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ELECTRICITY FOR EUROPE

National Renewable Energy Action Plans:
An industry analysis




RESAP

This report is part of the EURELECTRIC Renewables Action Plan (RESAP).

The electricity industry is an important investor in renewable energy sources (RES) in Europe. For instance, it is responsible for 40% of all wind onshore investments. RES generation already represents a substantial share in the power mix and will continue to increase in the coming years.

EURELECTRIC's Renewables Action Plan (RESAP) was launched in spring 2010 to develop a comprehensive industry strategy on renewables development in Europe.

RESAP addresses the following key challenges in promoting RES generation:

- the need for a system approach to flexibility and back-up,
- the need for a market-driven approach,
- the need for a European approach to RES development.

RESAP consists of 13 task forces, including for example demand side management, market design, load and storage. The purpose of RESAP is to develop, through a series of reports and a final synopsis report, sound analysis with key recommendations for policymakers and industry experts.

All reports are available at www.eurelectric.org/RESAP

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The **Union of the Electricity Industry–EURELECTRIC** is the sector association representing the common interests of the electricity industry at pan-European level, plus its affiliates and associates on several other continents.

In line with its mission, EURELECTRIC seeks to contribute to the competitiveness of the electricity industry, to provide effective representation for the industry in public affairs, and to promote the role of electricity both in the advancement of society and in helping provide solutions to the challenges of sustainable development.

EURELECTRIC's formal opinions, policy positions and reports are formulated in Working Groups, composed of experts from the electricity industry, supervised by five Committees. This "structure of expertise" ensures that EURELECTRIC's published documents are based on high-quality input with up-to-date information.

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EURELECTRIC pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

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TF National Renewable Energy Action Plan Analysis
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Background notes:

This report takes as its basis a study carried out for EURELECTRIC by Pöyry Energy Consulting, completed in March 2011, entitled "An Evaluation of National Renewable Energy Action Plans". Graphs and figures in this report derived from this study are referenced in this report as simply "Pöyry". It should also be noted that the figures quoted from the National Renewable Energy Action Plans are also only corrected to the versions received by the European Commission up until the end of February 2011, and do not reflect later revisions to the plans submitted by member states. However, these later revisions are not considered to radically affect summary results or conclusions.

INTRODUCTION

The 2009 Renewables Directive sets a new precedent for EU policy on renewable energy sources (RES), setting a 20% target for RES in total energy consumption by 2020, rising from a 2005 level of around 8.5%. The directive presents member states with a major implementation challenge that cannot simply be met by an extension of existing promotional policies for renewables, but rather requires a paradigm shift in the promotion policies, to establish renewables as a mainstream source of energy rather than a niche technology.

This report sets out to assess some of the key challenges and solutions for achieving the target, based on an analysis of the National Renewable Energy Action Plans submitted by member states to the European Commission. As a EURELECTRIC publication, this report focuses on the electricity sector, although reference to the RES heating and cooling and RES transport sectors is made where they have a direction interaction with RES-Electricity (e.g. competing uses of biomass).

At the outset, this report represents the very positive view of renewables from EURELECTRIC and its members. EURELECTRIC members are already very significant investors in renewables, and are ready to deliver massive investment in renewables over the next decade and beyond. We want to play a major role in meeting the 2020 targets. This report reflects our positive views, but attempts to carefully and constructively analyse some of the policy changes which may be needed to reach the targets, and whilst maintaining a secure, stable, and competitive power system that meets the needs of Europe citizens and industries.

KEY POLICY RECOMMENDATIONS

The key policy recommendations arising from our analysis of the National Plans are as follows:

Support schemes, co-operation mechanisms & financing:

- Support schemes should be predictable, cost efficient and adequate to deliver the targets. Technology specific tariffs should be regularly adjusted to the learning curve of the technology, but changes should never be retroactive. We recommend that the European Commission investigate the effect on investment stability and investor confidence of measures funded from customers' tariffs or from national government budgets.
- Use of co-operation mechanisms and progressive convergence of support schemes for RES must be incentivized to ensure cost-effectiveness and to establish a European level playing field.
- Furthermore, the lack of use of the co-operation mechanisms allowed under the RES Directive threatens the feasibility of the targets; we urge the Commission to go beyond its initial attempts to facilitate the use of the mechanisms by:
    - Establishing a framework for utilisation of co-operation mechanisms;
    - Creating a group for both member state officials *and* industry participants.

Planning & infrastructure:

- Planning and permitting problems have to be overcome to facilitate the development of RES on the scale required to meet the renewables target. We encourage the Commission to investigate best practice and to implement this across more member states. Member states should report positive intention in their first progress report on plans to set up a single administrative body for planning and permitting, and establish time limits for decisions after which automatic approval is granted
- The high growth of renewables demands a major expansion of infrastructure
- The scale of the required investments in power generation and energy networks within the tight timeframe to 2020 demands a very stable investment environment and legislative framework. Particularly in view of the ongoing financial crisis, a key focus of EU energy policy in the forthcoming years should be in facilitating these investments and their financing

Policy coherence:

- We are concerned by significant conflicts between the ambitious foreseen growth of renewables and other existing and proposed EU legislation in the environment and climate fields
- The use of a primary energy methodology and a primary energy factor for electricity under the proposed Energy Efficiency Directive runs somewhat counter to the final energy consumption methodology of the Renewables Directive and the development of heat pumps as a key RES heating & cooling technology.
- The slow development of the internal energy market should not be used as an excuse for the lack of development of co-operation mechanisms, but indeed the development of the IEM will help facilitate the development of a more European approach. Thereby, the development of the IEM will be distorted by purely national RES support schemes

neglecting the requirements of market integration by taking increasing shares of a market away from competition.

Reporting and monitoring 2011-2013:

- The Commission should seek clarifications and revisions against member states who have submitted national plans which are unrealistic in terms of technology growth, sufficiency of support measures, etc. In particular, we are concerned that many of the renewables support schemes reported upon in the National plans are not currently sufficient to deliver the targets.
- The progress reports submitted by member states on a biannual basis (starting from end 2011) should be clear on where the member state is deviating from its national action plan and what measures are being taken to address this. From the second progress report at end 2013 the adherence to the member state's interim target trajectory will be clear and so deviances from this should specifically addressed. The Commission should closely analyse these reports and take appropriate action.

Technology balance in the National Plans:

- The Commission should further promote the use of electrified transport using RES electricity towards fulfilling the RES transport target which is aligned with other broader policy aims for the transport sector.
- There is a lack of emphasis on RES heating; policy measures are insufficient to reach the ambitions in the plans. We consider that, outside the ETS, carbon taxes on fossil fuel use can be a very effective measure in promoting the development of the RES Heating

Medium term policy recommendations:

- Progressive implementation of an EU-wide harmonised RES support system which is compatible with a common European electricity market
- EC to promote an EU-wide system approach to reaching target, taking into account infrastructure and back-up generation
- Revisions to the content of the national progress reports in reaction to issues that arise on the path to 2020

KEY INSIGHTS

A. Overview of National Plans

- ❖ Positively, all the countries have submitted what we consider to be serious, detailed National Renewable Energy Action Plans. Furthermore, it is encouraging to note that a number of the plans include references to background studies and research carried out at national level
- ❖ The NREAPs do not, however, indicate a move towards developing renewables on an EU-wide basis, potential to use co-operation mechanisms has not been taken up
- ❖ Most member states intend to reduce their historical rate of increase in energy consumption, and achievement of the RES target is highly dependent on achieving this
- ❖ There is some lack of policy coherence concerning the proposed energy efficiency directive, which proposes targets based on primary energy consumption rather than the final energy consumption used in the RES directive; furthermore the proposed primary energy factor of 2.5 could disadvantage heat pumps, a key RES Heating technology

B. Sectoral Analysis

There are significant concerns on the growth of individual technologies:

- ❖ The amount of intermittent generation in proportion to demand is likely to create significant challenges to system stability in several countries
- ❖ There is a lack of logic concerning the optimal distribution of RES technologies, which significantly increases costs. This is due to both national policy choices and the lack of use of co-operation mechanisms
- ❖ There is a problem of coherence with other EU policies, e.g. Energy Efficiency Directive, Water Framework Directive

(a) Wind

- o Continued high deployment of onshore wind will require significant changes of planning and permitting
- o The extremely challenging build rates for offshore wind impose significant technical challenges e.g. availability of specialised construction vessels
- o Wind plays the dominant role in increasing the level of intermittent power generation by 2020 which will require solutions in terms of back-up capacity, demand side flexibility and market mechanisms

(b) Hydro

- o The level of ambition for hydro in the NREAPs is disappointing given it role as rapid response back-up power supporting intermittent Renewables; its growth is significantly constrained by environmental regulation

(c) Solar

- o Solarpower deployment in the plans is very high and not distributed geographically corresponding to resource availability, leading to higher costs
- o The key determinant for determining solarpower deployment will be cost decreases in the technology; further R&D in this area is needed

