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Costs and risks of the import of RES statistics by the Dutch government

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Summary

This paper presents a first estimate of the costs and risks of a potential import of renewable energy statistics by the Dutch Government in order to meet the binding renewable energy (RE) target of 14% by 2020. Recently the new government has announced that it will increase the ambition from 14% to 16%. Progress so-far has been slow however and meeting these targets requires near to maximum realisable deployment rates of all relevant technologies. It points at the necessity to increase national policy measures (spatial, political, financial, etc.) for all renewable energy technologies or alternatively, to apply the cooperation mechanisms and/or import RES statistics from other countries.

It is generally assumed that imported RE statistics, through the cooperation mechanisms of the European RES Directive, will have lower costs than supporting the potentially more expensive domestic technologies that would be needed to meet the targets fully by domestic production. This paper shows that this assumption is questionable, and that the risks of pursuing an import-strategy may be significant.

The analysis shows that the use of statistical transfers, which in principle may be a viable option for realising part of the Dutch RE target, is linked to high uncertainties. Important aspects contributing to these uncertainties are:

- The effectiveness and efficiency of policies in the European Member States to meet domestic RE targets by and up to 2020, and hence the related surplus/shortfall of RE production and resulting market prices for statistical transfers.
- The price setting mechanisms that will be established between Member States, including the anticipated cost of infringement in case of non-fulfilment of the 2020 targets. Imports will likely be charged against the market prices for (statistical) transfers, not against the cost prices of RE technologies. The price of statistical transfers can be expected to be higher in the case of a clear "buyer market" in which many Member States will be willing to pay for statistical transfer.
- Political, economic and legal considerations.

Based on an assessment of available literature, the expected price of statistical transfers might be in the broad range of **50-100 €/MWh (excluding electricity price) over the average economic lifetime of 15 years**, which can be roughly compared to the cost levels for producing electricity by onshore wind energy (lower end) to offshore wind energy (higher end) in the Netherlands.

Without early negotiations with potential exporters, there is a significant risk that imports will not be available at lower cost than domestic RE production. An additional risk is that exporters may not be able to deliver the RE as forecasted. Finally, public acceptance of statistical imports may be lower than of domestic RE production, due to the missed domestic co-benefits.

These arguments do not speak against the use of statistical transfers or cooperation mechanisms in general, but they show that the use of the mechanisms is linked to a certain level of uncertainty and complexity. These challenges have to be weighed against the costs and benefits of increased domestic production in the Netherlands (e.g. grid enforcement, employment effects, etc.).

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1 Introduction

In June 2009, the EU directive on the promotion of renewable energy sources (RES) entered into effect. The directive 2009/28/EC sets binding national RES targets for all Member States and provides for three cooperation mechanisms that will allow Member States to achieve their national RES target in cooperation with other countries:

- statistical transfers between Member States,
- joint projects (with Member States or third countries), and
- joint support schemes.

So far, Member States have made very little use of the cooperation mechanisms. Only Norway and Sweden have implemented a joint support scheme (as of 1 January 2012). However, the two States have done so from a background with similar potentials for renewables and similar national energy mixes, that is, they benefitted from favourable background conditions. Furthermore negotiations on implementing a joint quota scheme had been on-going for more than 5 years already.

In its Communication *COM 2012 (271) final* on *Renewable Energy: a major player in the European energy market* the European Commission calls for an increased use of the Cooperation Mechanisms and seeks to address several barriers for their implementation. It announces for the first half of 2013 guidance for the implementation of the Cooperation Mechanisms.

Moreover, since the Dutch 2020 target for renewable energy (RE) cannot be realised by domestic production alone with the current support policy framework, the Dutch government currently explores the use of these cooperation mechanisms. The assumption is that the costs of using these options will be lower than support for domestic production.

The Netherlands have a binding target of 14% RES in gross final energy consumption until 2020. With a moderate growth of RES-share of 2.3% in 2005 to 4.3% in 2011, the Netherlands is lagging behind other Member States. A recent PBL/ECN report shows that the 14% target will not be met by a distance of 3% on the basis of current and planned policies[1].

The new government has the ambition to further raise the share of renewable energy from 14% to 16%. The government agreement provides a rough outline of a set of policies for the next four years to reach this target and to overcome the 5% gap that now exists. The exact policy details need yet to become clear.

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[1] PBL/ECN Referentieraming energie en emissies: actualisatie 2012. Den Haag 2012.
http://www.pbl.nl/sites/default/files/cms/publicaties/PBL_2012_Referentieraming-energie-en-emissies-2012_500278001.pdf

In the next chapter we present a first projection of renewable energy deployment in order to meet the 14% - 16% target. Our analysis shows that in order to meet the 16% target, all renewable energy sources would need to grow at near to maximum deployment rates, with a need for offshore wind up to 6000 MW, from the currently installed capacity of 228 MW. Meeting the binding 14% target still requires highly ambitious deployment rates and correspondingly high support and efforts to overcome prevailing barriers. It points at the necessity to increase national policy measures (spatial, political, financial, etc.) for all renewable energy (and energy efficiency) technologies or alternatively, to apply the cooperation mechanisms and import RES statistics from other countries.

In this report we analyse this situation and explore the costs and risks of the import of renewable energy statistics by the Netherlands.

2 Renewable energy deployment projections

The new government has the ambition to raise the share of renewable energy from the in EU-context agreed 14% - to 16% (final energy consumption). However, with a moderate growth of RES-share of 2.3% in 2005 to 4.3% in 2011, the Netherlands is progressing slowly. This is illustrated in the left bar of the graph below that shows the final consumption of renewable energy and its origins in 2011 (92 PJ in total).

A recent PBL/ECN report shows that the 14% target will not be met by a distance of 4% on the basis of current and planned policies[2] - the middle bar in Figure 1. This leads to a renewable energy production of 237 PJ and a share of 11% in total final energy consumption[3].

