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Green certificates and carbon trading in the Netherlands

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Abstract

The combination of trading schemes for green certificates and for carbon, as they are implemented and planned in the Netherlands, imply a complete separation of green certificates and CO_2 markets. This means that the costs of CO_2 reduction will be reflected in the spot price of electricity and that the price of green certificates only reflects the additional cost of RE development. However, since the green certificate scheme is already implemented, while the carbon trading scheme is not, it is unclear if currently the green certificate value includes the CO_2 reduction value of RE production. It is important that buyers and sellers in the market for green certificates agree on what they are trading, therefore this issue should be clarified.

1. Introduction

Market-based instruments in environmental policy and especially tradable emissions gain ground in the Netherlands. The Dutch reached agreement on the introduction of NO_x emissions trading (in 2003) in the industrial sectors. As from 1 July 2001, the market for electricity produced with renewable sources (RE) is facilitated by the possibility of trade in green certificates. Moreover, the possibilities of carbon emissions trading are being investigated. However, the various concepts for trade in externalities related to the environmental problems stand on their own. The possible mutual effects are largely being ignored or not recognised. For example, it is clear that a growing share of RE is also advantageous for meeting the CO_2 reduction target. In the current situation of a combination of targets for RE and CO_2 reduction and instruments of green certificates and CO_2 emissions trading, this might cause some problems.

A system of green certificates has been implemented in the Netherlands, however, there is no CO_2 emissions trading scheme as yet, although the latter is likely to play a role in the future. In the current situation it is unclear if the CO_2 reduction related to RE production, is accounted for in the green certificates issued. For the price making of green certificates on the market it is however of great importance, since it should be clear what you are buying and selling. When the electricity supplier buys a green certificate from the producer at a low price, suggesting that the CO_2 credit is not involved, and subsequently sells green electricity to the consumer at a high price, using CO_2 reduction as a marketing motif, the consumer is deceived and the supplier profits, while the producer is not properly rewarded.

In order to establish a transparent market in green certificates, it is important to know what is exactly traded. Are you also buying the implicit CO_2 reduction with the green certificate? How can you be sure you are not paying for CO_2 reduction already established and paid for? How can we prevent that the CO_2 reduction realised is twice accounted for meeting the target? This paper tries to clarify some of the issues at stake, without pretending to offer ready-made solutions. The Dutch situation with respect to green certificates and CO_2 emissions trading is the starting point of the discussion. The green certificate and proposed CO_2 trading schemes are therefore separately described in more detail below.

2. Climate change policy and trade

Under the Burden Sharing Agreement the Netherlands has a target of reducing its greenhouse gas emissions by 6% relative to 1990 levels. This is equivalent to a reduction of circa 13 Mt CO_2 equivalents. Under a 'business as usual' scenario, assuming no change in policies, greenhouse gas emissions will

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increase by 37 Mt by 2010. The total policy challenge thus amounts to 50 Mt. Half of this reduction is to be achieved through the use of domestic measures. The other 25 Mt can be achieved with foreign emissions reductions through the Kyoto Mechanisms.

The current climate policy development in the Netherlands is described in two documents: the Climate Policy Implementation Plan, part I (Ministry of VROM, 1999) and part II (Ministry of VROM, 2000). Part I deals with the 25 Mt to be reached with domestic measures, while part II focuses on the role of the Kyoto Mechanisms. Both documents consider the role of a national emissions trading scheme as a means of achieving emissions reduction targets. Part I considers it as a long-term option of innovation of domestic policy instruments in the field of climate change, and part II briefly considers the need for compatibility with the Kyoto Mechanisms and EU initiatives to develop an EU emissions trading scheme. Any potential use of emissions trading as a policy instrument—also in the case of international trading—would not alter the principle that 50% of emissions reductions should be realised domestically.

2.1. Domestic measures

Part I of the Climate Policy Implementation Plan (known as UK I) groups the available climate policy options into three policy packages. The basic package contains all readily available cost-effective options for which implementation is feasible in the short run, and which together will be sufficient to achieve a domestic CO_2 emission reduction of 25 Mt. Table 1 gives a summary of measures to be taken in the basic package.