(d) Biomass

- The significant growth of the bioenergy sector in general, will require a doubling in the supply of primary biomass, which will in turn, demands major expansion of EU biomass production, especially in the agricultural sector, and also significant import
- Harmonised EU sustainability criteria for solid biomass are necessary to facilitate the growth of bioenergy production

C. Comparison of RES Deployment in NREAPs with other model results

- Compared to modelled scenarios, the NREAPs represent a relatively costly technology mix for reaching the 2020 RES target, a significant factor being the high proportion of offshore wind and solar

D. Policy measures in plans for delivering targets

- The support schemes described in the NREAPs appear insufficient to reach the targets
- Recent lack of stability in support schemes – due either to state budget pressures or impacts on consumer prices is very concerning and has significantly affected investor confidence. The schemes must be more stable, but in many cases high cost will only be reduced by use of co-operation mechanisms and progressive integration of support schemes
- Planning and permitting remains a key barrier to development of both RES generation and grids; the European Commission and member states must work together to reduce these obstructions

E. Role of co-operation mechanisms

- The minimal use of co-operation mechanisms in the national plans is concerning and possibly even threatens the feasibility of the target. In any case, the greater use of these mechanisms would lead to very significant cost reductions in achieving the target
- The development of the joint certificate schemes between Sweden and Norway is a positive development and could be potentially expanded to other member states

1. INTRODUCTION TO THE 2020 RES TARGET

The 20% target for renewable energy is calculated as a percentage of total final energy consumption, including all energy use – electricity, heating & cooling and transport. There are no sectoral targets for electricity or heating/cooling, but a separate 10% target has been set for use of renewable energy in transport. The calculation of the consequent national targets is set out in the box below.

Calculation of national targets :

The overall 20% EU renewables target for 2020 is split into separate targets for individual member states, enshrined in directive 2009/28/EC on the promotion of the use of energy from renewable sources. These national targets represent the first ever legally binding energy portfolio obligations placed on member states, in contrast to the indicative targets of a 21% share for RES-power in total electricity by 2010 set under the 2001 Renewables Directive (2001/77/EC), and a 5.75% share for use of biofuels in total transport fuels by 2010 under the Biofuels Directive. As neither of these indicative targets is likely to be achieved, the legislators decided to set legally binding targets for the 2009 directive, in an attempt to avoid the previous disappointments with indicative targets.

As the percentage of renewables in total EU energy was around 8.5% in 2005, the marginal increase required across the EU as a whole to 2020 is 11.5%. Member states have been assigned to achieve different marginal increases in their national RES percentages, on the following principles:

- All member states must achieve a marginal flat increase of 5.75%.
- A further increase, based on national GDP per capita, is applied in addition to the flat 5.75%, such that the total of GDP-modulated targets in principle averages 5.75%.
- Some account is taken of significant advances in RES development already made by member states such as Sweden and Finland.

The national targets are indicated in the figure on the following page.

As the national target are partly defined by GDP per capita, rather than national potential, the Renewables directive allowed for “**co-operation mechanisms**” allowing a limited level of RES trading between member states. These co-operation mechanisms, composed of statistical transfer (between governments), joint support schemes and joint projects are explained in detail in section 7 of this report. In principal though, one of the key ideas behind the co-operation mechanisms was to allow transfer of Renewables from states with high RES potential (i.e. lower RES production costs) to relatively wealthy states (with high RES targets). This would therefore result in significant cost reductions for achieving the targets for the higher GDP states with high targets (whilst providing benefits for high RES potential states, which in some cases may be significantly poorer)

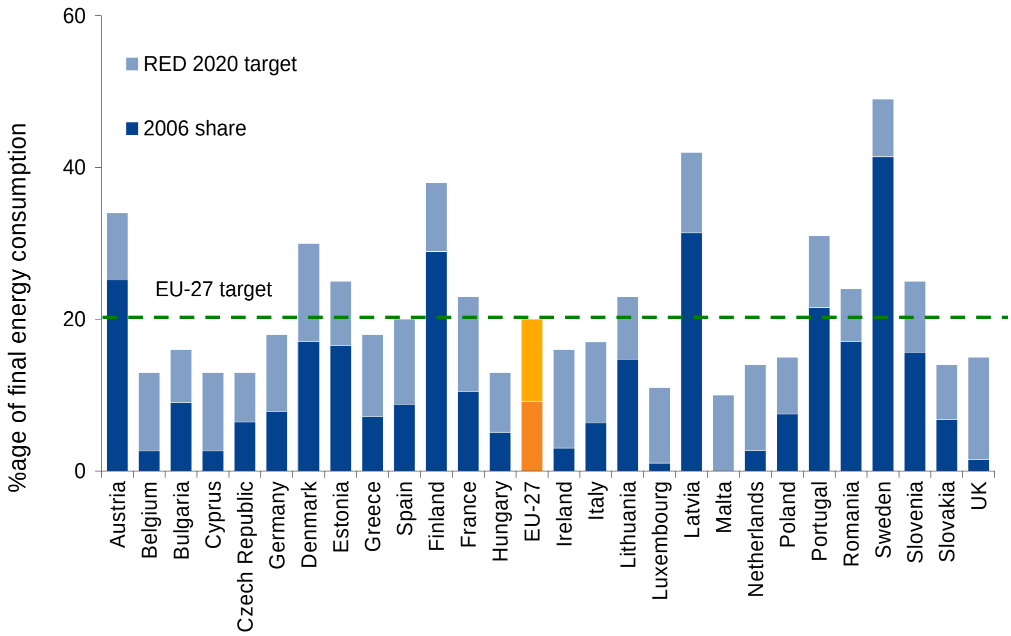

Figure 1: Comparison of National Renewable Energy Targets with overall EU-27 target and national RES shares in 2006 (Source: Pöyry)

Incentivising the development of renewables can be justified on a number of grounds, principally as follows:

- Reduction of carbon emissions – through displacing fossil -fired generation, heating and transport fuels;
- Increasing security of supply – by deferring imports of fuels needed for energy production, especially gas and oil;
- Economic growth – through creating an export driven RES industry in Europe, and also by creating jobs in installation, operation and maintenance (although in some cases such employment will displace that in other forms of energy production).

2. OVERVIEW OF NATIONAL PLANS

Overall, the total gross production from RES estimated in the plans just exceeds the target of 20% renewables in the year 2020. Consequently, if the plans are followed the EU target will be reached.

The largest contribution of renewable energy will be made by heating and cooling (46%), closely followed by electricity (41%). Transport is estimated to contribute more than the minimum target of 10%, reaching 13% in total.

As figure 2 shows, the original 2005 baseline figures provided in Annex 1 of the Renewables directive were modified slightly in the NREAPs due to new data and modified calculation. The figure also indicates the member states planning to reach a domestic surplus over their national targets, which is further described in section 2.1.

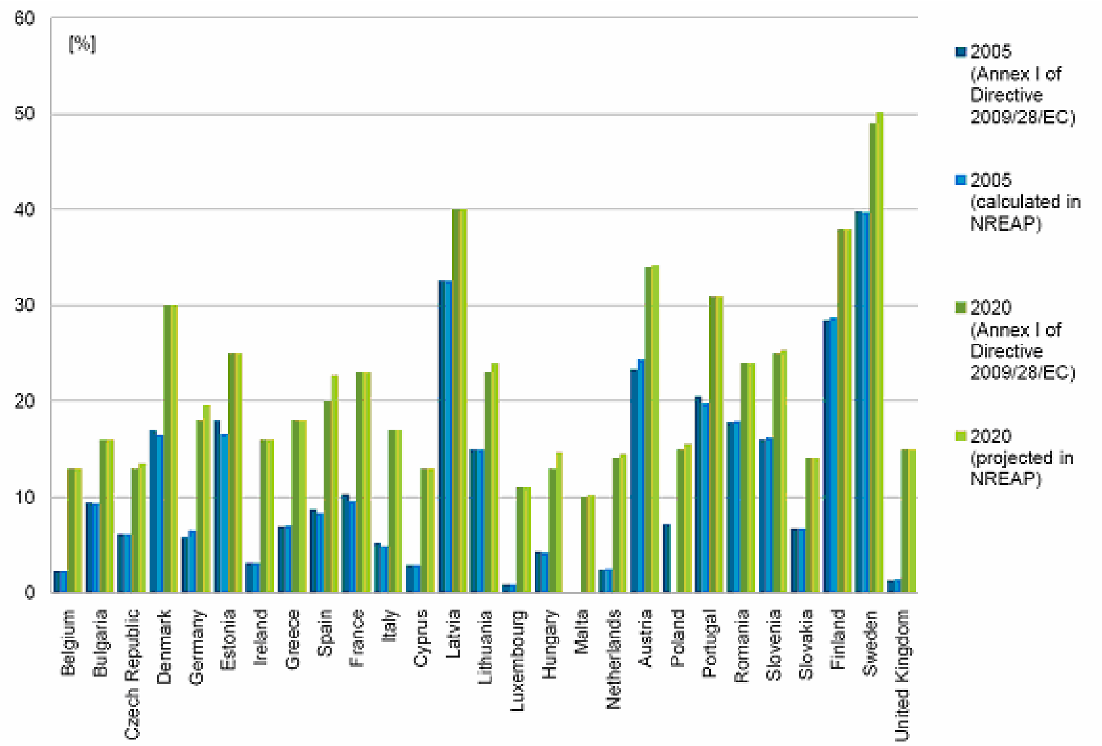

Figure 2: Renewable energy shares historical and according to the NREAPs[1]

[1] *ECN (2011) Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the European Member States*

2.1 National surpluses and deficits

KEY POINTS:

- **The national plans indicate a significant surplus over the overall 20% target, but given subsequent policy changes, it is difficult to evaluate if this is realistic.**
- **There appears to be potential to use co-operation mechanisms but few member states make any definite proposal to use the mechanisms – opportunities for co-ordination between countries have not been taken up**

Looking at national levels as illustrated in Figure 3, Italy and Luxembourg have reported projected domestic deficits of renewable energy compared to their target amounts in 2020 (several other member states also have deficits in intermediate years, though this is not expressed in the figure). These deficits are to be addressed by importing RES "target counting value" through the co-operation mechanisms described below. Other member states plan to have a domestic surplus of renewables – for example, Germany and Spain each expect to have an excess of renewable energy of around 3Mtoe.