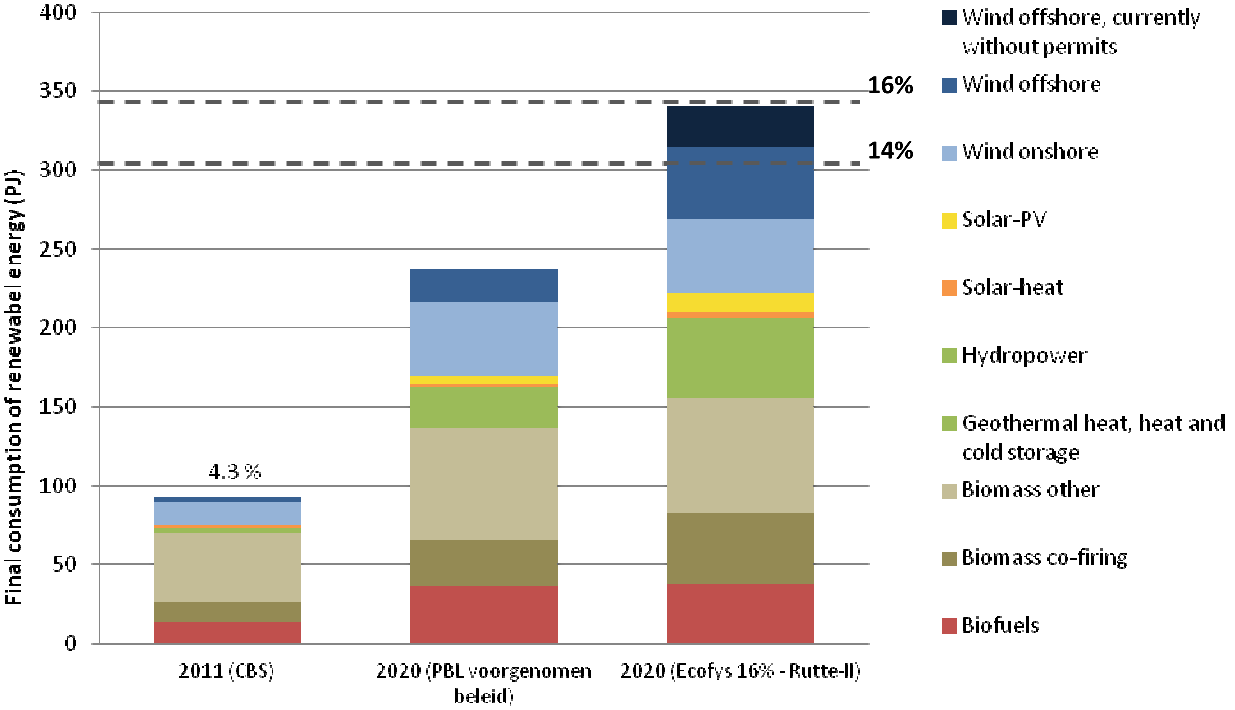

Figure 1 Renewable energy deployment in the Netherlands. Current status, projection on the basis of current policies (PBL/ECN) and maximum deployment projection leading to 16% RES in 2020(1% equals about 21.5 PJ under the assumptions in this memo)

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2 PBL/ECN Referentieraming energie en emissies: actualisatie 2012. Den Haag 2012. http://www.pbl.nl/sites/default/files/cms/publicaties/PBL_2012_Referentieraming-energie-en-emissies-2012_500278001.pdf

3 With a total final energy consumption of 2183 PJ in 2020, from 2305 in 2010.

The bar on the right is a projection when assuming ambitious deployment rates for the renewable energy technology categories. The expected *maximum* realisable share of renewable energy of total final consumption is in the range of 14 – 16% in 2020. In both cases it is required to strengthen policies along the proposed lines, overcoming many of the prevailing barriers and stepping up the efforts by all stakeholders involved.

Below we discuss the growth trajectories of the renewable energy categories that are presented in the right bar of the figure. Combined, the options lead to an estimated renewable energy consumption of 241 PJ, or 15.8%, assuming highly ambitious growth trajectories for all technologies. For example, it would require installing a total of 6000 MW wind offshore. Part of the 6000 MW offshore wind capacity has no permits (2300 MW) and government support has not been allocated yet. 6000 MW is highly ambitious, considering the currently installed capacity and slow progress in recent years. If these offshore wind projects are excluded from the total estimate, the renewable energy consumption would total 314 PJ, or 14.6% - about 1.4% below the new national 16%-target.

- **Energy saving** is the most cost-effective way of meeting the target. A reduction of energy consumption and a similar production of renewable energy, leads to a higher renewable energy share (from total consumption). From 2004 – 2011, the average annual energy savings rate was about 1.1%. ECN/PBL has calculated that an annual saving of 1.4% is obtainable with current government policies. This implies a reduction of -121 PJ in 2020 from 2010 levels. The recently adopted EU Energy Efficiency Directive would have to lead to a reduction of 1.5% annually. This is equivalent to a reduction of roughly -151 PJ in 2020 from 2010 levels (leading to a total final energy consumption of 2150 PJ in 2020) and should be considered a maximum of what is realistically possible by 2020.
- **Biofuels**. Under the Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Member States are required to raise the share of renewable energy in transport to a minimum of 10%. Most of this is expected to come from biofuels, with a minor share of renewable electricity. There are currently no ambitions to increase this share further towards 2020. 10% corresponds to about 36 PJ in 2020.
- **Co-firing of biomass**. The government has announced plans to support co-firing of biomass. 20% biomass co-firing is generally considered feasible, 30% and up to 50% is technically possible. 30% co-firing could produce up to 45 PJ in 2020 (about 2.1 % of total final consumption, or 13.2% of final RES consumption) and we consider this a realistic, yet ambitious contribution towards the 16% target.
- **Biomass other**. This category includes biomass installations for electricity and heat (stand-alone, waste incineration, biomass digestion, wood stoves etc.). The policies currently in place are expected to lead already to considerable deployment until 2020 and will put large pressure on the locally available biomass (also considering co-firing). ECN/PBL believe that growth beyond the result of current policies in place, is not likely, thereby leading to a maximum renewable energy consumption of 73.3 PJ in 2020, from the current 54.3 PJ.
- The **geothermal heat** potential is still large and costs are relatively low. An increase to 15 PJ is considered possible for 2020, in line with projections of the Dutch geothermal energy

platform. In 2012, a large amount of geothermal projects applied for SDE+ – with a total estimated maximum production of 8.9 PJ/year). Heat and cold storage has relatively low investment costs and a wide array of applications and a large potential, particularly in the horticulture sector. With a continuation of the growth over the last 5 years until 2020, 35 PJ of renewable energy production can be realised. This is equal to roughly half of the realisable potential in 2050 (70 PJ) and should be considered a maximum.

- **Solar-PV**. A study by KEMA suggests that 4000 MWp (equalling 12 PJ with 850 full load hours) of solar capacity could be installed by 2020, largely without the need for direct government support. Solar-PV would need to grow strongly from 0.4 PJ in 2011, to 12 PJ in 2020 with an average annual installation rate of 1.8 million individual solar panels each year[4]. The potential for **solar-heat** deployment until 2020 is considered relatively small with 3.5 PJ (from about 1 PJ today).
- **Wind onshore**. Currently, onshore wind produces 14.3 PJ of renewable energy (installed capacity of 2090 MW). Another 2140 MW has received SDE(+) subsidy. Progress has been slow recent years. Projects experience difficulties obtaining SDE+ as they are outcompeted by other technologies, particularly by biogas and heat projects (geothermal energy in 2012). Apart from financial support issues, spatial planning forms an important barrier to further deployment. The government's vision on large-scale wind projects (>100 MW, to be further detailed in a *Structuurvisie windenergie op land* (SWOL)) will address these planning issues. However, the political status of the document is unclear and was put on hold by the previous government. 6000 MW (or 47.6 PJ) in 2020 should be considered a maximum and it is currently highly uncertain if the required locations can be found. Over the course of 2013, more is expected to become clear with regards to the 'Structuurvisie'.
- The currently installed capacity of **wind offshore** is 228 MW (round I) and another 950 MW has been awarded financial government support (round II). The technical potential is large, but in recent years only little progress was made. The (previous governments') target of 6000 MW installed capacity by 2020, is therefore becoming more and more uncertain. In addition to the 950 MW that received financial support thus far, an additional 2530 MW has received the required permits, but no financial support (yet). In order to realise 6000 MW by 2020, about 2300 MW would need to be additionally permitted and supported by the government. An approach for this is currently worked out in the context of a 'Green Deal' between the government and the Dutch wind sector.

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[4] Assumed panel size of 240 Wp and an average annual production of 190 kWh

Table 1 Renewable energy deployment in the Netherlands. Current status, projection on the basis of current policies and maximum deployment projection leading to 16% RES in 2020. (Data belonging to Figure 1.)

