

## **MSC analysis of high annual import prices and green tickets**

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### **Introduction**

The results of the auction for annual import capacity from Germany for 2002, held in November 2001, were, at 18 Eur/MWh, significantly higher than the previous year. This price increase has been attributed by some to the change in the Electricity Act 1998, as of January 2002, making physically imported green energy eligible for green certification, and the associated exemption from eco-tax (REB) when supplied to Dutch green energy customers.

DTe requested the MSC to assess whether the high interconnection prices can indeed be explained by these causes, or whether other reasons can be identified.

### **Interconnection prices**

It should first be verified that the price for interconnection capacity does indeed not reflect efficient arbitrage. The price differential for annual base load contracts, for delivery in 2002, in the Netherlands and Germany equalled some 9 Eur/MWh at the time of the auction.<sup>1</sup> The premium for annual interconnection capacity therefore amounted to an additional 9 Eur/MWh (= 18-9 Eur/MWh). In the previous year, in the annual auction for capacity for 2001, there was hardly any difference, with both year-ahead annual base load price differential and interconnection price at some 10-11 Eur/MWh.

One might however expect a small premium of interconnect capacity vs. base load price differential since the acquired capacity can remain unused when German prices are higher than Dutch. The value of the capacity is therefore greater than the average price difference over the year. (Interconnection capacity may effectively be considered an option on the hourly price difference between the Netherlands and Germany).

We may calculate the realised 'option value' for the year 2001 by comparing the average of hourly APX price minus hourly LPX price, or zero whenever LPX is higher (the ex post value), to the simple average of realised prices. The average APX and LPX prices differ by 9.5 Eur/MWh, while the ex post value of interconnection (the realised option value) was 11 Eur/MWh, a premium of 1.5 Eur/MWh. Based on 2001 data, the interconnector prices therefore seem higher than required by arbitrage.

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<sup>1</sup> Platt's Electricity Power Daily

## Green energy

Dutch government policy is to increase the contribution of renewable electricity in total electricity consumption, to comply with the Kyoto agreement. The policy goal for 2010 is a share of 9% of green electricity in total consumption<sup>2</sup>. For compliance with the agreement, the sources of green energy are allowed to be located outside the country, provided the energy is subsequently imported.

In order to reach this goal, use of green energy (solar, wind and biomass energy) is stimulated in two ways. One is a demand-side measure, exempting consumers of green electricity from the eco-tax. The other is a supply-side measure, subsidising producers of green electricity for each generated MWh.

Consumers of green electricity are exempted from paying the eco-tax (Regulerende Energie Belasting, REB) on the consumed green electricity.<sup>3</sup> This tax is collected and passed on by their supplier, and included in the energy bill. The eco-tax rate is 60.1 Eur/MWh for small customers (up to 10,000 kWh/yr), declining to 6.1 Eur/MWh for contract sizes between 50 MWh and 10 GWh, and zero for any amount above this (see table 1). This tax exemption allows suppliers to deliver green energy to consumers at a price comparable to, or below that of grey energy. To benefit from the exemption, the supply company needs i) a contract to supply green energy to a customer, and ii) a green certificate, demonstrating that the supplied energy was purchased from a green generator. Green certificates are issued by a subsidiary of system operator TenneT, Groencertificatenbeheer (GCB), based on purchased electricity generation from recognised green producers. Green certificates contain information regarding the source of the energy, and the amount of MWh involved. They are tradable, and are valid for one year after their issuance. This is to guarantee that green consumption and production are balanced on average for each year.

Table 1: eco-tax tariff schedule (2002)

Annual electricity consumption (MWh)	marginal REB tariff (Eur/MWh)
0-10	60.10
10-50	20.00
50-10,000	6.10
>10,000	0

Green certificates can also be issued for green electricity generated abroad, subject to the rule of 'reciprocity', in practice making eligible, currently, only green electricity produced in the UK, Germany, Austria, Norway, Sweden and Finland. Such green electricity production is measured by independent institutions, recognised by the Ministry of Economic Affairs, which send the data to GCB. Furthermore, the electricity has to be physically imported. This requirement effectively means that a company can apply for a green certificate if it can indicate that in a given month, an amount of green electricity has been purchased from a green generator, and that in the same month an equal amount of electricity has been imported

<sup>2</sup> Energierapport 2002

<sup>3</sup> article 36i of the WBM (environmental tax law)

by the company. No matching of moment of production and import within the month is required, nor does a contract path between producer and imports have to be demonstrated (i.e. in principle it is possible to purchase green electricity in the first half of the month in Finland, and to import the same amount of electricity from Belgium in the second half).