In absolute terms, most other member states expect relatively small surpluses or deficits; most plan to be broadly balanced, meeting their targets through domestic action alone. The total net surplus in 2020 is around 6.5Mtoe, compared to a total EU renewable energy target of around 233Mtoe (based on NREAP demand projections). If realised, this would represent an over-achievement against the RES target of just under 3%.

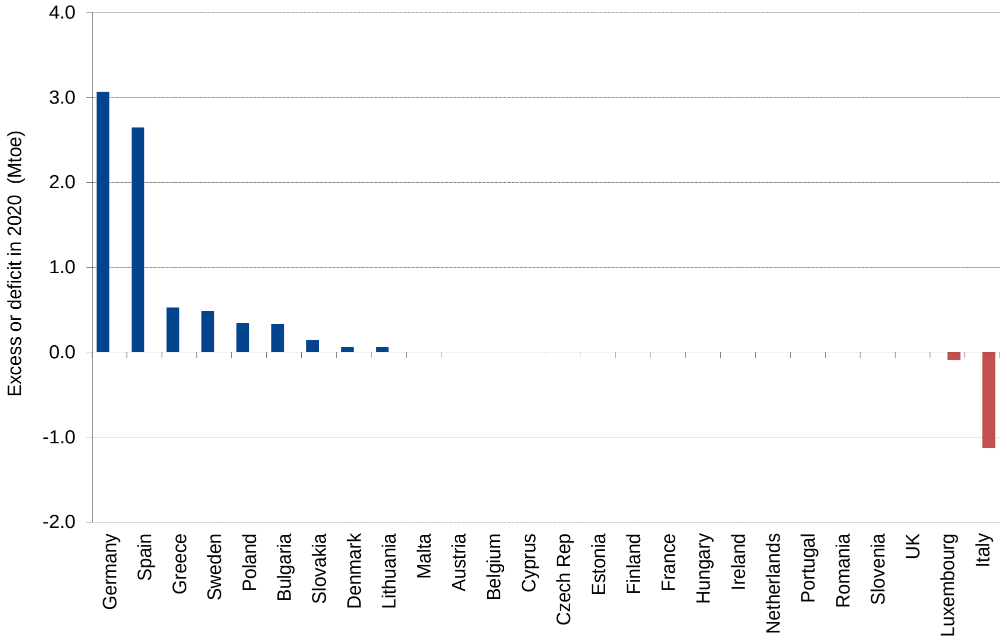

Figure 3: Reported surpluses and deficits states in 2020 (Mtoe) (Source: Pöyry)

Under the RES directive, countries with surpluses and deficits can transfer "RES target value" between each other virtually (i.e. no physical power transfer needed) by so-called "co-operation mechanisms". These co-operation mechanisms are composed of statistical transfer, joint support schemes and joint projects; the exact mechanisms are explained in detail in section 7 (there is also the possibility for joint projects with third countries, but this requires physical transfer). Overall, it appears from the surpluses and deficits in the above figure that there is some potential to make use of co-operation mechanisms, but only a few member states definitely state in detail their intention to use them, and only Italy explains its intention in any detail (in its case it intends to use to use joint projects with third countries to import RES). However, some member states with surpluses express the possibility to use statistical transfer.

A further factor creating uncertainty in use of co-operation mechanisms is that some of the countries with surpluses in their national plans have already altered their national policy, and the surpluses for some countries – among them Greece and Spain – do not seem realistic. Consequently, it is difficult to conclude with absolute certainty that the overall EU-target is within reach by balancing surpluses with deficits. However rather than simply considering the feasibility of the target, it is more disappointing that member states do not express interest in using the co-operation mechanisms to reduce cost of compliance with the targets – especially for member states with higher GDP (and therefore higher targets), but with low RES potential, and therefore expensive national RES resources. The issues concerning co-operation mechanisms are considered in greater detail in section 7.

2.2 Energy Efficiency

KEY POINTS:

- **Most member states intend to reduce their historical rate of increase in energy consumption, and achievement of the RES target is highly dependent on achieving this.**
- **There is some lack of policy coherence concerning the proposed energy efficiency directive, which proposes targets based on primary energy consumption rather than the final energy consumption used in the RES directive; furthermore the proposed primary energy factor of 2.5 could disadvantage heat pumps, a key RES Heating technology**

The level of consumption plays an important role in reaching the renewable energy target, because the target is expressed in relative terms – as a percentage of final energy consumption (FEC) – rather than in absolute terms. Reducing FEC through efficiency measures can therefore play an important role in reaching the target, and reduces the need for building new RES capacity. In contrast, it also implies that if countries do not meet their ambitious energy efficiency measures, RES capacity has to be increased beyond the projections in the NREAPs.

As shown in the figure below, compared to historical rates of change in annual energy consumption for the period 2000-2008, almost all member states plan either to reduce their annual rate of growth, or, in a few cases, change from a positive growth rate to a fall in consumption (e.g. for France, Germany). There are, however, a number of exceptions. For instance, Sweden and Belgium both experienced falling rates of consumption in the years from 2000 to 2008, but project a slow rise from 2010 to 2020 (whilst the UK expects its historical negative growth rate to reduce somewhat). However, these exceptions do not significantly affect the overall negative growth rate. It is notable that a number of the member states which joined the EU in 2004, have historically had higher percentage growth in energy consumption than other member states, in line with higher economic growth rates (e.g. Estonia, Latvia, Lithuania, Malta). All of these states plan to reduce their consumption growth rate, in some cases quite significantly, and it may be questioned whether this is realistic if these states continue high rates of economic growth after the current economic crisis.

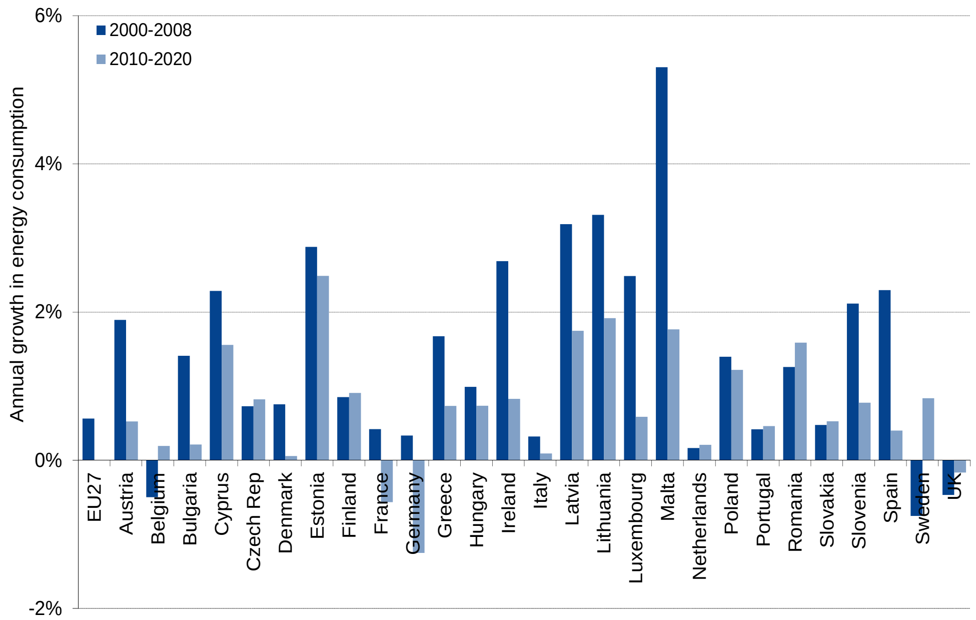

Figure 4: Comparison of gross final energy consumption in 2020 between the *Reference* and *Additional Energy Efficiency* cases (the *Reference* case represents a "business as usual" scenario, while the *Additional Energy Efficiency* case is assumed in the accounting of achieving the targets in the NREAPs) (Source: Pöyry)

The figure below gives some further insights on this overall negative consumption trend, looking at the projected changes in consumption by sector, i.e. electricity, heating & cooling, and transport. Although national plans vary, one general trend appears to be a particular focus on reducing energy consumption in the heating and cooling sector. In principal, this can be achieved through improved insulation and/or more efficient heating and cooling technologies.