Table 1
Emission reduction measures in basic package of UK I

	CO_2 reduction in 2010 (Mt)
CO_2 in transport sector	2.2–2.9
Other CO_2 measures	15.7
Measures in coal fired power production	6
Renewable energy	2
Energy savings and other measures	7.7
Other GHG (non-CO_2)	8.2

From Table 1 it becomes clear that further RE development is seen as part of the domestic measures for CO_2 emission reduction. However, this RE does not necessarily have to be generated in the Netherlands. Imported RE result in lower domestic CO_2 emissions because conventionally generated electricity is replaced by RE. Fig. 1 shows the costs of the different emission reduction options in the basic package of measures and illustrates that renewable energy is the most expensive reduction option. The expected costs of RE development are 82 euro/t CO_2 (Ministry of VROM, 1999).

In addition, a reserve package has been composed as a sort of assurance policy, should the basic package not be enough to meet the Burden Sharing commitment. The reserve package consists of tax increases, CO_2 storage and NO_2 reduction in the chemical industry. Finally, with a view to the future after the first Kyoto commitment period, an innovation package was formed to achieve further greenhouse gas emission reductions in the long run. Both technological innovations and innovations in policy instruments are considered. Tradable carbon emissions are part of these innovative policy instruments.

2.2. Carbon emissions trading

2.2.1. Domestic emissions trading

The Commission Vogtländer (named after its chairman) is currently investigating the possibilities and options for a domestic carbon emissions trading scheme in the Netherlands. Its preliminary findings are presented here, but they are still subject to consultation (see KPMG, 2001).

A distinction is made between sheltered and exposed sectors. Exposed sectors are energy intensive industries

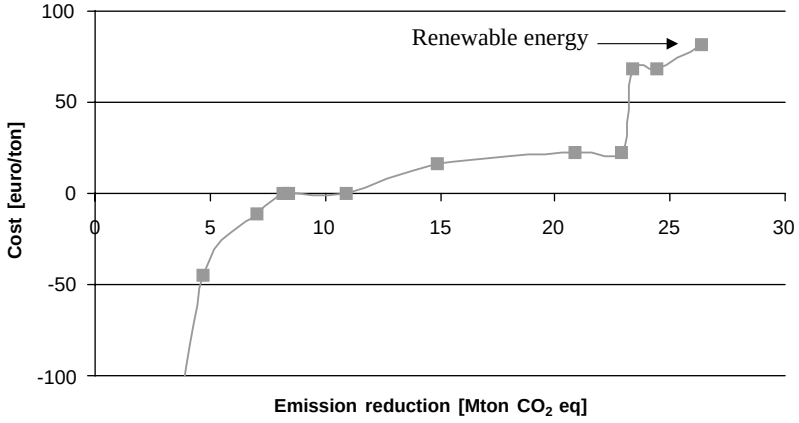

Fig. 1. CO_2 emission reduction options and costs in the Netherlands (source: Ministry of VROM, 1999).

(energy intensity of more than 5% in terms of costs) that are subject to (heavy) international competition (export ratio of more than 15% in terms of production value). Sheltered sectors are those industries that have a relatively lower energy intensity and that are less exposed to international competition.

Under the current proposal the sheltered sectors, including households, would be brought under a cap and trade scheme. The point of departure is that the international competitiveness of domestic electricity generators should not deteriorate as a consequence of emissions trading. The proposed system therefore allocates the emissions from electricity generation to the end consumers in the sheltered sectors through intermediaries such as electricity supply companies. The electricity supply companies would then be responsible for holding sufficient allowances to cover the emissions associated with their customer's demand and pass on the cost of these allowances to the end users in the sheltered sectors. The electricity suppliers can purchase emission allowances from the government at an annual auction. Since this is a generic measure (like a generic tax), the sheltered sectors may incorporate the extra cost into their prices to end consumers. Fig. 2 gives an overview of this cap and trade scheme.