	2011 (CBS)	2020 (PBL 'voorgenomen Beleid')	2020 (Ecofys 16% Rutte-II)
Biofuels	13	36	37
Biomass co-firing	13	29	45
Biomass other	44	71	73
Geothermal heat, heat and cold storage	3	26	50
Hydropower	0	1	1
Solar-heat	1	1	4
Solar-PV	0,4	5	12
Wind onshore	15	47	48
Wind offshore	3	21	45
Wind offshore, currently without permits	0	0	26
Total RES final consumption	**92**	**237**	**340**
Total final consumption	**2304**	**2183**	**2150**
RES share (%)	**4%**	**10,9%**	**15,8%**

3 How could the price of statistical RES imports be determined?

3.1 Prices or price setting mechanisms will be negotiated bilaterally

The RES Directive defines that Member States are in charge of the cooperation mechanisms, i.e. the conditions for the use of the mechanisms are negotiated between governments bi- or multilaterally. The reason why the majority of Member States opted for such a Member State driven approach, compared to a European trading scheme between private actors, as proposed by the European Commission, was that governments wanted to keep the control of their RES support costs and the use of their domestic potentials (see Klessmann 2009).

Due to the bilateral character and the reluctant use of the mechanisms, there is currently no real market place for statistical transfers and/or joint projects which would help to determine the price for using these mechanisms. Contracts and prices (or price setting mechanisms) will be negotiated individually between the governments of the involved Member States. It is an open question whether and how the price levels resulting from such negotiations will become disclosed and transparent. As aforementioned, the European Commission will provide additional guidance on the implementation of cooperation mechanisms, but the content and scope of this guidance remain to be seen.

3.2 Different time horizons: Ex-post or ex-ante transfers?

All three cooperation mechanisms use statistical transfers as tool for target accounting, in that sense one can analyse the price of statistical imports for all three mechanisms. In practice, there are important differences in the negotiation and pricing of the three mechanisms, however:

- In the case of **statistical transfers** as defined in Article 6 of the RES directive, governments agree that RE that has been produced in one country is ex-post (and virtually) transferred to the other country.
- In the case of **joint projects** between Member States (Art. 7-8), an agreement defines ex-ante that the importing Member States will financially support certain RE projects in other countries and in return count (part of) the RE produced in the supported installations for its target.
- **Joint support schemes** (Art. 11) are also an ex-ante cooperation mechanism: two countries agree to use the same support mechanism in the future and define how they will share the resulting costs and benefits.

3.2.1 Statistical transfers

In the case of pure **statistical transfers** (Art. 6) the importing country does not get involved in the design of the respective support mechanisms but leaves it completely to the exporting Member State how to incentivise RE surplus generation. The transfer itself is an administrative procedure. The price of such statistical transfers may be negotiated between the contracting parties based on their political interests and their willingness to pay or it may be determined based on a transparent price rule. For example, the average support level for all new RES plants supported in the exporting country could serve as the price basis for any transferred RES generation in the following year (see Klessmann et al. 2010, who also explores other pricing/accounting approaches for joint support schemes and statistical transfers). Such a pricing rule could provide a good level of transparency and be perceived as more "fair" than a politically negotiated price. Both aspects could increase he public acceptance of the statistical transfer.

The timing of the contract may play an important role in the price definition of statistical transfers, as explained in Klessmann et al. 2010:

> "One may consider short term (e.g. one year) versus long term (e.g. 15 years) contracts for statistical transfers. […] Formally the mandatory targets are set only for the year 2020. Therefore, importers would be most interested to import virtual RE for the target year. As this year is the relevant year for all exporting and importing countries, however, parties will scarcely be interested (or able) to offer surplus generation for only one year. In particular, in the instance that Europe as a whole is short in reaching the 20% target, exporting countries would be in the position to ask for a price that reflects the additional support costs for the lifetime of the plant. In the instance that Europe as a whole would have an excess of RES generation in 2020, exporters may not be able to request the full additional costs for generation to be sold. By closing a transfer agreement well before 2020, the importing country could hedge its price risk for reaching its 2020 target."

Early agreements would also provide more certainty to the exporting country and legitimise the domestic support costs required to generate the RE surplus (see e.g. the example of Spain, who downsizes its projected surplus in its domestic RE action plan 2011-2020).

3.2.2 Joint projects

In the case of joint projects (Art.7-8), the challenge of defining the transfer price is mainly to define the right support mechanism and/or support level for the joint project. A particularly suitable mechanism might be a tendering procedure in which the support level is defined through the winning bid that asks for the lowest support level. The practical administration of such a call for tenders can be complicated and time consuming though, at least if it is not part of an already existing tendering scheme. From the Member State perspective, an additional complication compared to the design of a domestic support mechanism is that Member States may want to reflect the domestic costs and benefits of the projects (e.g. grid integration costs, job benefits, etc.) in the target sharing approach between them.

Furthermore, the question arises whether the importing country pays only for/up to the target year 2020 or for the full lifetime/support period of the plant. Jacobson et al. 2012 explore these alternatives and show that they lead to substantially different transfer prices. They also point at the uncertainty that the value of the RE generation in the post-2020 cannot be estimated as long as no post-2020 targets and policy framework exist.

3.2.3 Joint support schemes

Joint support schemes (Art. 11) could help to harmonise or align the support structure and levels, and would hence enable the price setting for any surplus. We don't expect that this cooperation mechanism will be an option for the Netherlands in the short term. It is remarkable that several European Member States move towards sliding feed-in premium schemes (as being applied in the Netherlands), whereas the Netherlands is considering to move to a quota obligation scheme. We will hence only look into statistical transfers and joint projects in this report.

3.3 Other important parameters that will influence the price of transfer

Other important parameters that will influence the price of statistical transfers are:

- The demand and the supply curve in the importing country. From an economic point of view, the most expensive technology needed for purely domestic target achievement in the importing country will determine the upper price limit the country is willing to pay. The equation is complicated by other considerations, such as missed domestic benefits.
- The supply curve in the exporting country. In case of a flat RE supply curve (i.e. large low-costs potentials), the exporting Member State may be willing to transfer the requested RE volumes at relatively low cost. The steeper the supply curve, the lower the expected willingness to sell RE volumes at low cost / the higher the price offer. Again, national costs and benefits as well as other political considerations will influence this picture. Without the certainty that the surplus can be sold at a good price, the exporting country may be reluctant to make the required investments (grid enforcement investments, regulatory costs, etc.) for producing a RE surplus, unless it has a vital domestic interest in the further development of RE.
- The overall demand for statistical RE imports in Europe. In the case of an overall deficit, the prices will most likely be higher than in the case of an overall surplus (see above). In other words, the price of statistical transfers can be expected to be higher in the case of a clear "buyer market" in which many Member States will be willing to pay for statistical transfer. Considering the current Member State efforts and the experience with earlier RE directives, it seems likely that many Member States will not meet their targets domestically. Against the background of unclear costs of infringement in case of non-fulfilment of the 2020 targets (see next bullet point), however, it is not certain that such a buyer's market will emerge. Member States may also decide not to comply with their targets, instead of using the cooperation mechanisms.