The second measure, apart from this tax exemption on the demand side, is a subsidy to generators of green energy of 20 Eur/MWh, for domestic as well as foreign production<sup>4</sup>. The subsidy is also valid for small scale (<15 MW) hydropower producers, unlike the consumer subsidy. This subsidy is not linked to consumer contracts for green energy. The requirements for imports are much stricter for this subsidy: generation and contract path including use of import capacity on all borders that are involved have to be demonstrated to the tax authorities (via E-programmes). This means that the moment of generation coincides with the moment of import into the Netherlands.

Annual consumption of green energy in 2000 in the Netherlands was estimated at around 3 to 4 TWh.<sup>5</sup> Due to large advertising campaigns, demand for green electricity in 2002 is growing rapidly, with a quote of 1,300,000 households having contracted green energy in October 2002, coming from 775,000 at the end of 2001, and 200,000 in January 2001.<sup>6</sup> At an estimated household consumption of 3.5 MWh per year, this would give an annual demand of 4.5 TWh.<sup>7</sup> Also business consumers contribute to green energy demand, and some of them are in fact the very large consumers (over 10 GWh/yr) whose marginal eco-tax rate is zero and who hence do not benefit from its rebate over large part of their consumption. Supply by domestic generators is estimated at 2 to 3 TWh/yr by both Elan and ECN<sup>8</sup>, which is in line with the current amount of green certificates issued for domestically produced green electricity.

### **Could green energy in principle explain the high import prices?**

In the absence of green subsidies, German-Dutch interconnection prices will, under perfect arbitrage, reflect the price difference for grey electricity between Germany and the Netherlands. Once green subsidies are added on the Dutch side, in effect a second market, the green market, is created. The value of green energy in the Netherlands is equal to the value of grey electricity plus the subsidy. In this case, there are two possibilities:

1. marginal imports are grey imports
2. marginal imports are green imports

In case 1, the marginal difference in costs<sup>9</sup> of green energy and its value in the Netherlands is lower than the marginal difference in prices for grey energy, and any increase in import capacity would hence be used for grey electricity. In this case, the interconnector price is

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<sup>4</sup> article 360 of the WBM

<sup>5</sup> ECN, Referentieraming energie en CO2 2001-2010; Energierapport 2002.

<sup>6</sup> Ecofys, at [www.greenprices.nl](http://www.greenprices.nl)

<sup>7</sup> At a total Dutch consumption of around 100 TWh per year,

<sup>8</sup> Elan: Dutch Wholesale Power Market Review; ECN: Referentieraming energie en CO2 2001-2010

<sup>9</sup> By costs we mean the opportunity costs for green energy, i.e. the highest price that one can receive by selling the power outside of the Netherlands, rather than the production costs. These may for instance be equal to marginal system prices in the country of production, or be determined by local minimum feed-in tariffs for renewable energy.

determined by the grey energy price differential, so the fact that green imports are subsidised does not influence the interconnection market. In case 2, on the other hand, it is, at the margin, more valuable to use import capacity for green electricity. In this case, the interconnector price is defined by the marginal value of green electricity in the Netherlands, minus the marginal costs of acquiring green power in Germany.

The introduction of the green subsidy policy may therefore explain the high interconnector prices if green imports constitute the marginal use of interconnection capacity.

### **Analysis of green imports**

The tax benefits for green energy (both the eco-tax reduction and the subsidy for producers, both domestic and foreign) seem to provide the financial incentive to buy green energy generated abroad, import it and sell it as green energy. This is especially the case for that part of green energy benefiting from the exemption from the highest (60 Eur/MWh) eco-tax rate, as well as the 20 Eur/MWh producer subsidy. Market parties suggested that even the 20 Eur/MWh production subsidy might be sufficient incentive to import energy from e.g. small scale hydro power producers. This would imply that market parties would be willing to pay the higher interconnection prices to import green energy, and still make a profit. This willingness to pay will, however, only affect prices if green imports fill up the entire interconnect capacity. In this case the equilibrium interconnect price would be related to the marginal level of subsidy. If at least some import capacity is used to import grey electricity, prices would not be affected by the requirement of physical imports.

#### *Do green imports fill up the entire capacity?*

Preliminary information on green certificates issued for imported green energy suggests that currently the import capacity is not fully used for green imports. As of October, green certificates for 5.8 TWh of imported energy were issued (generated almost exclusively from biomass and hydropower). Monthly green imports seem to have stabilised at the amount of approximately 1000 GWh, which corresponds to a base load capacity of approximately 1400 MW. This is to be compared to total German-Dutch import capacity around 1700 MW. A second indication that not yet all capacity is used for green imports comes from the prices of interconnector capacity in the daily auctions, which are still near zero in off-peak periods. The monthly auctions, however, have followed the price rise of the annual capacity prices since June, reaching prices of around 20 Eur/MWh in August and September, and increasing to 28 Eur/MWh for October and November (see graph). At the same time, monthly green imports have increased to more than the combined capacity offered by annual and monthly contracts.