Lack of coherence:

It is notable that whilst the RES Directive incentivises a reduction of final energy consumption, the proposed mandatory national targets under the draft Energy Efficiency Directive are based on primary energy consumption. This lack of coherence creates a difficulty for member states in designing energy efficiency policy: should they design a policy for reducing final energy consumption or primary energy consumption?

This policy incoherence could become problematic in several areas. For example, heat pumps may be promoted both as a RES heating & cooling technology and a means to reduce final energy consumption – and therefore to assist compliance under the RES Directive. On a primary energy basis however, the energy efficiency advantage of heat pumps is much reduced, as the Energy Efficiency Directive may apply a default primary energy factor of 2.5 for all electricity usage (this factor reflects an assumed average efficiency of the entire power plant fleet of 40%). For the purposes of the Energy Efficiency Directive therefore, heat pumps will possibly have only a limited advantage over the most efficient gas-fired boilers.
It is by no means certain that such a mandatory primary energy efficiency target will be put in place.

Continuous adaptation of the primary energy factor - closer to 2 by 2020?

Yet even if the primary energy methodology remains unchanged, a possible solution would be to continuously adapt the proposed primary energy factor to the increased share of renewables (and likely expansion of CHP). As renewables, with the exception of biomass, are recognised as 100% efficient in these calculations, such a revised methodology could lead to a primary energy factor closer to 2 in the 2020 time horizon.

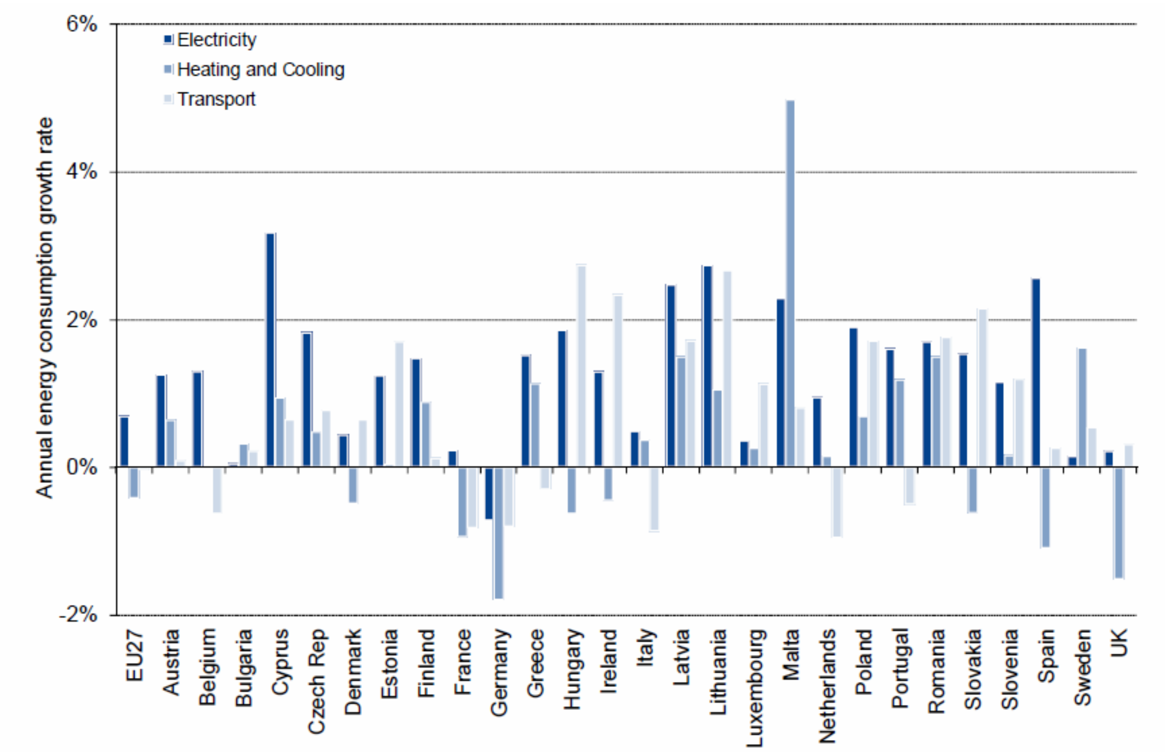

Figure 5: Changes in consumption in electricity, heating & cooling and transport sectors according to NREAPs (Source: Pöyry)

In conclusion, the plans for energy efficiency appear to be very ambitious for a majority of member states. Hence, the evaluation of the national plans depends strongly upon whether the member states are on track with their energy efficiency targets. Any evaluation of the plans must therefore include an evaluation of measures for achieving energy efficiency. In addition, possible conflicts between the primary energy based approach under the proposed Energy Efficiency Directive and the final energy consumption approach of the Renewables Directive should be evaluated and unforeseen consequences mitigated, including a possible adjustment of the primary energy factor to reflect the changing electricity mix towards the 2020 target.

2.3 Overview of growth in RES electricity

KEY INSIGHT: The national plans require over 50TWh of new RES production to be added each year up until 2020, compared to just over 20TWh in the period 2000-2008, the national plan indicate a particular deployment challenge for offshore wind and solar

2.3.1 RES electricity production

Table 1 indicates the projected electricity production from different RES electricity technologies in 2020 (from NREAPs), compared to historical data for 2000 and 2008 (from EUROSTAT). Whilst the patterns for individual technologies are analysed in following sections, it can already be noted that looking at the percentage growth rates of different technologies can actually be somewhat misleading. For example, the table indicates that most individual RES technologies experienced growth rates from 2000-2008 that are higher than those required for the period 2008-2020. Yet the overall growth of RES-E technologies for 2000-2008 (4.5%/yr) is lower than that for 2020 (6.1% per year). This reflects the fact that growth rates in the period 2000-2008 were high for technologies such as solar and wind, which were growing from a very low base, but that the overall growth rate in this period was weighed down by the low growth rate of hydro. In the period 2008-2020, the foreseen low growth rate of hydro makes less difference to the overall figures as other technologies have both high growth rates and high growth in absolute levels of production. Therefore it is more relevant to consider overall rates of production growth, and it is here that the real challenge is evident: the annual production of RES electricity rose by about 22TWh per year in the period 2000 to 2008 and yet it must increase by 52TWh per year from 2008-2020 in order to reach the targets according to the NREAPs.

Gross Electricity Generation	***2000***	***2008***	***2020***	***Actual Growth rate 2000-2008***	***Required growth rate 2008-2020 to reach NREAP***
TWh	***Actual data: EUROSTAT***	***Actual data: EUROSTAT***	***Projection from NREAP***		
Hydro	352.5	359.2	370.0	0.2%	0.2%
Biomass	40.5	107.9	232.0	13.0%	6.6%
Wind	22.3	118.7	495.0	23.2%	12.6%
Solar	0.1	7.4	103.0	71.3%	24.5%
Geothermal/Other	4.8	5.7	17.0	2.2%	9.5%
TOTAL RES-Electricity generation	**420.2**	**598.9**	**1217.0**	**4.5% (+22TWh/yr)**	**6.1% (+52TWh/yr)**
% SHARE RES-E IN ELECTRICITY CONSUMPTION	**13.8%**	**16.7%**	**34.5%**		

Table 1: Comparison of RES production data and growth rates for historical reference period (2000-2007, data from EUROSTAT) and for projections from NREAPs to meet 2020 target (for EU-27 only) *Source: EURELECTRIC, from Eurostat and NREAP data, 2011*

2.3.2 RES electricity capacity

Evaluating capacity deployment rates is essential to assess whether reaching the renewables target is plausible. Any significant increase in deployment rates raises questions of potential supply chain capacity constraints. Figure 6 compares recent deployment rates with rates listed in the NREAPs.