- The anticipated cost of infringement, which can be considered as upper price ceiling for the use of cooperation mechanism. The outcome of a future infringement procedure is highly uncertain and may not necessarily result in actual penalty payments, but the threat of infringement and "being pilloried" still poses a significant psychological threat for many governments. How this threat is perceived depends, however, on the economic situation of the country, the political culture, the governance structure, etc.
- A critical question for early agreements on statistical transfers and also for joint projects is the risk of non-delivery, which arises from the uncertainty of the RE forecasts, from flaws in support instrument design and from other barriers that exist in the exporting country. The higher the risk of non-delivery by the exporting country, the lower the willingness to pay/cooperate by the importing country. Contractual arrangements on risk sharing and future adjustments may help to limit this risk for both sides.
- Political and public acceptance of the envisaged transfer is likely to influence the decision and the acceptable price in both countries involved in the cooperation. This is particularly true for the importing country that needs to justify why it supports foreign RE projects and misses out on the national benefits of RE.
- Indirect costs and benefits (e.g. local job creation and local value added, grid reinforcement, environmental benefits and costs, security of supply, etc.) are partially very difficult to quantify, but are likely to influence the negotiated price paid for electricity in a joint project or in the case of statistical transfers.
- The expectation whether or not there will be post-2020 RE targets, which would influence the importing country's decision to secure RE imports only up to 2020 or beyond.

As there are significant uncertainties in the determination of any of these parameters, the future price for the implementation of the cooperation measures is difficult to predict, which implies that the risks of pursuing an import-strategy may be significant.

4 Expected price ranges

As mentioned above, the price range for statistical transfers cannot be determined with certainty and its detailed analysis would require own calculations that fall outside the scope of this report. Nevertheless, existing studies and the NREAP projections of the Member States give some indication on the potential price ranges. We will first look into which countries are likely to offer RE surplus. Then we will analyse the expected price range and compare it to the RE supply curve in the Netherlands.

4.1 Which Member States are likely to offer surplus RE?

The Member State forecasts in their NREAPs (NREAPs, 2011) provide the official picture of which Member States plan to have a surplus in 2020. However, these forecasts are rather uncertain and outdated, a fact that is mentioned in many of the NREAPs and also illustrated by the Dutch example: while the Dutch NREAP still shows a surplus, the generally accepted notion among policy makers and experts is that the Dutch government should expect a deficit by now (e.g. PBL/ECN, 2011).

We will concentrate on results from other studies, particularly on the Green-X model results from the EU projects FUTURES-E (Resch et al. 2009) and on first results from the RES4Less project (Caldés et al. 2011).

a) The NREAP forecasts for 2020

According to the NREAP forecasts, the Member States with the highest surplus in 2020 would be Germany, Spain, Greece, France and Sweden.

Uncertainties of the forecast include (see Winkel et al. 2011 and NREAPs 2011):

- Germany has a stable and effective support framework for RES electricity, but wind offshore has developed below expectations so far. Also, RES heat lags behind national targets. Due to its high average support costs, it is unlikely that Germany will offer cheap RE to the Netherlands.

- Spain has published on 11 November 2011 a domestic RE action plan that downsizes its surplus significantly compared to the NREAP it has submitted in 2010 (NREAP, 2011): the projected RE share in 2020 is decreased from 22.7% to 20.8%, compared to a binding target of 20%. Interestingly, the draft plan expects that statistical RE exports will be offered for at least 54 €/MWh[5] (Spanish Renewable Energy Plan, 2011). However, the situation in Spain has fundamentally changed, because the Royal Decree-Law 1/2012 (of 27 January 2012) suspended all economic incentives (feed-in tariffs, premiums, etc.) for renewables.

- The situation in Greece can be considered highly uncertain due to the financial and economic crisis.

- According to the French NREAP, France explicitly does not plan "the use of imports, exports or statistical transfers" (NREAPs 2011).

- According to the NREAP forecast, Sweden will exceed the trajectory during the whole period, but the gap will get smaller over time and end up at 1.2% which is in the range of the uncertainties in the prognosis. In the last years, however, the Swedish RE sector has grown more rapidly than projected, which makes Sweden a potential candidate to offer a RE surplus. Its willingness to export still needs to be explored (see below – Report by the Swedish Energy Agency).

On top of these uncertainties, the NREAP forecasts may not provide a complete picture, as additional Member States explore the use of cooperation mechanisms and may update their projections accordingly in the coming years.

Model-based projections by Ragwitz et al. (2012) reveal that without additional policy efforts by Member States, the overall EU 2020 target will not be met (also see below: Results from the Re-shaping project). Moreover, several policy changes in 2012 indicate that the related policy landscape in Europe has become less secure than one year ago. Apart from Spain, also Portugal and Latvia have issued moratoriums and there is great uncertainty on the future of the support schemes of the Czech Republic and Bulgaria.

This shows that the surplus projected by the NREAPs must be considered uncertain and could in fact turn into a deficit in 2020, which would potentially drive up prices for statistical transfers.

b) Results from the FUTURES-E project

The European research project FUTURES-E (Resch et al. 2009) compares the national targets to the available RES potentials and develops policy scenarios for 2020 target achievement with the Green-X model. According to the resource assessment, the Dutch RES potential which is realistically realisable until 2020 only slightly exceeds the 2020 target.

The largest untapped RES potentials are in Eastern Europe and in Scandinavia (see Figure 2), but this does not necessarily mean that they will develop and export this potential. An interesting scenario in

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[5] In a draft version of 26 July 2011 a price of 46 €/MWh was mentioned.

this respect is the case of "strengthened national support" where "efficient and effective resource exploitation is assessed rather from the national than the European perspective – in line with proposed[6] 2020 RES targets" (Resch et al. 2009).

Economic restrictions are applied to limit differences in applied financial RES support among countries to a feasible level. If support in a country with low RES potentials and/or an ambitious RES target exceeds the upper boundary, the remaining target gap will be covered by (statistical) imports from other countries. According to this scenario, not all countries have the (economic) possibility to fulfil their 2020 RES obligation purely with domestic action.

Figure 3 illustrates the resulting import and export volumes according to the underlying scenario assumptions. RES imports are required for e.g. Italy, Belgium, Luxembourg, the Netherlands and the UK. At first glance surprisingly, also three new Member States have to rely on cooperation measures with other countries – i.e. Hungary, Latvia and Romania – to meet their 2020 RES obligations due to limited cheap to moderate domestic resources which are exploited by the expected growing demand for energy. Among the candidates for RES exports are Spain, Austria and Finland as well as Bulgaria, Estonia and Lithuania. As stated by Resch et al. 2009, this constellation is however sensitive to specific assumptions on the realisable RES potentials and the future development of energy demand. One should also be aware that the project was finalised in early 2009, therefore the results are not fully up to date.

For the context of this study, the results of the FUTURES-E project show two things: Firstly, the Netherlands are technically able to achieve their RE target, since their realisable potential is slightly higher than their set target. Secondly, the results state that under the assumption of cost-efficient resource exploitation and not considering domestic benefits, the Netherlands could reduce their target compliance costs through statistical transfers, assuming that sufficient statistical RE volumes are available. As explained above, this assumption is highly uncertain.

6 With the exception of Latvia where the finally agreed 2020 RES targets is 2% lower than the proposed one (i.e. 40% instead of 42%), national RES targets for 2020 as finally agreed in the European Council and Parliament in December 2008 are equal to the proposed ones as published in the Commission's draft RES directive.

