, the price for green electricity was only slightly less than the price for gray electricity. Retail price information from www.greenprices.com demonstrates that, at the moment, some new entrants do provide large discounts on green energy of € 10 to 40/MWh, however, prices of market leaders tend to be close to gray energy prices, and in 2002, new entrants only had a small market share. Recall that only 6% of consumers have switched to a different company at the moment, presumably some of these have switched to existing players on the market. As Van damme and Zwart (2003) show, also producers benefit only marginally, as the price of a green certificate is rather small: between € 10/MWh and € 20/MWh. Hence, the major beneficiaries of the scheme are the intermediary supply companies. Given that supply companies receive the remaining € 40-50/MWh a sensible estimate is that of the € 270 million that is at stake, circa € 200 million ends up with supply companies, while the remainder, € 70 million, goes to producers. From the data that are publicly available, it is not possible to determine exactly how this latter amount is split between foreign and domestic producers. On the one hand, there is more supply from abroad, but on the other hand, for marketing purposes, there may be a preference for green electricity that is produced within the Netherlands. As a rough estimate, we assume an equal split between Dutch and foreign producers, hence € 35 million each. Domestic producers therefore receive, on aggregate, € 72.5 million producer subsidies and € 35 million from green certificates, leading to a total of € 107.5 million. For foreign producers, the resulting figure is € 138.5 million. All in all, the balance is as in Table 11.

Destination	Market player	Amount (million €)
Home	Producers	107.5
	Supply Companies	200
	Network Company	52
Abroad	Producers	138.5
	Network Companies	52
Total	Dutch government	-550

Table11: who profited from Dutch environmental friendliness?

One may wonder why, given that green electricity consumers have free choice of supply company, there is not more competition between these companies and why consumers do not benefit from lower prices. Allegedly this is because the Ministry of Economic Affairs has put pressure on these companies not to lower their prices for green energy; see Financieel Dagblad (2001). From a public finance perspective, this would be understandable, after all each household that switches to green electricity costs the Dutch taxpayer € 192 per year, but from a purely economic point of view, inducing cartel behavior to resolve a mistake in a policy design seems hardly satisfactory.

Last week it was announced that the competition authority, Nma, had raided the offices of the traditional distribution companies, in search for evidence of price fixing.

6. CONCLUSION

[to be added]