Thus, CO_2 emissions due to generating electricity are imputed to the end user in the sheltered sector. For the delivery of electricity to the exposed sector, no permits are needed. Because of practical problems of introducing a CO_2 labelling system in the short run, the Committee proposes to impute a uniform, fixed amount of CO_2 emissions per kWh for all electricity produced and imported in the Netherlands. The only exception is renewable electricity. If a supplier can hand over a certificate to prove that the electricity has indeed been generated as such, no CO_2 emissions per kWh will be imputed, implying that renewable electricity will become more attractive for both electricity suppliers and end users.

Most of the exposed sectors—i.e. the electricity production sector and industry—are subject to the Covenant Benchmarking Energy Efficiency or an industrial multi-annual agreement on energy efficiency. Based on these voluntary agreements, performance standard rates (PSR) will be determined in terms of

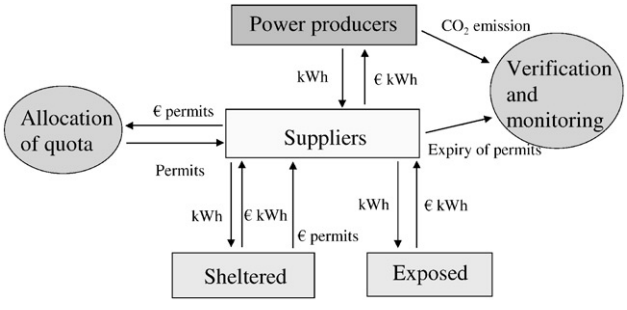

Fig. 2. Attribution of CO_2 emissions to electricity use.

CO_2 emission per unit of energy input (kg CO_2/GJ) or per unit of output, and will decline over time. Thus, the PSR is given for the exposed sectors, and the allowance of the sector is calculated as the product of its annual energy use (or production volume) and the PSR. Emission permits will be generated when the firm emits less than its allowance. These permits are freely tradable, i.e. they can be sold to firms in both the exposed and the sheltered sectors. A shortage of permits can be levelled out by purchasing permits, again both from firms in the exposed or the sheltered sectors.

2.2.2. International emissions trading and Kyoto mechanisms

The average costs of 25 Mt emission reduction options to be realised within the Netherlands are estimated to be circa 18 euro/t CO_2 (Van der Linden et al., 2000). Reduction options abroad are generally a lot cheaper and estimated at 4–14 euro/t CO_2 (Van der Linden et al., 2000). Therefore, it is profitable for the Dutch to realise emission reductions in other countries. Calculations related to international CO_2 emissions trade show that the Netherlands would be a substantial buyer of emission permits (see for example the PRIMES study for the EU, Capros and Mantzos, 2000). A European system for emissions trading is therefore preferred by the Dutch. Proposals for such a harmonised system are being prepared (European Commission, 2000, 2001a). However, it will probably take years before actual emissions trade will take place within this framework.

Besides harmonised international trade in emissions and/or a national emissions trading scheme, where firms and sectors are the main actors, there is a third form of emissions trading: trade between national governments based on projects (Joint Implementation and Clean Development Mechanism). The Dutch government has energetically induced projects to test such schemes within the activities implemented jointly (AIJ). The EruPT tender is an appealing example within the framework of bilateral co-operation for JI with Central and East European countries. In the first EruPT tender, projects related to renewable energy were also rewarded, see Table 2. For each of the projects the amount of Emission Reduction Units (ERUs), i.e. the number of tonnes of CO_2 possessed by the Netherlands, and the price to be paid for these, were determined.