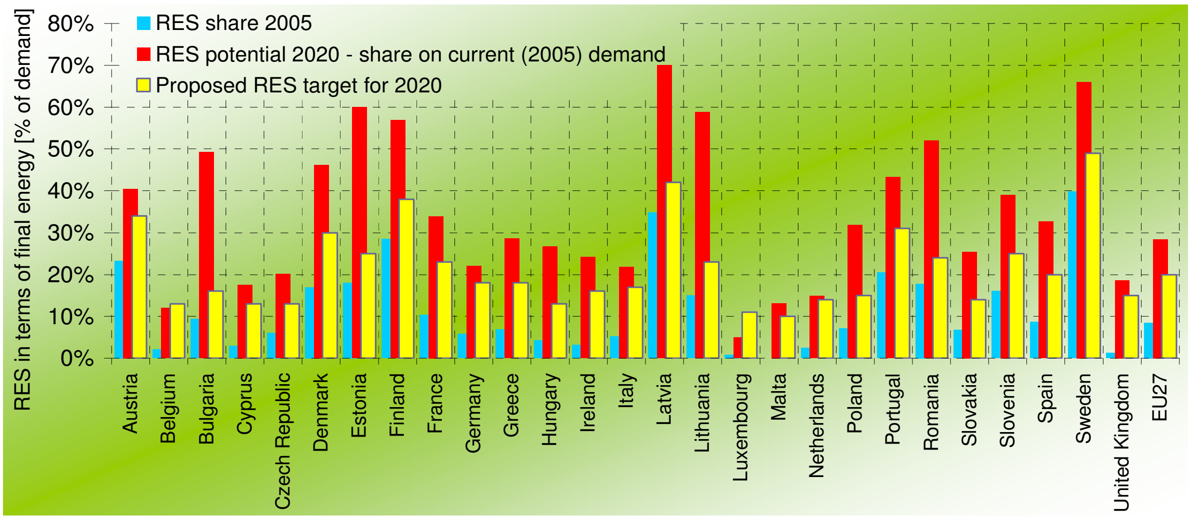

Figure 2 RES target for 2020 in terms of final energy demand compared to total national potential and already achieved RES share in 2005 (Source: Resch et al., 2009)

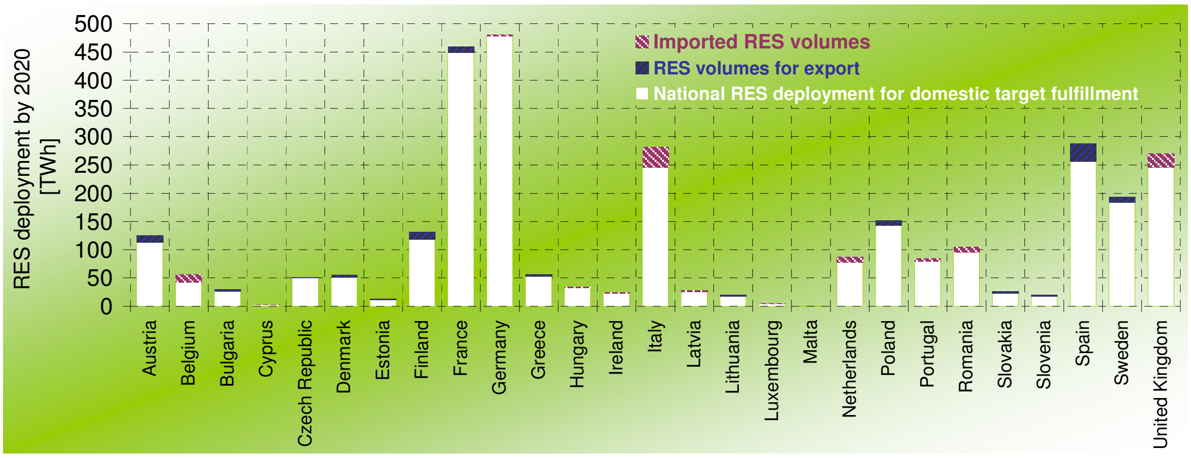

Figure 3 Comparison of national RES deployment for domestic target fulfilment, required import and available export RES volumes in EU-27 countries according to the case of "strengthened national support" (Source: Resch et al., 2009)

c) Result from the Re-shaping project

Estimates given in the reporting of the Re-shaping project (Ragwitz et al. 2012) are also based on the Green-X model. Results show that with currently implemented policies (as of end of 2011) "the majority of the EU countries will fail to trigger the required investments in new RES technologies needed for the 2020 RES target fulfilment" (Ragwitz et al. 2012, p. 25). They argue that "strengthened national policies" (SNP) are necessary to make up for the expected lack of investment. The consequences of unchanged policies are shown in Figure 4: in a business as usual scenario (BAU) the RES-E share would remain at 25.4%, implying a RES share of only 14.8% (right side). Even if non-cost barriers were reduced, current support policies would not be able to trigger sufficient investments.

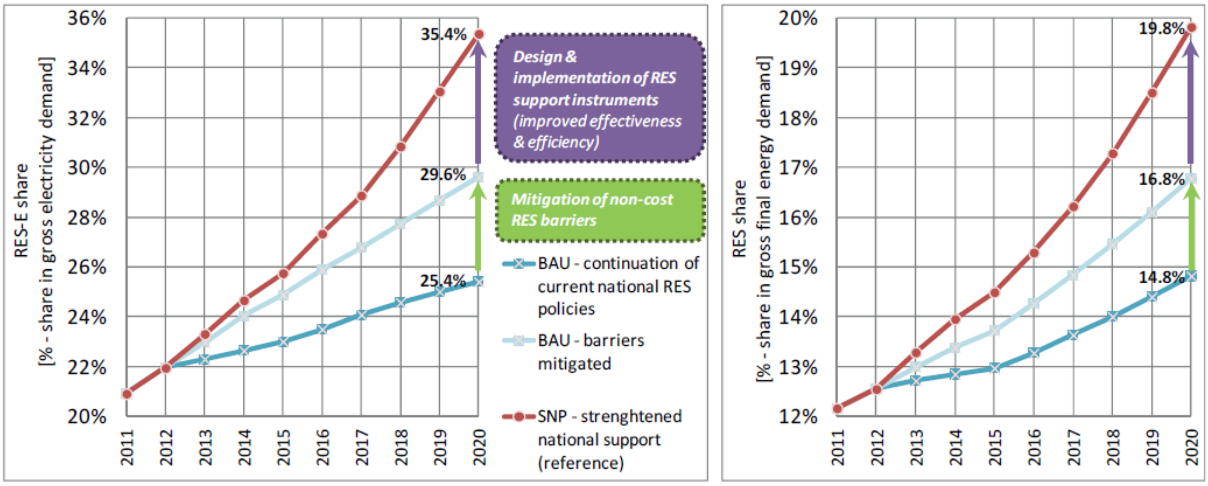

Figure 4 RES-E (left) and RES (right) deployment (expressed as share in gross electricity demand (left) / gross final energy demand (right)) in the period 2011 to 2020 in the EU-27 according to the BAU case (incl. a sensitivity variant of mitigated barriers) and the (default) case of "strengthened national policies"

Figure 5 clearly shows that the majority of countries would not meet their 2020 targets under BAU assumptions. The situation changes for several countries in the case of SNP, but the overall situation still indicates a potential short market for statistical transfers. Moreover, the figure shows that the Netherlands would in all scenarios (BAU, mitigated non-cost barriers and SNP) fall short of their 2020 target. In the first two cases (BAU and mitigated barriers) the Dutch demand for implementing a cooperation mechanism would be significant, with a lack of target fulfilment between 6% and 9%. Assuming the SNP scenario, the main sellers of RES-statistics could potentially be Lithuania (which has a remarkable potential compared to the BAU scenario), Portugal, Denmark, Bulgaria, Estonia, Finland, Austria and of course Sweden. The main potential buyers would then be The Netherlands, Slovenia, Belgium, Luxemburg and Italy.