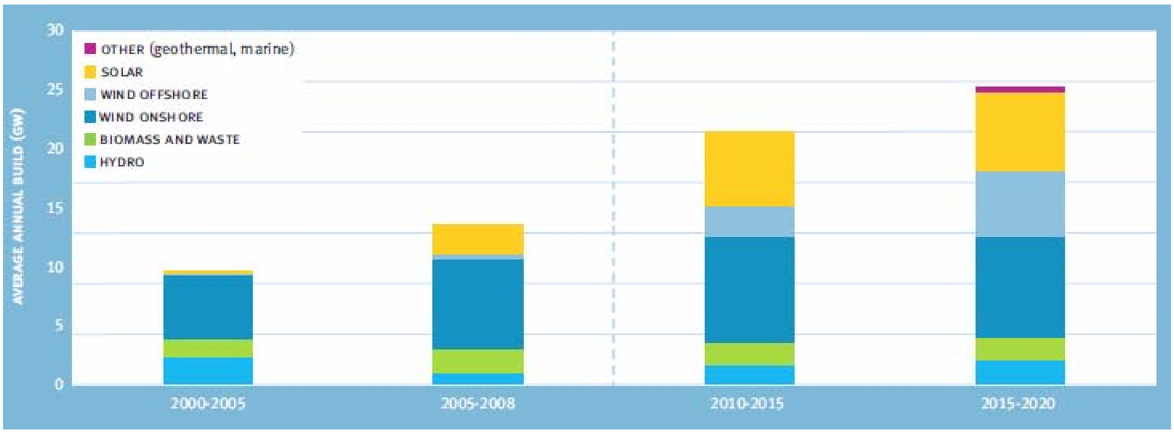

Figure 6: Annual average build of renewable electricity generation capacity (Source: Pöyry)

The most noticeable trend is that offshore wind deployment rates are projected to increase significantly. Other technologies such as hydro or solar show a more modest growth, while the deployment rate of onshore wind falls slightly in the latter half of the decade.

Conclusions:

- It will be necessary to increase growth in new RES production per year by 2.5 over historical growth rates.
- It is questionable whether the offshore industry will be able to meet demand and expected technology development in the period. Recent studies by Deloitte and GL Garrad Hassan on offshore supply chains[2] showed that plans for major offshore wind development to 2020 in the NREAPs can be met in principal. However, since the study was conducted some countries have delayed construction of offshore wind parks to the narrow time period between 2018 and 2020. Consequently, we may well experience supply chain problems and high costs in this period.
- Solar deployment is facing a similar challenge; its economic feasibility is strongly dependent on cost reductions.

[2] *Deloitte (2011) Analysis on the furthering of competition in relation to the establishment of large offshore wind farms in Denmark Report for the Danish Ministry of Climate and Energy*

3. SECTORAL ANALYSIS

In this section, reviews are made of the development of individual RES-Electricity sectors according to the national plans. In the case of biomass, some attention is given to the bioenergy sector as a whole (including heating and cooling and transport), not just biomass electricity, given the competition for the same primary biomass resources by the bioenergy sectors.

3.1 Wind

KEY POINTS:

- **The deployment of onshore wind is challenging but broadly in line with recent build rates; however, continuing this will require significant changes of planning and permitting**
- **The extremely challenging build rates for offshore wind impose significant technical challenges in terms of equipment manufacturing and offshore construction, and in terms of financing**
- **Wind plays the dominant role in increasing the level of intermittent power generation by 2020 which will require solutions in terms of back-up capacity, demand side flexibility and market mechanisms**

Capacity growth:
ALL WIND POWER:
2005 capacity (NREAPs): 40.5GW
2020 capacity (NREAPs): 213.4GW
ONSHORE WIND:
2005-2008 capacity growth (EUROSTAT): 7.7GW/year
2010-2015 capacity growth (NREAPs): 9.1GW/year
2015-2020 capacity growth (NREAPs): 8.5GW/year
OFFSHORE WIND:
2005-2008 capacity growth (EUROSTAT): 0.3GW/year
2010-2015 capacity growth (NREAPs): 2.5GW/year
2015-2020 capacity growth (NREAPs): 5.6GW/year
ALL WIND POWER:
2005-2008 capacity growth (EUROSTAT): 8GW/year
2010-2015 capacity growth (NREAPs): 11.6GW/year
2015-2020 capacity growth (NREAPs): 14.1GW/year
Production growth:
ALL WIND POWER:
2005 (NREAPs): 70.4TWh
2010 (NREAPs): 164.6TWh
2020 (NREAPs): 494.6TWh

Wind dominates, in capacity terms compared to all RES technologies, with the highest average annual installed capacity of around 11.5GW between 2010 and 2015 and around 14GW between 2015 and 2020 (compared to around 8GW between 2005 and 2008). Production from wind energy sources is expected to reach almost 500 TWh in 2020, compared to only 70.4TWh in 2005. This equates to 14% of total projected electricity consumption expected in 2020.

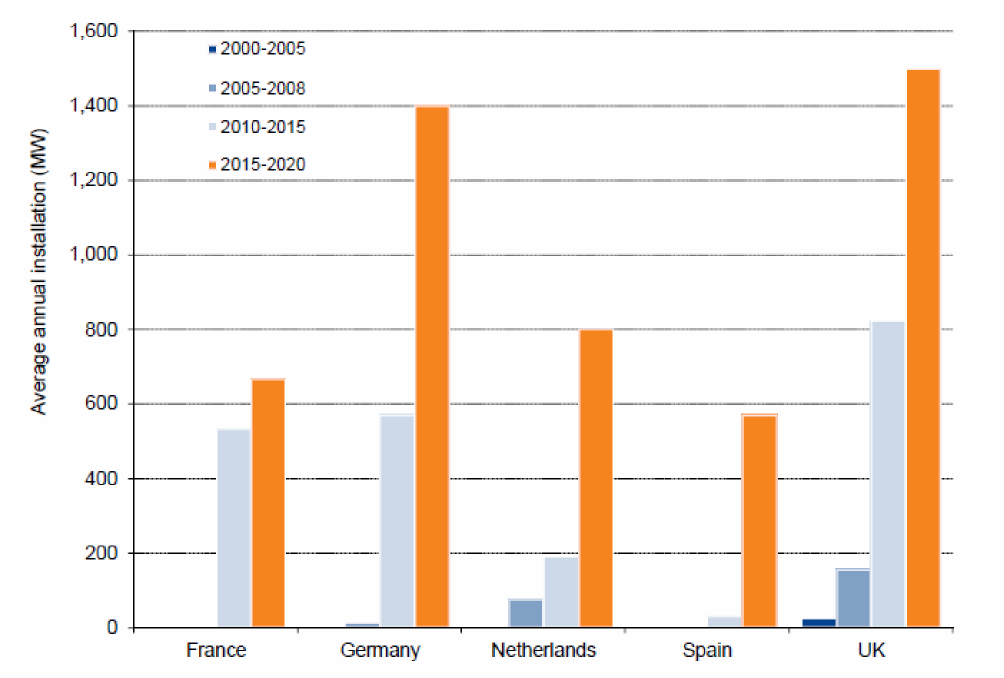

Figure 7: Annual average build of offshore wind between 2000 and 2020 (Source: Pöyry)

For onshore wind, the deployment rate of 9.1GW/year in the period 2010-2015 and 8.5GW/year in 2015-2020 is very challenging but not substantially out of line with the growth rate of 7.7GW/year in the period 2005-2008. However, continuing this very high growth will depend on significant easing of planning and permitting constraints. Compared to historical growth rates, the greatest deployment challenge is for offshore wind. The figure below presents annual average build rates of offshore wind between 2000 and 2020 for all EU member states. The leading installers of offshore wind are France, Germany, the Netherlands, Spain and the UK, each installing more than 500MW per year at some point in time. France is planning to increase its average annual installation rate of offshore wind to around 700MW per year in 2015-2020, Germany to 1,400MW per year, the Netherlands to 800MW per year, Spain to around 600MW per year and the UK to 1,500MW per year.

All member states but Denmark and Sweden are planning to increase their offshore wind build rates. The overall picture is of very significant deployment of offshore wind between 2010 and 2020, starting from a current very low base. Average deployment in 2015-2020 is projected at around 5.5GW per year, compared to an average for 2005-2008 of around 300MW per year. Note however that offshore deployment rates are already increasing – according to the latest EWEA data additions of offshore capacity totalled almost 600MW in 2009 and close to 900MW in 2010. Nevertheless, the foreseen expansion of 5.5GW a year is extremely challenging – in terms of equipment production, availability of construction vessels and indeed financing.

In addition to the deployment challenge, the high penetration of wind power also implies significant challenges related to its inherent intermittency. The figure below shows the total projected wind capacity in the NREAPs as a percentage of the average minimum summer overnight demand in 2020 plus interconnectivity.[3] According to this analysis, two countries –

[3] *The figure assumes that all interconnections are available for exports and includes all interconnection foreseen to be built by 2020. The comparison to average minimum overnight demand is appropriate as high winds can occur at night during a period of low power demand. It should also be noted that in reality, the entire interconnection is unlikely to be available for export, worsening the situation further.*

Ireland and Spain – could actually face wind production in excess of overnight demand plus interconnectivity, while Portugal, Greece and the UK all face over 80%.