3. Renewable electricity policy and trade

3.1. Targets

Recently, the Dutch agreed, in the European framework, to a renewable electricity target of 9% of total electricity consumption in 2010 (European Commission,

Table 2
Awarded EruPT projects related to renewable energy

	Project	# ERUs (t CO_2 equiv.)	Price (€/ERU)
BTG Biomass Technoligy Group	A biomass energy portfolio (Czech Republic)	522,320	9.00
United Power Co.	Surduc-Nehoiasu Hydro Power Plant (Romania)	612,631	5.00
Nuon International Projects	Skrobotowo Windpark (Poland)	583,500	9.00

Table 3
Indicative targets for RE in 2010 (% of electricity consumption)

	1997	2010
Austria	70.0	78.1
Belgium	1.1	6.0
Denmark	8.7	29.0
Finland	24.7	31.5
France	15.0	21.0
Germany	4.5	12.5
Greece	8.6	20.1
Ireland	3.6	13.2
Italy	16.0	25.0
Luxembourg	2.1	5.7
Netherlands	3.5	9.0
Portugal	38.5	39.0
Spain	19.9	29.4
Sweden	49.1	60.0
UK	1.7	10.0
EU-15	13.9	22.0

Table 4
Regulating energy tax REB per user category (€ct/m^3 or €ct/kWh)

	1998	1999	2000	2001
Natural gas (m^3)				
0–800	0	0	0	12.03
800–5000	4.32	7.25	9.45	12.03
5000–170,000	4.32	4.74	5.19	5.62
170,000–1 mln	0	0.32	0.70	1.04
> 1 mln	0	0	0	0
Electricity (kWh)				
0–800	0	0	0	5.83
800–10,000	1.34	2.25	3.72	5.83
10,000–50,000	1.34	1.47	1.61	1.94
50,000–10 mln	0	0.10	0.22	0.59
> 10 mln	0	0	0	0

2001b; see Table 3). This is a bit higher than the national target. Within the context of the implementation of the Kyoto protocol in the Netherlands (see Ministry of VROM, 1999), it was announced that renewable energy should account for 5% of total energy consumption in 2010. This is estimated to be the equivalent of 8.5% of electricity consumption. The target for the longer term is 10% renewable energy in 2020 (ca. 17% electricity), and dates already from 1995.

3.2. REB

At the basis of RE support policy in the Netherlands is the Regulating Energy Tax (REB or ecotax). Domestic consumers pay REB on their electricity and natural gas consumption. Table 4 shows that the REB has increased substantially over the last years. As from 2001, the REB also applies to the first 800 m^3 or kWh used. For the years after 2001 no further increases (except from indexing) are expected. The main goal of this tax is to stimulate energy conservation.

Energy supply companies collect the tax through the energy bill and, in turn, transfer it to the treasury. An exception is made for electricity generated with RE, i.e. customers buying renewable electricity do not pay REB (REB nil tariff). This increases the profitability of renewables in comparison with conventional electricity; for households the advantage is 5.83 €ct/kWh. The REB also supports the production of RE because producers of renewable energy receive part of the proceeds of the REB (REB subsidy). Energy supply companies may pay 1.94 €ct/kWh in 2001 to producers of RE. This brings total support for RE to 7.77 €ct/kWh, i.e. when production costs for RE are up to 7.77 €ct/kWh higher than for conventional electricity, green electricity is competitive.

3.3. Green Labels

By the end of 2000 at least 3.2% of the electricity distributed should have come from RE. This equals about 1700 million kWh. In order to reach this target, energy companies had the opportunity to raise a so-called 'MAP levy' (which, on average, was 1.8% of the energy bill) on conventional energy sold to their customers. The revenues from this MAP levy have been used for renewable energy and energy saving projects. The renewable energy target of 3.2% was divided among the energy companies. To give all energy companies the possibility to reach their targets (also those companies that operate in less windy regions), a system of Green Labels was introduced, following the Environmental Action Plan 2000 (MAP, 2000), published in 1997 by the Dutch energy utilities. In January 1998, the Dutch energy supplying companies, united in EnergieNed, have voluntarily introduced the Green Label system to establish a market for renewable electricity. The aim of the Green Label system was 1.7 billion kWh electricity

produced by renewable energy sources in 2000. Each company was allotted a minimum target (quota) for electricity from RE, based on past (1995) sales volumes. In order to meet its quota, a supplier had to hand over Green Labels. These Green Labels were created by producers of renewable electricity, who received one Green Label for every 10,000 kWh electricity produced from RE.