Ragwitz et al. conclude that even "the results of the case of 'strengthened national RES policies' show that cooperation is a key necessity for several Member States. This is at least the case if Member States aim for an effective and economically efficient RES target fulfilment" (Ragwitz et al. 2012, p, 29). These findings highlight the potentials of the cooperation mechanisms but they also underline the related uncertainties regarding their availability, political feasibility and related prices.

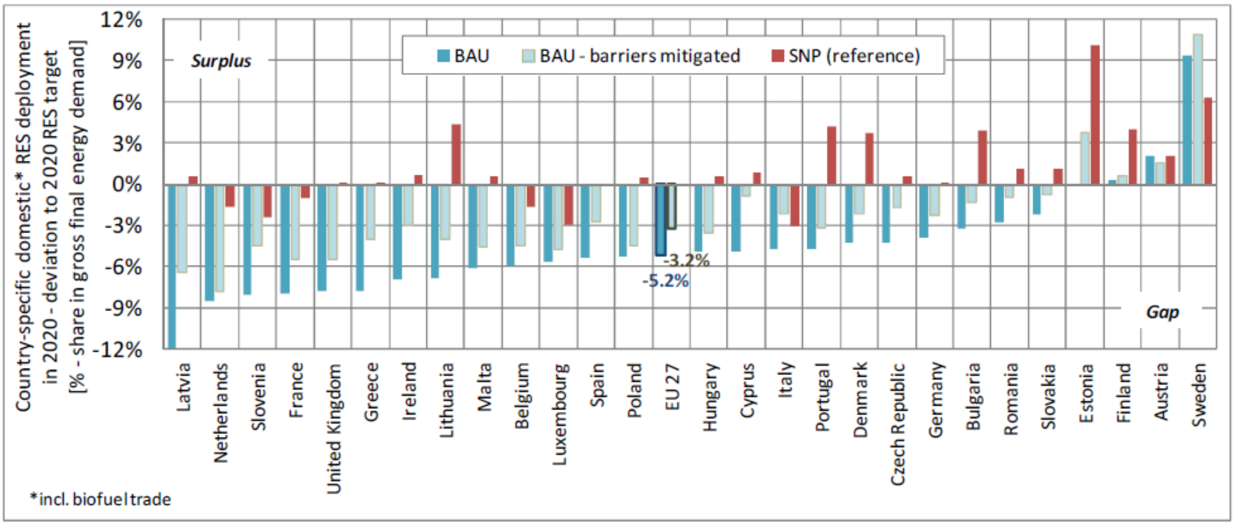

Figure 5 RES deployment versus targets: Comparison of the country-specific domestic (incl. biofuel trade) RES deployment in 2020 according to the BAU case (incl. a sensitivity variant of mitigated barriers) and the (default) case of "strengthened national policies"

d) Results from the RES4LESS project

The RES4LESS project derives European virtual supply and demand curves for RE and identifies potential importers and exporters on this basis (see the "global analysis" in Caldés et al. 2011). Figure 6 shows the results for 2020. On the left side are countries that were identified as exporting/host countries of statistical transfers, on the right side potential importers/user countries. The largest exporters are France, Germany, Denmark, Sweden and Ireland.

According to this scenario, the Netherlands are among the potential user countries of statistical transfers. The European equilibrium price is calculated at 148 €/MWh in 2020. The underlying assumptions of the supply and demand curves are not fully transparent and seem to differ significantly from Resch et al. 2009 and Ragwitz et al. 2012, but details cannot be assessed here. Another key difference between the two scenarios is that the RES4LESS scenario does not consider any restrictions to the use of cooperation mechanism and therefore seems less realistic than the FUTURES-E scenario. The authors indeed mention that "the above mentioned results should be regarded as an indication of where the cooperation opportunities (Valleys of Opportunity - VoO) may exist. However, it is unlikely that all the above identified VoOs will become actual transactions between two or more Member States when other factors are taken into account in the analysis." (Caldés et al. 2011, p.20)

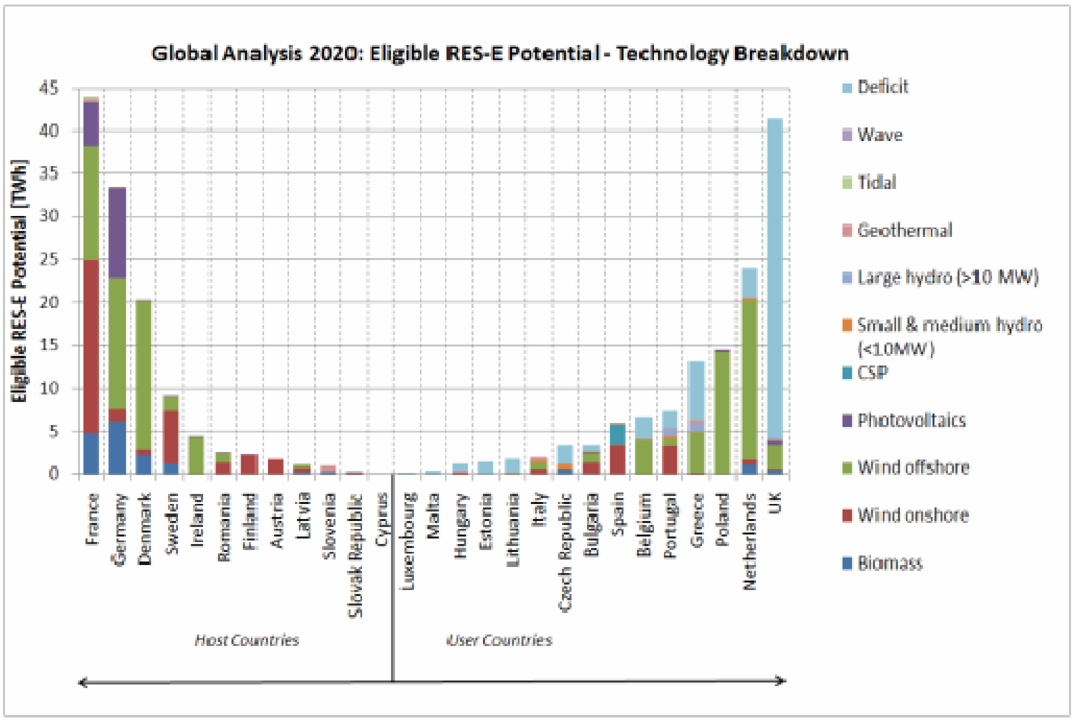

Figure 6 RES4Less analysis of import/export opportunities based on their European "global anaylsis" scenario (Caldés et al. 2011)

e) Report by the Swedish Energy Agency

The Swedish Energy Agency published a report on the potentials for cooperation mechanisms for the Sweden (SEA 2011)[7]. Although Sweden is just one of the 27 Member States, its report is relevant for the Netherlands because Sweden is considered to be an important country for the cooperation mechanisms due to its expected surplus of renewable energy.