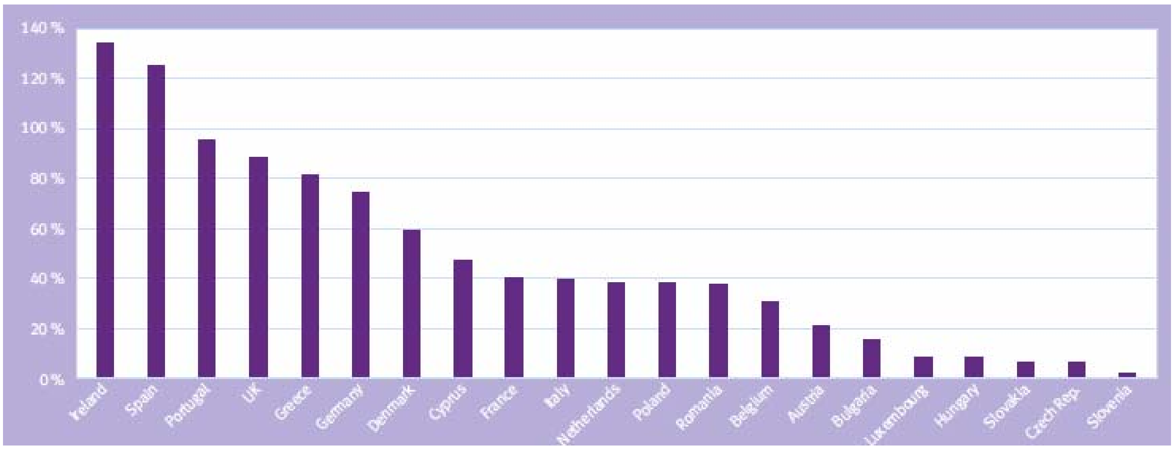

Figure 8: Wind capacity according to NREAPs as a percentage of average minimum overnight summer demand plus interconnectivity in 2020 (Source: Pöyry)

This intermittency challenge requires a wide range of solutions:

- Back-up energy capacity to cover peak loads. This back-up must be provided by technologies with a high reliability on their availability and a proportion of plant must have a high level of flexibility. The most flexible plant are open cycle gas turbines and conventional hydro and pumped storage plants, although other plants – even conventional coal and nuclear plants can also provide significant flexibility although it is not always economical to run plants in this way. The use and operation of these flexible back-up plant and the market mechanisms to incentivise their availability are covered in two separate EURELECTRIC reports under the RES Action Plan[4].
- Measures to increase demand during periods of wind availability and reduce demand at times of scarcity (this issue is covered in detail by a further report under the EURELECTRIC RES Action Plan on demand side participation[5])
- Apart from being intermittent, wind power is difficult to forecast. Two key issues for its further development are therefore improving predictability and equipment with rapid response capability, although there is already significant progress in this area
- Wind energy capacity development will require a powerful network infrastructure. This concerns both the strengthening of existing networks in those countries where they are not sufficiently developed, and the development of new infrastructure to enable access of new wind farms that will probably be located away from existing networks. The wind industry itself must also facilitate such access by adopting appropriate technical measures such as:
  - Aforementioned improvements in production forecasting
  - Meeting the requirements of voltage dips
  - Controllability of system operators.

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4 *Two reports referred to:*
EURELECTRIC (2011) Flexible generation: Backing up Renewables
EURELECTRIC (2011) RES Integration and Market Design: Are capacity renumeration mechanisms needed to ensure generation adequacy?
Reports available at www.eurelectric.org/RESAP

5 *EURELECTRIC (2011) EURELECTRIC views on Demand side Participation* *www.eurelectric.org/RESAP*

Taking into account wind energy's low variable costs and the priority dispatch set out in the RES Directive, an optimal use requires a substantial strengthening of the interconnections in high wind conditions. These new interconnections would help not only to develop wind energy in high-resource countries, but also, depending on the type of support, could prevent the appearance of negative prices in some markets.

This large-scale wind development requires enormous investments, and investors require a minimum guarantee of return on investment for which stable regulation is vital. Continuous changes to the regulatory framework, or, even worse, retroactive changes, would be a major barrier to attracting the capital required for this investment.

3.2 Hydro

KEY POINT: As a key source of rapid response back-up power supporting intermittent Renewables, the level of ambition for hydro in the NREAPs is disappointing, and its growth is significantly constrained by environmental regulation

Capacity growth:
2005 capacity (NREAPs): 115GW
2020 capacity (NREAPs): 135.6GW
2005-2008 capacity growth (EUROSTAT): 0.9GW/year
2010-2015 capacity growth (NREAPs): 1.5GW/year
2015-2020 capacity growth (NREAPs): 1.9GW/year
Production growth:
2005 (NREAPs): 346.6TWh
2010 (NREAPs): 345.7TWh
2020 (NREAPs): 370.1TWh

The development of hydropower in the national plans is relatively limited compared to other RES-E technologies, with an average annual build rate of 1.5GW in the period 2010-2015, and 1.9GW in the period 2015-2020, leading to a total installed capacity of over 135GW. Although this rise in capacity equates to an increase of 18%, the corresponding increase in production is only 7%. Key explanatory factors are the reduction in output due to environmental restrictions (in particular, the Water Framework Directive) and the fact that new/planned hydro plants have lower capacity factors due to poorer hydrological conditions.

Given the fact that hydropower can play a crucial role in providing rapid response back-up power to intermittent renewables, the ambitions foreseen in the NREAPs are disappointing. Analysis in a separate EURELECTRIC report has indicated a much larger potential for hydropower development up to 2020[6], compared to the NREAPs, as well as a greater role for pumped storage (which although not contributing to net hydro production, provides crucial support to intermittent RES) The study has also highlighted the need to make the potential available on a larger regional and European scale, via more interconnections.

[6] *EURELECTRIC (2011) Hydro in Europe: Powering Renewables www.eurelectric.org/RESAP*

3.3 Solar

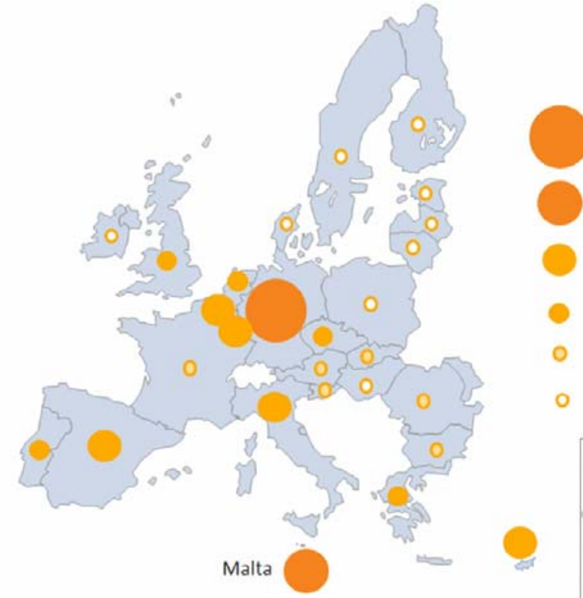
KEY POINTS:

- **The rates of solarpower deployment in the plans are very high, capacity growth in more than double recent deployment rates**
- **Solarpower is not distributed geographically corresponding to resource availability, leading to higher costs in general**
- **Currently, solarpower remains a high cost form of RES-Electricity, and many support schemes have already been altered due to pressure on consumer costs or state budgets. Some of these changes have significantly affected investor confidence; there is a need to establish realistic, sustainable support schemes.**
- **The key determinant for determining solarpower deployment will be cost decreases in the technology; further R&D in this area is needed**

Capacity growth:
2005 capacity (NREAPs): 2.2GW (all PV)
2020 capacity (NREAPs): 91.4GW (of which 7GW CSP, 84.4GW PV)
2005-2008 capacity growth (EUROSTAT): 2.6GW/year
2010-2015 capacity growth (NREAPs): 6.4GW/year
2015-2020 capacity growth (NREAPs): 6.7GW/year
Production growth:
2005 (NREAPs): 1.5TWh (all PV)
2010 (NREAPs): 21.3TWh (of which 20.12TWh PV, 1.15TWh CSP)
2020 (NREAPs): 103.3TWh (of which 83.38TWh PV, 19.96 TWh CSP)
NB:
PV = Photovoltaic
CSP = Concentrated solar power

As shown in the box above, the growth pathway foreseen for solarpower is quite astonishing, reaching a production of over 100TWh in 2020 compared to 1.5TWh in 2005 (although that is forecast already to have risen to 21.3TWh for 2010). In terms of capacity growth, the NREAPs require the already steep deployment growth from 2005-2008 of 2.6GW to be extended to an average of over 6.5GW from 2010 to 2020. As shown in the box, a small amount of this growth is from concentrating solar power, but the majority is from solar photovoltaic; the latter technology is the main focus of this section.

As is shown in figure 9, the deployment of solar according to the national plans (in kWe per km^2, in the left hand image) is not entirely in line with the incidence of solar radiation (right hand image, solar irradiation in kWh per m^2). Logically, of course, the solarpower would be established where the cost of production is lowest – i.e. in southern Europe, possibly with co-operation mechanisms (see section 2.1 and section 7) The geographical illogical development of solarpower reflects the entirely national approach adopted towards RES development in the national plans in general. This will significant increase the cost of compliance with the targets for Europe as a whole, a point made more concretely in section 7 of this report.