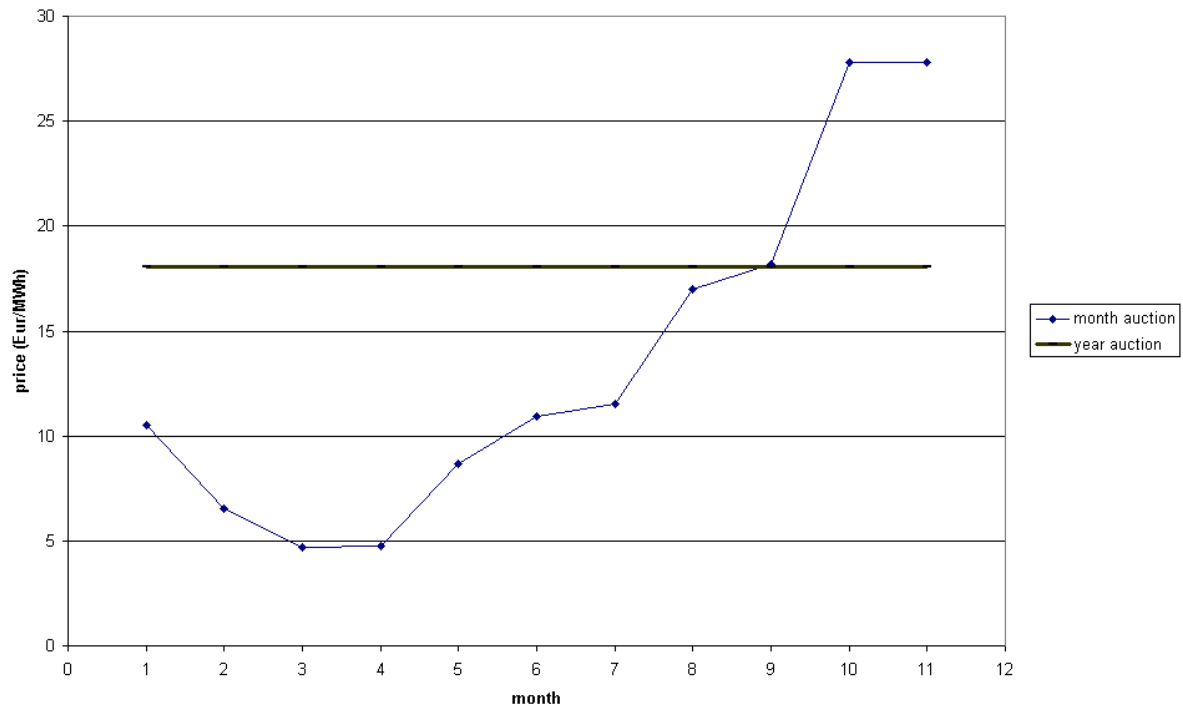


Figure 1: development of German-Dutch interconnection prices.

For prices to be explainable by green imports, it should therefore be argued that

1. Annual and monthly capacity is preferred over daily capacity for green imports
2. The marginal value of green imports is higher than that of grey imports

To analyse these questions, it is essential to make a distinction between the eco-tax exemption (article 36i), and the producer subsidy (36o).

#### *Analysis for the consumer subsidy, 36i*

Green certificates, that are necessary for the eco-tax exemption, remain valid for a year, so consumption does not need to be synchronous with the acquisition of a green certificate to qualify for tax benefits, i.e. only on average consumption and production have to match. Furthermore, for acquisition of a certificate it is only necessary that on average imports match production. It is therefore possible to use base load import capacity to obtain green certificates, or in case of less demand, only use cheaper off-peak capacity. Furthermore, since no contract path between production (in e.g. Finland) and consumption is required, also Belgian import capacity may in principle be used (but energy prices are typically higher in Belgium than in Germany). Total auctioned capacity on the German Dutch interconnector ranges approximately between 1500 and 2000 MW, of which 572 MW was auctioned in the form of annual capacity. Total capacity for importing green energy therefore amounts to over 15 TWh per year (5 TWh in annual contracts), or roughly 15% of total consumption, if capacity is used continuously.

Since consumer contracts determine the value deriving from the tax exemption, the marginal contribution to the value of green energy from this demand-side measure depends on the potential size of the green consumer market. The potential for green demand is significant.