The report states that at the moment there is great uncertainty regarding the question how the market for cooperation mechanisms will evolve. Moreover, it acknowledges that "the time period for which the mechanisms will be available is relatively short" (SEA 2011, summary). This situation "could possibly indicate that any agreements between states will cover only smaller quantities". Another statement is important in this context because it directly relates to the aforementioned risk regarding the actual delivery of the renewable energy (and the respective statistical transfer): Within the framework of statistical transfer, there is nothing to prevent Sweden selling statistics for individual years in those cases where the Agency's forecasts indicate a surplus, and where there is a demand for the statistics" (SEA 2011, summary).

While the report seeks to highlight the willingness of Sweden to further engage in cooperation mechanisms, it clearly reveals the uncertainty related to the use of the mechanisms.

f) Other countries

Norway and Iceland are members of the European Economic Area (EEA) and will have to comply with the RES Directive. The EEA Joint Committee agreed on 19 December 2011 on 2020 targets of 67.5% for Norway (from 58.2% in 2005), and 64% for Iceland (from 55.0%)[8]. Norway has a significant potential for onshore and offshore wind (about 77 TWh) at costs of about 70 to 110 €/MWh, but the electricity network capacity may be a restricting factor for harvesting this resource potential (GreenStream, 2010). Norway and Sweden have joined their obligation schemes as of 2012. The electricity supply of Iceland is already close to 100% from renewable energy sources (hydro and geothermal). There is still a significant potential for renewable energy, but here also infrastructure connecting supply to end users in the rest of Europe is a significant restriction on the short term. At this stage it is not clear whether these two countries might be able to generate a RES surplus by 2020.

The RES Directive (Art. 9) allows for **joint projects between EU Member States and third countries** under certain conditions, the most important being that the generated electricity is consumed in the EU and that the project is not receiving support from a support scheme of the third country, other than investment aid granted to the installation. Possible suppliers could be found in

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7 The report is only available in Swedish, apart from its summary. The summary in turn does not go into details and does not mention explicit figures. However, some of its statements are of interest for this report.

8 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:076:0049:0050:EN:PDF

North Africa and Eastern Europe (e.g. Russia). There may be some projects that would be able to apply for this mechanism, but several administrative hurdles may need to be taken.

Conclusion on importers and exporters

We conclude that the existing assessments and forecasts of who would be importing and exporting countries differ substantially. This is mainly due to the policy driven national development paths that do not necessarily match the national potential. Another reason is the difference in the assumptions on national costs and potentials. Moreover, as several Member States will probably not meet their envisaged RE targets, potentially more States might have an incentive to use the statistical transfer mechanism, which in turn could significantly drive up prices for the transfer.

4.2 RE generation cost range in Europe

Figure 7 and Figure 8 show the wide range of long-run marginal generation costs of various RES-E and RES-H technologies for the year 2010, as provided by Green-X (2011). As explained above, it is not fully clear which technology would be available for statistical imports, while the focus of using the cooperation mechanisms is obviously on the relatively low-cost technologies (especially through joint projects) in countries with insufficient support to make these projects bankable. On the other hand, with the price setting mechanisms not being established yet, statistical transfers will have a market price which is not necessarily related to the marginal cost price of the technologies in the 'surplus pool'.

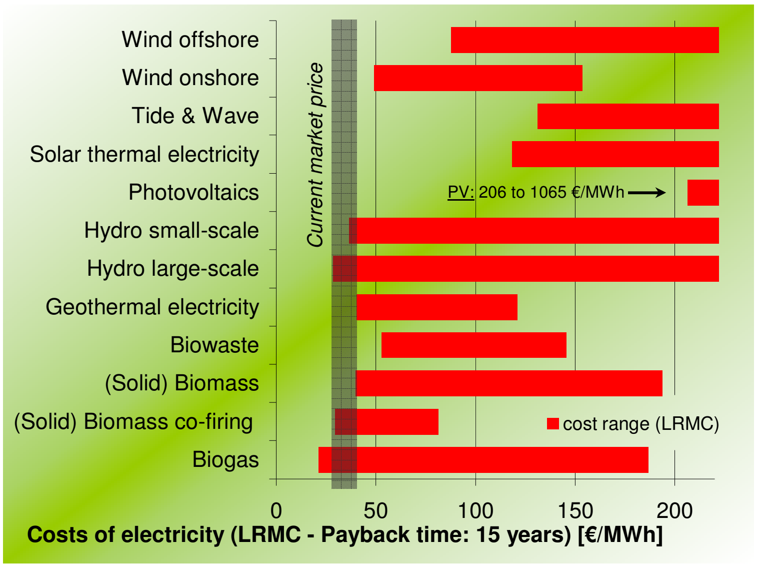

Figure 7 Long-run marginal generation costs of RES-E technologies for the year 2010 across the EU (Source: Green-X 2011)

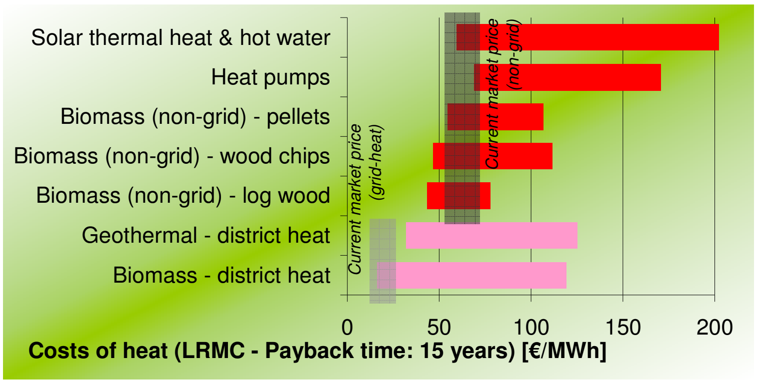

Figure 8 Long-run marginal generation costs of RES-H technologies for the year 2010 across the EU (Source: Green-X 2011)

The Spanish bottom price of 54 €/MWh for statistical transfers (excluding the price of electricity; roughly 90-110 €/MWh including the electricity price) is higher than the lowest generation costs, but still rather at the lower end considering the European equilibrium price of 148 €/MWh (incl. electricity market price, i.e. approx. 100 €/MWh excluding electricity) calculated by Caldés et al. 2011. Very roughly speaking, the expected price of statistical transfers might thus be in the range of 50-100 €/MWh annually (excluding electricity price), obviously depending on the different variables described in section 2. In particular, this estimate assumes that this price is either paid over the economic lifetime of the plant (15 years) or that the exporting country does not intend to recover the full support costs over the lifetime of the plant, e.g. because it has sufficiently strong interest in domestic RE generation. Otherwise the transfer price for the year 2020 could be substantially higher, as shown by Klinge Jakobsen et al. (2012) in the RES4LESS project.

In several recent case studies, the RES4LESS project has explored concrete examples for the implementation of cooperation mechanisms, involving the Netherlands and either Denmark (wind offshore), Spain (CSP) or Romania (biomass).