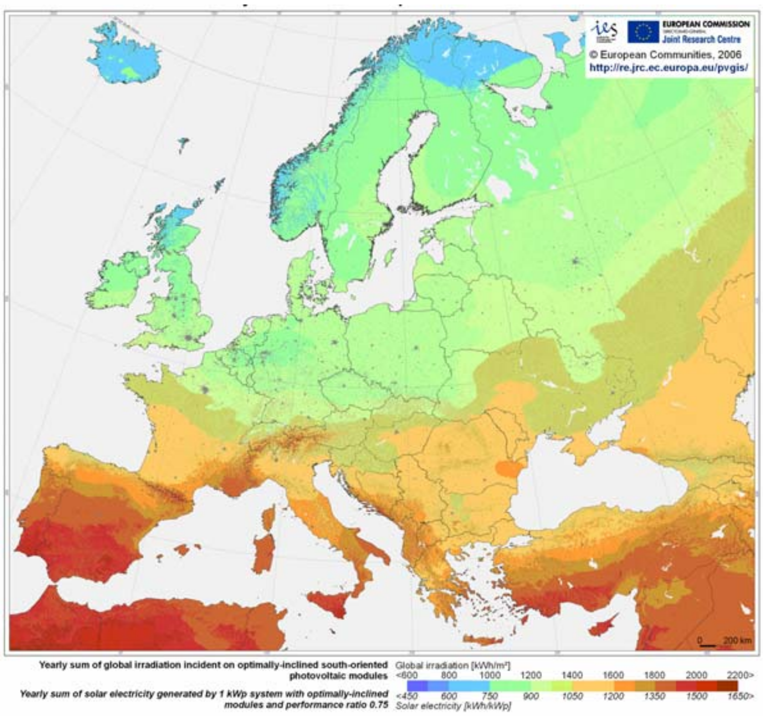


Figure 9: Left hand image: Density of solar power in kWe installed vs km2 land area in 2020 according to national plans Right hand image: Solar electricity potential (Source: Pöyry – left hand image, EC Joint Research Centre[7] – right hand image)

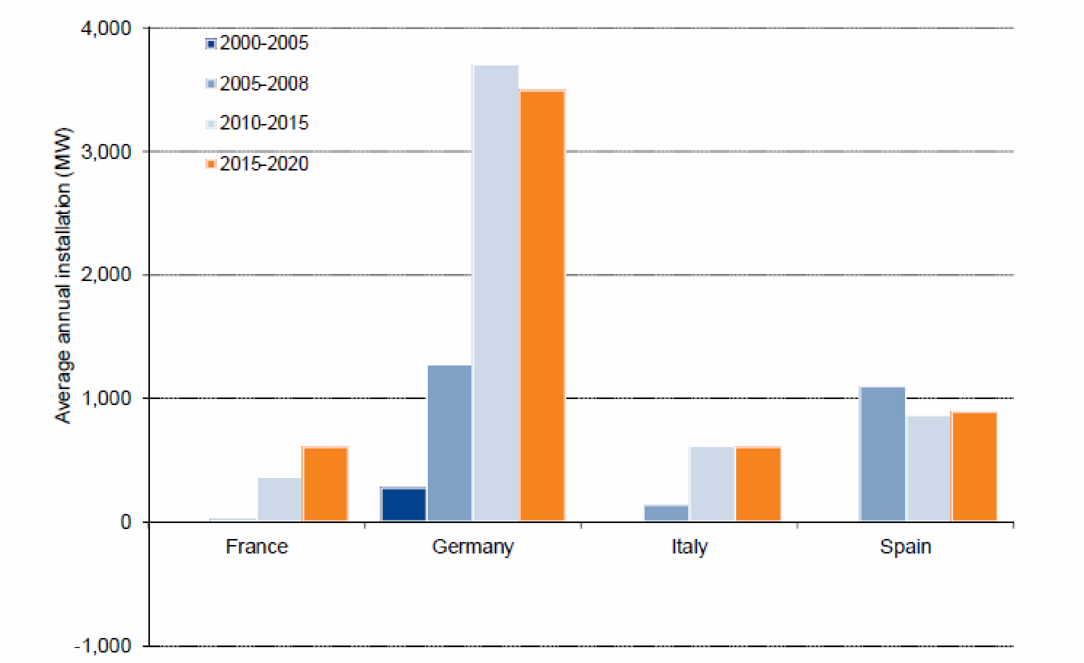


Figure 10: Deployment of solar 2000-2020 in key countries (Source: Pöyry)

[7] *EC Joint Research Centre: Photovoltaic Geographical Information System* http://re.jrc.ec.europa.eu/pvgis/

Adding to the rather geographically illogical and therefore expensive development of solarpower outlined in the plans, realising the high growth rate in solarpower is anyway heavily dependent on significant cost reductions in solar PV. The technology has already achieved major cost reductions, but the solar generation remains significantly more expensive than other RES-Electricity technologies, still commanding feed-in tariffs of over 40c/kWh in some member states. The high cost of solar promotion have led to tariffs being cut or curtailed altogether in some member states. For example, in countries such as Spain, Germany, France and Italy the PV growth acceleration has recently raised government concerns with respect to the consequent increase of the total support costs which often represent a disproportionate share of total RES-Electricity support costs compared to the share of solarpower in total RES-Electricity production. As a consequence measures have been implemented to better control costs. Whilst in some cases these changes rather positively reflect recent technological and manufacturing improvements (especially cost declines in solar panels in the last two years), in other cases changes have been more influenced by financial pressures arising from increasing in customer prices or burdens on state budgets. In some cases the low visibility of the longevity of tariff rates has driven rapid growth as the market inflates in anticipation of expected incentive reductions.

Feed-in schemes remain the dominant policy in Europe for PV promotion. For the time being, it is expected that many member states will continue with adequate support policies to try to deliver the levels of PV foreseen in the national plans. If the trend for PV cost improvements stemming also from the recent oversupply in the global PV module market continues solarpower may be able to achieve the growth rates set out in the national plans. However, if these cost reductions do not continue, we believe it will be very difficult to reach the foreseen level of growth. One way to help achieve these cost reductions would be greater investment in research and development; indeed we would support a partial transfer from solar production subsidies towards greater investment in R&D – which could also ensure that solar technologies are developed in the EU – rather than importing technologies as is increasing become the case. The issue of increase R&D support of RES technologies is covered in a separate EURELECTRIC report[8]. For the moment, the uncertainty remains, especially in a period of economic constraints, that customer backlashes (against high prices) or pressure on state budgets will put pressure on PV development. There is therefore a key need to ensure that solarpower tariffs are realistic and therefore can be sustained in the longer term, as recent changes in some member states have threatened investor confidence and seriously threaten achieving the growth rates envisaged in the national plans.

As is the case for wind power, solar PV does imply certain challenges in terms of intermittency. However, the situation is less acute than for wind power, as less solar will be installed and as peak production of solar power will occur during the daytime, at a time of relatively high loads. Indeed, in countries with high air conditioning loads, peak solar production may directly align with peak loads. However, as the figure below indicates, Germany could face some problems, as their plans for PV account for around 80% of average demand. For Spain, Portugal and Cyprus, the figure of 30% of average demand is unlikely to be problematic, particularly due to the overlap between peak PV production and peak air-conditioning loads in these states. However, PV production at this time does cause unforeseen market effects; for example, the flexible thermal generation required for backing up wind also relies on revenue from midday peak power loads to justify the business case for constructing the plant – and therefore PV production can potential deny the case for building such plant. The solution for this is not of course to reduce aspirations for PV, but to

[8] *EURELECTRIC (2011) How to Foster Research, Development and Deployment of RES-E Technologies* www.eurelectric.org/RESAP

ensure that sufficient market mechanisms are put in place to ensure that this essential flexible back-up plant is constructed.

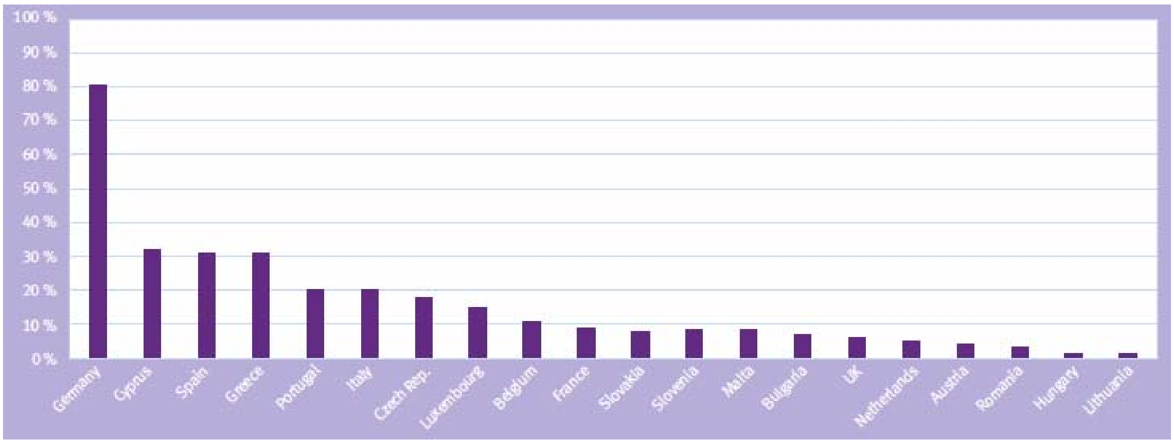


Figure 11: Solar capacity according to NREAPs as a percentage of average demand plus interconnectivity in 2020 (Source: Pöyry)