Combined with the producer subsidy (20 Eur/MWh) the effect of the fiscal measures amounts to a subsidy of 80 Eur/MWh for green energy supplied to small consumers. For most sources of green electricity, this will easily exceed the cost difference with grey electricity, making it valuable for supply companies to stimulate small consumers to switch to green consumption, and to collect part of the resulting gains. The large advertising campaigns by supply companies, and the entry of new suppliers offering green electricity at discounts of up to 15% compared to grey electricity corroborate this analysis.

Total electricity demand by small customers exceeds 20 TWh per year, which in itself is more than total base load import capacity from Germany. To this should be added the demand from larger customers, for whom the tax benefits are however lower (see table above). Clearly, the market is large enough to potentially congest the interconnection links with Germany. At present however this is not the case, with only some 15% of all households having switched to green energy, representing some 4.5 TWh consumption on an annual basis, indicating that even if only annual capacity is used, the marginal effect from this measure alone on interconnection value is negligible.

An indication of the actual (marginal) value derived from the eco-tax exemption can be obtained by looking at prices that are paid for traded green certificates, table 2.

Table 2: prices for Dutch green certificates for Nordic biomass<sup>10</sup>

Month	Price (Eur/MWh)
Jan-02	25
Feb-02	24
Mar-02	22
Apr-02	20.5
May-02	15
Jun-02	12
Jul-02	10.75
Aug-02	10.75

Evidently, the marginal value contributed by the demand side measure (36i) has declined, presumably as (expected) supply significantly exceeds (expected) demand. Note, also, that prices for imported hydro energy certificates (half of all imports) are virtually zero, since hydropower does not benefit from the consumer subsidy.

To conclude, as to the demand side subsidy, 36i, there is no need for traders to focus purely on the (base load) month and year contracts, because since production and import need not be simultaneous, imports need not be continuous. It therefore seems that this part of the subsidy cannot in itself explain the green congestion. Furthermore green demand in the high tax segment is still low relative to interconnector capacity, and based on traded certificate prices, is not expected to rise significantly within the year. If the interconnector is indeed congested

<sup>10</sup> Source: broker information via market party

for other green reasons, the marginal value contributed by the consumer subsidy is at most around 10 Eur/MWh (and zero for imported hydropower).

#### *Analysis for the producer subsidy, 360*

The situation is different for the production subsidy, 360. Here, imports should be synchronous with production, and in fact the whole contract path from place of production into the Netherlands should be made clear via E-programmes. Furthermore, there is no limit on the amount of produced electricity that is subsidised.

Market parties have argued that relying on day-ahead import capacity is insecure, as contracts with producers and customers are usually base load, and tax authorities seem to require imports of all contracted power. This gives a preference for monthly or annual contracts, since this is more convenient, and gains from these transactions are large enough so that prices for this import capacity are not prohibitive.

Since the producer subsidy is not linked to green consumption, the subsidy has a value of 20 Eur/MWh independent of quantity (that is, if we exclude the consumer subsidy that may be obtained from the imported energy). Since the opportunity costs of hydro or biomass energy need not be significantly above the (German) market price of grey electricity<sup>11</sup>, the value of marginal green imports that derives from the 360 measure is of the order of 28-32 Euros (subsidy plus Dutch-German market spread).

It seems therefore that the producer subsidy alone is sufficient to cause congestion on the monthly and annual import capacity. Any additional marginal revenues on the green certificates (due to the consumer subsidy) may subsequently raise the congested capacity price. The fact that the last monthly auctions' results are comparable to the cross border price difference plus producer subsidy may be explained by the fact that this value is zero for hydropower. Probably these hydro-imports set the margin. This may change if future growth of small consumer green demand is large, making other forms of green energy more profitable. In that case interconnector prices are likely to increase even more.

It is therefore likely that the high annual, and monthly, auction prices are a reflection of the value of the producer subsidy on green imports. Indeed, the market parties that obtained this capacity do generally have a profile of being active in the green energy market, as distributors of green energy, or as owners of green energy resources abroad (see table 3).

Table 3: Distribution of annual import capacity Germany-Netherlands (**confidential**)

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<sup>11</sup> at least in the absence of high feed-in tariffs locally. In Germany high feed-in tariffs exist for small scale biomass plants (<20 MW) and hydro power plants of capacity smaller than 5 MW. For these installations the incentive would be different. In other eligible countries different rules apply.

### **Effects on the electricity market**

The high import prices have various effects on the Dutch electricity market as a whole. First of all it is however important to note that in principle, in a competitive market, the high import tariffs do not directly adversely affect prices for grey electricity. The higher import prices are the result of all capacity being used by green imports, and it is precisely the subsidies that allow importers to pay the higher price. Since on aggregate the volume of imported electricity is at least as high as in the absence of green policy, equilibrium prices in a *competitive* market will be lower.