With regard to cooperation mechanisms with Denmark, the report focuses on joint projects, based on tenders for off-shore wind farms in the Danish North Sea, which would be financed in the first place by Denmark (Klinge Jacobsen et. al, 2012). In a second step, it constructs two different cases for the statistical transfer, which would result from the joint project in order to finance the project (that is, to compensate for the Danish direct support costs): Either the Netherlands acquire the full RES capacity credits necessary for the compliance with the 2020 targets (while there is no physical transfer of the power generation). In this case, the Netherlands would pay 80 Euro/MWh annually for 15 years. In this case, the overall costs for the Netherlands would accumulate over 15 years. However, such a long-term contract would provide security for the Netherlands regarding potential post 2020 targets. In a second scenario the Netherlands would only acquire the credits necessary for the compliance of the 2020 targets (and thus only for the year 2020), regardless of any potential post 2020 scenario. The cost example results in 350 Euro/MWh in 2020 for the 8200 GWh of necessary credits for 2020. While the overall costs for the second option would be far below the first option, the Netherlands would bear the full risk on post 2020 target compliance (Klinge Jacobsen et. al, 2012). Klinge Jakobsen et al. conclude that "Benefits in terms of compliance cost savings for the Netherlands can be substantial." However, these figures are "extremely sensitive to the assumptions regarding the value of post 2020 credits" (Klinge Jacobsen et. al, 2012, p. 57).

Regarding a cooperation mechanism involving CSP in Spain (statistical transfer), RES4LESS also assumes the required support under the cooperative scenario is significantly lower than producing RES domestically in the Netherlands" (Santamaría / Caldés 2012, p.52). However, it is important to note that Santamaría and Caldés assume a very optimistic technology learning curve for CSP (with LCoE for CSP decreasing from 180 €/MWh to 100 €/MWh by 2020).

In the case of a cooperation mechanism with Romania, biomass is compared to the alternative of domestically deploying off-shore wind (assuming costs of 150 €/MWh by 2020) (Tantareanu 2012). While addressing several barriers for such cooperation (for instance, security of supply, supply chain issues and "political acceptance"), the report suggests the implementation of a so called "cooperation scheme". This scheme would support a specific amount of biomass based RES-E production in Romania, which would be paid for by the Netherlands (by partially opening up the Dutch SDE+). Tantareanu assumes that "the difference between the minimal public (support) costs asked to produce the green electricity in Romania (approx. 58 €/MWh) and the domestic public cost to produce the same amount of electricity in the Netherlands (approx. 85 €/MWh) reveals an attractive scope for a win-win Cooperation agreement" (Tantareanu 2012, p.8). Also in this case, the project argues that significant savings can be achieved by the Netherlands in case it enters into a cooperation.

4.3 Domestic RE generation cost in the Netherlands

Figure 9 shows the cost supply curve of RES-E in the Netherlands, as estimated by Frontier Economics (2011). The marginal technology for reaching the RES-E target as defined in the NREAP (50.3 TWh) would be offshore wind at the price of approx. 125-140 €/MWh[9]. It thus would be approx. in the same range as the European equilibrium price calculated by Caldés et al. 2011, which can be considered as an upper price of statistical transfers, unless a strong buyer's market evolves over an overall deficit of RE. However, this comparison does not specifically account for the uncertainties and variables described in the precedent sections.

In order to get a complete picture of the domestic costs, one would also need to include RES-H in the supply curve in order to judge if the marginal cost of target achievement could be reduced domestically by increasing the heat compared to the electricity share.

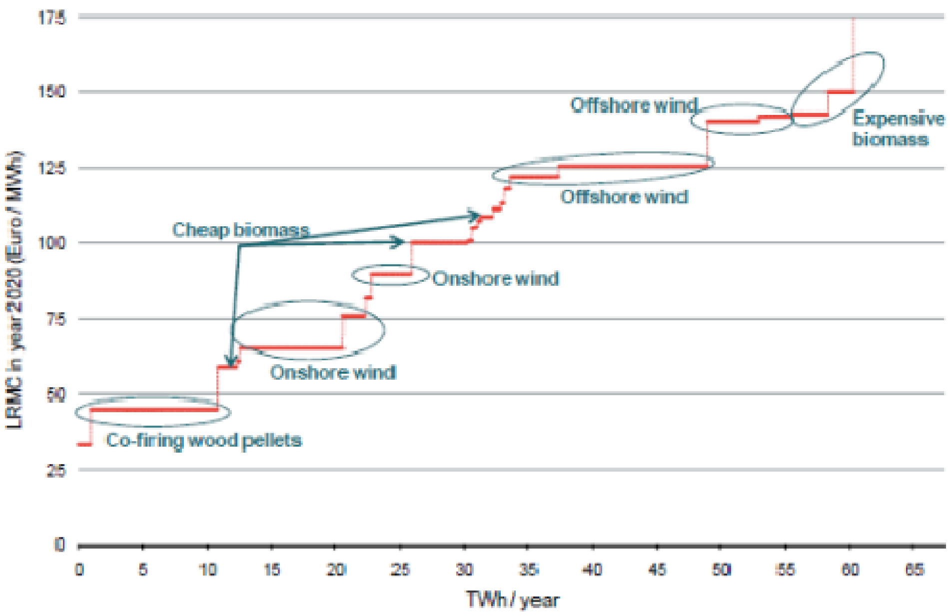

Figure 9 RES-E supply curve for the Netherlands 2020 (Source: Frontier Economics 2011 based on data provided by ECN and other sources)

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9 We believe that the data for offshore wind are at the low end. For 2010 Frontier Economics assumes a levelised cost of electricity of about 135 €/MWh, despite assuming 40% equity. The reason is that the study assumes a 20 year project depreciation period (which is potentially too long given the 15 year time period of the current Dutch tender scheme), and probably a higher assumption for the full load hours (which are not explicitly mentioned). These costs include costs for onshore grid connection. If these connection costs were to be socialised (as demanded by the Dutch Parliament), the import of statistics would even be less favourable.

5 Conclusion

The analysis showed that the use of statistical transfers, which in principle may be a viable option for realising part of the Dutch RE target, is linked to high uncertainties. The market price of statistical transfers depends on different variables such as the supply curves, support schemes and political interests of the involved Member States, the timing of the agreement, the overall European deficit/surplus, etc. Therefore, target achievement through statistical transfers or other cooperation mechanisms is related to a high level of uncertainty and whether they would in practice be cheaper than domestic production remains an open question.

Based on an assessment of available literature, the expected market price of statistical transfers might be in the broad range of **50-100 €/MWh (excluding electricity price) over the average economic lifetime of 15 years**, which can be roughly compared to the cost levels for producing electricity by onshore wind energy (lower end) to offshore wind energy (higher end) in the Netherlands.

Without early negotiations with potential exporters, there is a significant risk that imports will not be available at lower cost than domestic RE production. An additional risk is that exporters may not be able to deliver the RE as forecasted. Finally, public acceptance of statistical imports may be lower than of domestic RE production, due to the missed domestic benefits.

All these arguments do not speak against the use of statistical transfers in general, but they show that the use of the mechanisms is linked to a certain level of uncertainty and complexity. These challenges have to be weighed against the costs and benefits of increased domestic production in the Netherlands (e.g. grid enforcement, employment effects, etc.), which would require increased domestic RE support efforts.

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