For the physical supply of electricity (both from conventional and RE) in the Netherlands, producers received payments based on the costs of conventionally produced electricity (about 3.6 €ct/kWh). Production costs of renewable electricity are usually higher. Up till the introduction of Green Labels fiscal rebates and premium feed-in tariffs made up the difference. Subsidies were based on the exploitation costs of the project and funded by a small levy on the electricity price (the MAP-levy). The Green Label system replaced the existing subsidy that producers of electricity from RE received from suppliers. The costs for the Green Labels were paid from the same sources as the costs for the former feed-in tariffs: either by the MAP-levy or by the selling of green electricity. Note also that a higher REB implied a lower price for Green Labels.

The Green Label system has only been evaluated internally, i.e. within the group of participating firms. Average Label prices and the volume of trade in Labels are not public. However, the system was reasonably successful because it increased RE production (by the participating companies) from less than 800 GWh in 1997 to 1558 GWh in 2000, although the target of 1700 GWh was not reached. Six of the companies managed to meet their target, whereas the other 5 failed. Compensating payments have been made to settle the deficit of those latter companies (Personal communication with KEMA, 2001).

The Green Label system ceased to exist, together with the MAP, at the end of 2000. In the Electricity Law of 1998 and the proposed Gas Act of 2000, the possibility for the government to implement a system of green certificates is incorporated. In the Energy Report, published in 1999, the Minister of Economic Affairs elaborates on how to implement such a green certificate system (Ministry of Economic Affairs, 1999). In a letter to parliament on 8 March 2001, details on the liberalisation of the green electricity market and the introduction of a green certificate system where announced by the Minister. The decree on green certificates (Ministry of Economic Affairs, 2001a) of 7 May denotes the official legislation of the system.

It would in principle have been possible to transform the former Green Label system of the energy sector into a governmental certificate system. However, there are some difficulties and differences. First, the Minister has no intention to set a mandatory target or obligation for a minimum share of renewables in energy consumption. The idea is that voluntary demand will be large enough to ensure a market for green certificates. Second, EnergieNed stopped with the Green Label system because the Labels were not recognised by the Dutch fiscal administration (Treasury) as prove for renewable energy supply. Only the REB proved that renewable energy was supplied. If Green Labels would have been recognised, the system could easily have been transformed and used as the new green certificate system. Finally, the Green Label system was criticised by independent producers of green energy, who think that they were discriminated by the system.

4. Green certificates

As from 1 July 2001, the Dutch market for renewable electricity is liberalised and a system of green certificates introduced. It means that the green electricity consumer is free to choose his supplier, whereas the 'grey' consumer is still bound to his local supply company (until 2004). Green certificates are introduced to facilitate the opening up of this green electricity market. The idea is that trade in certificates will stimulate production of renewable electricity. Moreover, the certificates serve as proof that the amount of RE sold equals the amount of RE produced.

Imported RE is in principle also eligible for Dutch green certificates, conditional on issues like non-subsidised and credible RE production. However, since it is difficult to verify that RE produced in other countries is credible (i.e. really produced with RE, not benefited from other subsidies, additional to current production, etc.), until the end of 2001, green certificates are only issued to domestically produced RE. In September 2001, the Ministry of Economic Affairs announced that, as from 1 January 2002, imported RE is will also receive green certificates when certain conditions are fulfilled (Ministry of Economic Affairs, 2001b). These conditions are:

- Imported RE will only be awarded with green certificates when the market for RE is completely liberalised in the home country (reciprocity). At the moment, this effectively holds for Germany, Sweden, Norway, Finland and the UK.
- There should be reliable proof that the imported electricity is indeed generated with credible RE. The 'guarantee of origin' from the new EU directive on renewable electricity, as well as the RECS (Renewable Energy Certificate Systems) certificates, will qualify for this.
- For the import of RE, import capacity should be reserved and used. It effectively means that the green certificate for imported RE will be linked to the physical electricity flow.