Since the production subsidy has driven up the price for interconnection capacity, it follows that a large part of this subsidy is in fact extracted by the transmission system operators. If we compare German-Dutch monthly base load price differences for November 2002 (12.90 Eur/MWh<sup>12</sup>) to the price paid for interconnection capacity for that month (27.74 Eur/MWh), we find a (green) premium of almost 15 Eur/MWh. Roughly three quarters of production subsidy therefore ends up with the Dutch grid operator TenneT (who is obliged to use this income for investment in capacity) and the German grid operators RWE-Netz and EOn-Netz, rather than in the hands of green producers. If this policy persists, and premiums paid stay equal, this would add up to an annual amount of roughly 130 million Euros over 2003 (based on the annual plus monthly German-Dutch capacity).

A second effect of the artificial congestion is in price levels and competition in the grey market. As noted above, in purely competitive markets grey prices will generally diminish as more imported supply is fed into the market. In electricity markets that are relatively concentrated, however, the loss of elasticity of import levels may lead to an increase in prices. This may happen in particular in periods where, in the absence of green subsidy-induced congestion, import capacity would only be partly utilised (and its price should then fall to zero). In such periods strategic players could have the incentive to keep prices lower to prevent a flooding of the market with imports displacing their own production, and hence reducing their profits. In such cases an increase in demand for import capacity to import green electricity could congest the interconnector, at which point domestic producers have no longer an incentive to shade their prices to deter imports, but rather to raise them once the supply of imports becomes inelastic when the interconnector is congested.

### **Changes in policy**

The new Dutch cabinet that was formed in summer 2002 has announced policy reforms related to the subsidies on green energy. In order to curb subsidy flows abroad to foreign producers, the cabinet proposes to eliminate the producer subsidy. Furthermore, the eco-tax reduction was proposed to be reduced, to some 30 Eur/MWh for the highest tax segment. In the place of the producer subsidy, a new subsidy for producers is to be introduced, which will be restricted to domestic production, and to production units under a maximum age. This subsidy will furthermore be different for the various forms of green energy.

In view of the analysis above, the elimination of the producer subsidy for foreign green power will likely remove the reason for interconnector capacity congestion. Foreign energy



will remain eligible for eco-tax reduction, however, as we discussed, this measure alone should not cause congestion due to the absence of the matching requirement, unless consumer demand continues to grow at the current pace and the majority of small consumers switch to green energy (it is not inconceivable that this might happen).

With the fall of the cabinet in October 2002 the implementation of these measures is, however, still uncertain.

### **Conclusion**

Green policy in the Netherlands affected imports in 2002 through two measures. The first is the exemption from eco-tax for green power consumed by customers that have contracted green energy. The second is the subsidy of 20 Eur/MWh to foreign green production including small scale hydropower. The eco-tax measure in isolation is unlikely to explain the high prices for monthly and yearly import capacity, since the customer base is currently not large enough to congest the interconnector. Furthermore, since only on average monthly imports have to equal monthly foreign purchases of green electricity, there is no reason why importing firms would prefer to use monthly or yearly base load import capacity for green imports, rather than lower priced off-peak capacity.

The second measure is not limited by size of demand. Furthermore, secure base load capacity is preferable in this case since the time of import has to be matched with the time of production. Since aggregate green imports since July amount to more or less the sum of annual and monthly import capacity, the value of production subsidy could therefore be related to the prices paid for this capacity. Given the congestion caused by the producer subsidy, any additional marginal value generated from the eco-tax measure will contribute to capacity prices. Currently this contribution seems to be small, but potentially this may grow if policy remains unchanged.

The result of this congestion is that prices for interconnection capacity have increased, leading to an extraction of a large part of the production subsidies by transmission system owners in the Netherlands and Germany. Based on current price levels, the annualised rent for these parties may well exceed 100 million Euros, half of which accrues to foreign transmission owners.

A second effect of green congestion relates to levels of prices for grey electricity in the Netherlands. We argued that the congestion induced by green policy can affect equilibrium wholesale prices. While the general tendency would be for the subsidy to reduce Dutch electricity prices, we cannot rule out the possibility that, in certain circumstances, prices may in fact rise.

The proposed policy changes, to remove the subsidy for foreign production and reduce the eco-tax rebate, are likely to remove the green congestion, at least until the demand for green electricity rises to the capacity of the interconnectors.

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<sup>12</sup> Platt's Electricity Power Daily