- A possible additional condition might become effective (no decision made yet) in order to prevent that the imported RE will be sold twice or is already subsidised in the home country.
- Another important adaptation to the former rules is that hydropower is no longer eligible in the green certificate system. Since large amounts of RE from hydro are available in Europe, the danger might have been that it would be imported into the Netherlands on a large scale. Of course domestic hydropower will not receive green certificates either, however, it is hardly an important Dutch RE source.

Green certificates are issued to producers of RE for the amount of green electricity measured and fed into the electricity grid. Certificates can be sold to electricity supply companies. The supply companies have an incentive to buy certificates because they need the certificates, in combination with green electricity contracts with the end consumer, in order to make the nil tariff of the REB applicable. Based on a supply contract between the producer and the supply company, the latter passes through a part of the REB receipts to the producer (REB subsidy in Fig. 3). The supply company has to transfer the remaining REB receipts to the Treasury ($\sum$REB$-\sum$subs). When the supply company can proof, by showing green certificates in combination with a green supply contract, that the RE is actually sold to the consumer, he can also subtract the REB nil tariff from this payment to the Treasury (denoted as a separate flow in Fig. 3).

Fig. 3 shows how the Dutch RE support system works. The dashed arrows denote the green product (green certificate or GC), while the solid arrows represent monetary flows related to this green product. The grey arrows denote a (green) contract for RE delivery.

The transmission system operator TenneT is the appointed organisation in charge of implementing a Green Certificates Body (GCB). The GCB maintains a record of the generation of, and trade in, electricity produced from RE. It means that the GCB issues green certificates to the RE producer when he applies for it (see also www.groencertificatenbeheer.nl/).

Subject to certain conditions, the owners of plants where renewable electricity is generated may register with GCB as a generator, as well as registering their plant with the regional electricity grid administrator to which the plant is (to be) connected. The grid administrator in question checks the plant and the connection and provides for a measuring installation for the uniform registration of the quantity of electricity fed into the electricity grid. The plant's owner receives a 'Green Declaration' in exchange, following which it registers with the GCB. The latter opens an account in which the deliveries of electricity are posted.

The GCB generates an electronic certificate per MWh supplied, which is coded on the basis of the plant's connection number, thus providing for the subsequent traceability of the electricity. There are four green certificates denominations, 1, 10, 100 and 1000 MWh. The certificate is credited to the account number of the trader having been designated by the generating company. The GCB's system exclusively caters for certificate transfers (i.e. not for financial transactions). The certificate is available in electronic format only. Generating companies and traders/suppliers of green electricity may register with the GCB as traders; a 'current account' for the certificates will then be opened for them. The GCB records the ownership of the certificates and their transfer to another registered party. The parties can access their own account using a secured login connection, so as to request information and complete transactions. Any trader that supplies green electricity to an end user instantly becomes a

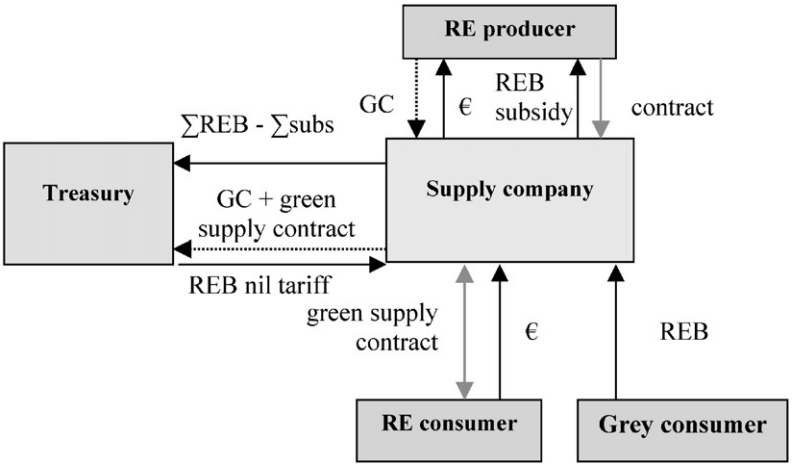

Fig. 3. Schematic overview RE support in the Netherlands.

supplier. It should report the green certificates registered in its name to the Treasury. When a matching quantity of power has effectively been supplied, the Treasury may decide to apply the REB nil tariff to green electricity. When the GCB transfers a certificate to the Treasury's account, the certificate is cancelled. All other certificates are automatically cancelled on expiry of a 1-year period of the date of issue. This ensures the reconciliation of the quantities of renewable electricity having been generated and used up on an annual basis.

The hallmark of the green certificate scheme is that the supply of electricity generated with RE and the generation of certificates are segregated at the post-generation stage. In principle it is possible for a trader to hold certificates without actually supplying any electricity. However, the significance of a certificate in terms of REB exemption depends on electricity having actually been supplied to consumers.

Up till the end of August 2001, e.g. after two months of operation, in total 868 green electricity producers and traders have applied for a green certificates account, 565 of those have already been certified as green. In total 1177 MWh of RE production has been awarded with green certificates. GCB have not yet published trade or prices for green certificates, however it is their intention to publish this type of market information on their website (TenneT, 2001).

5. Discussion

In the currently implemented Dutch green certificate scheme, there is no reference made to potential carbon. Moreover, there is no reference made to green certificates in the awarded EruPT projects and in the proposals for emissions trading. Therefore, we may conclude that green certificates and CO_2 credits or permits are regarded as completely separated issues, i.e. that both instruments serve their specific targets and that the carbon credit is not included in the green certificate. In a sense, this is quite convenient since problems related to determining the carbon content of a certificate are then avoided.

However, the proposed criteria for import of green certificates effective as of 2002 may give further indications of the CO_2 status of green certificates. First, the foreign RE can only be issued with Dutch green certificates if it has not been subsidised before. Since one may argue that the RE projects awarded in the EruPT tender are already subsidised (by the Dutch government), it is reasonable to conclude that the RE produced by these projects and imported to the Netherlands will not receive green certificates (this is however a hypothetical example because electricity from EruPT projects does not fulfil the reciprocity condition for import of RE). This conclusion would definitely hold if the green certificates represent also the CO_2 credit of RE production. However, if the green certificate only intends to represent the other advantages of RE (the non-CO_2 values), the imported electricity could be eligible for green certificates. After all, the EruPT subsidy then only concerns the pure CO_2-equivalents. Second, the Minister also indicated that for the issuing of green certificates to foreign RE, reservation of import capacity is necessary. This suggests that green certificates will only be issued for RE production abroad when its equivalent of physical electricity is also imported. As long as this is indeed the case there is not a real problem with the carbon balance of the country, since the imported RE substitutes domestic consumption and contributes to the CO_2 reduction in the Netherlands. It means that this reduction is linked to the physical electricity flow and not to the certificate, i.e. the green certificate does not include the carbon credit.

When taking the Dutch trading schemes for green certificates and for carbon as described in this paper into consideration, the conclusion is that, for the delivery of RE to consumers, the energy supply company needs no CO_2 permits. Consequently, the systems imply a complete separation of green certificates and CO_2 markets. This means that the costs of CO_2 reduction will be reflected in the spot price of electricity and that the price of green certificates only reflects the additional cost of RE development (Morthorst, 2001).

However, we are now in a transition period where the green certificate scheme is already implemented in the Netherlands, while the carbon trading scheme is not (and will not be until at least a couple of years). In this transition period the certificate value might include the CO_2 reduction value. Although the buyer of the certificate, e.g. the electricity supply company, cannot use the CO_2 credit of a green certificate since there is no obligation or permit system for CO_2 as yet, he has the opportunity to 'sell' the CO_2 credit to the RE consumer. In that case, the RE consumer pays more than is actually necessary. It is important that stakeholders in the market for green certificates agree on what they are trading. Therefore, it would suit the Dutch energy sector and the government to explicitly clarify this issue.

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