3.4 Biomass

- **Electricity from biomass needs to be trebled from 2005 level to 2020; capacity growth rates are consistent with very recent growth**

- **The significant growth of the bioenergy sector in general, will require a doubling in the supply of primary biomass, which will in turn, demands major expansion of EU biomass production, especially in the agricultural sector, and also significant import.**

- **Harmonised EU sustainability criteria for solid biomass are necessary to facilitate the growth of biomass in the electricity and heat sectors**

- **Liquid and open world markets are key to avoid biomass supply gaps.**

3.4.1 Biomass in the electricity sector

Capacity growth:
2005 capacity (NREAPs): 15.7GW
2020 capacity (NREAPs): 43.3GW
2005-2008 capacity growth (EUROSTAT): 2.0GW/year
2010-2015 capacity growth (NREAPs): 1.9GW/year
2015-2020 capacity growth (NREAPs): 2.0GW/year
Production growth:
2005 (NREAPs): 67.2TWh
2010 (NREAPs): 114.3TWh
2020 (NREAPs): 231.9TWh

In 2005, the total capacity of biomass power generation in the EU was 15.7 GW, with the highest capacity in Germany (just over 3GW), followed by Sweden (2.5GW) and Finland (2GW). According to the NREAPs, 2010 already saw 23.6GW in place (real data is not yet available), whilst the ambitions for reaching the 2020 renewables target would see an increase to 43.2GW.

As indicated in the box above, this growth rate is broadly consistent with the historical growth of biomass capacity in the period 2005-2008. However, the figure below shows that there is significant variation in the plans of member states to expand biomass electricity production. Poland, for example, intends to increase capacity six-fold between 2010 and 2020, Belgium plans to quadruple capacity, and many countries intend to double or triple capacity (e.g. UK, Italy, France).

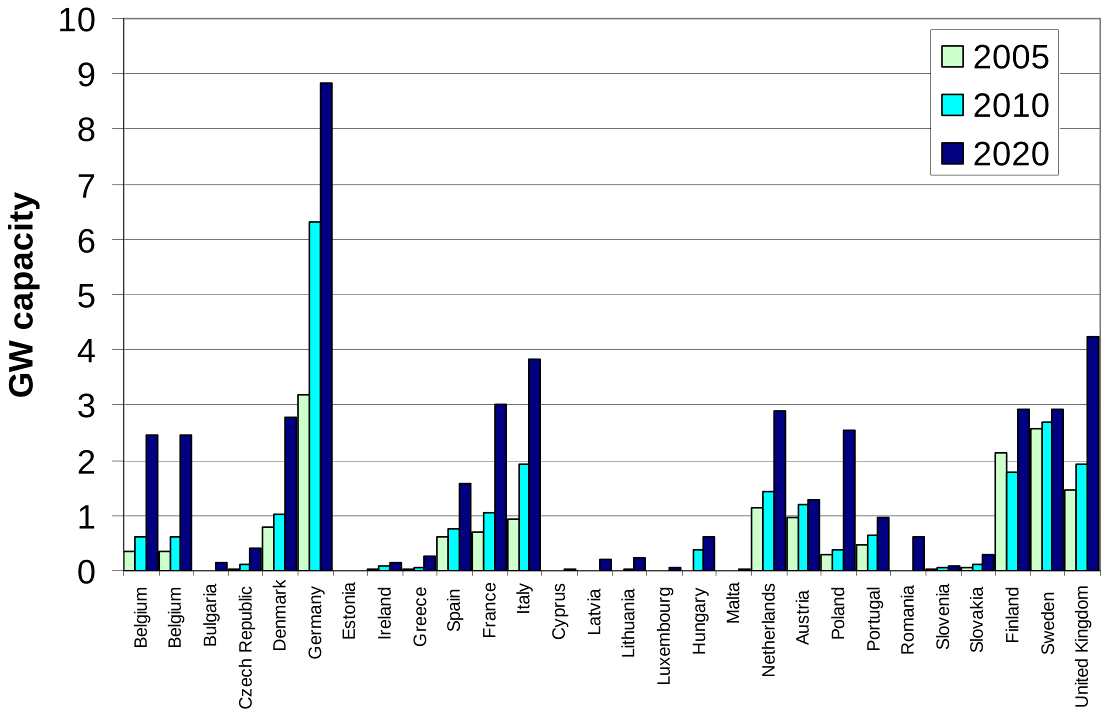


Figure 12: Biomass electricity production capacity in 2005, 2010 and 2020 in accordance with member state National Renewable Energy Action Plans [9]

This expansion in capacity is broadly consistent with the expansion in production, shown in the graph below. However, many member states appear to intend not only to expand capacity, but also to increase the average load factor of biomass plant. This pattern is notable for states such as Sweden (small rise in capacity, production almost doubled) and the Netherlands (capacity tripled, production quadrupled). There is some question as to whether this increase in load factors can be achieved, and therefore whether more biomass production capacity will need to be built to fulfil the ambitions for overall electricity production from biomass.

[9] *This figure is correct to the initial version of the NREAPs in February 2011; NB Estonia did not provide capacity figures and had not done so as of November 2011*

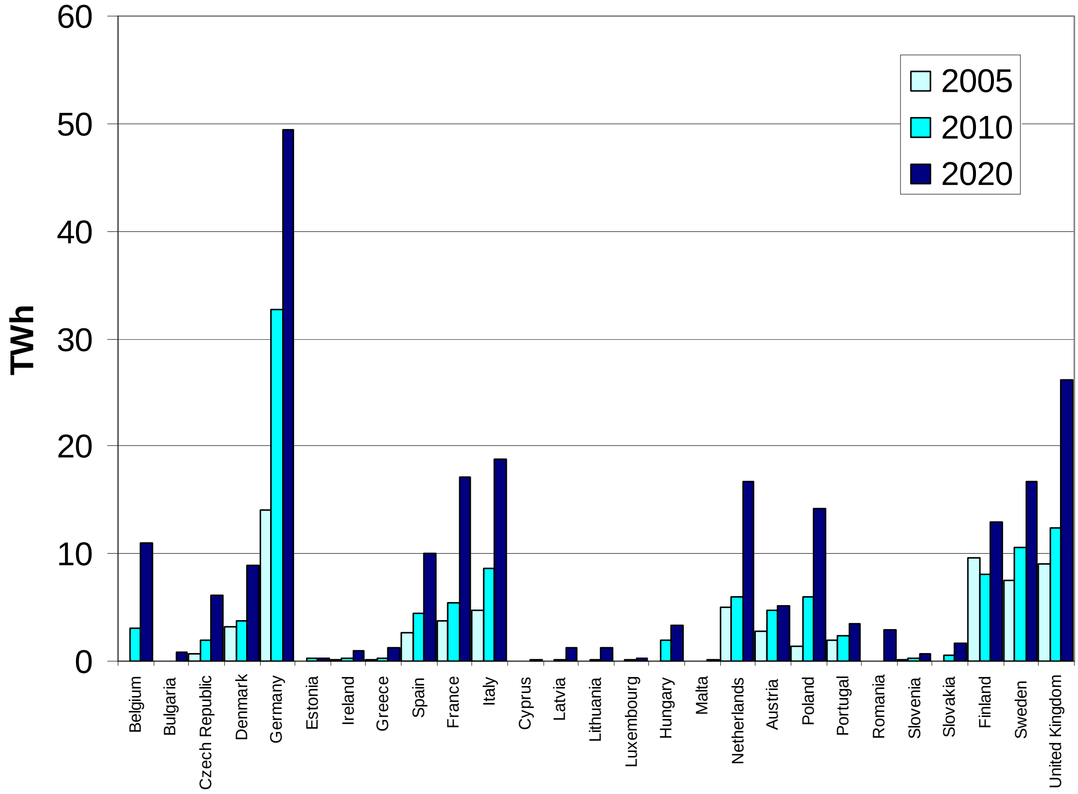


Figure 13: Biomass electricity production (TWh) in 2005, 2010 and 2020 in accordance with member state National Renewable Energy Action Plans[10]

3.4.2 Overall projections in the biomass sector

Biomass has three applications in the context of the NREAPs: it can be used to produce both electricity and heating as well as to produce biofuels for transport. The figure below show the contribution of all three forms of bioenergy towards the renewables target, in accordance with the data provided in the national plans.

The figure indicates that the greatest nominal growth is foreseen in the heat sector, with an increase from 59Mtoe in 2010 to 87Mtoe in 2020. The total use of bioenergy increases from 82Mtoe in 2010 to 135Mtoe in 2020. The greatest percentage rises are in the electricity and transport sector, where bioenergy use is foreseen to double – from 10Mtoe to 20Mtoe in the electricity sector and from 14 to 28Mtoe in the transport sector.

[10] *This figure is correct to the initial version of the NREAPs in February 2011;*

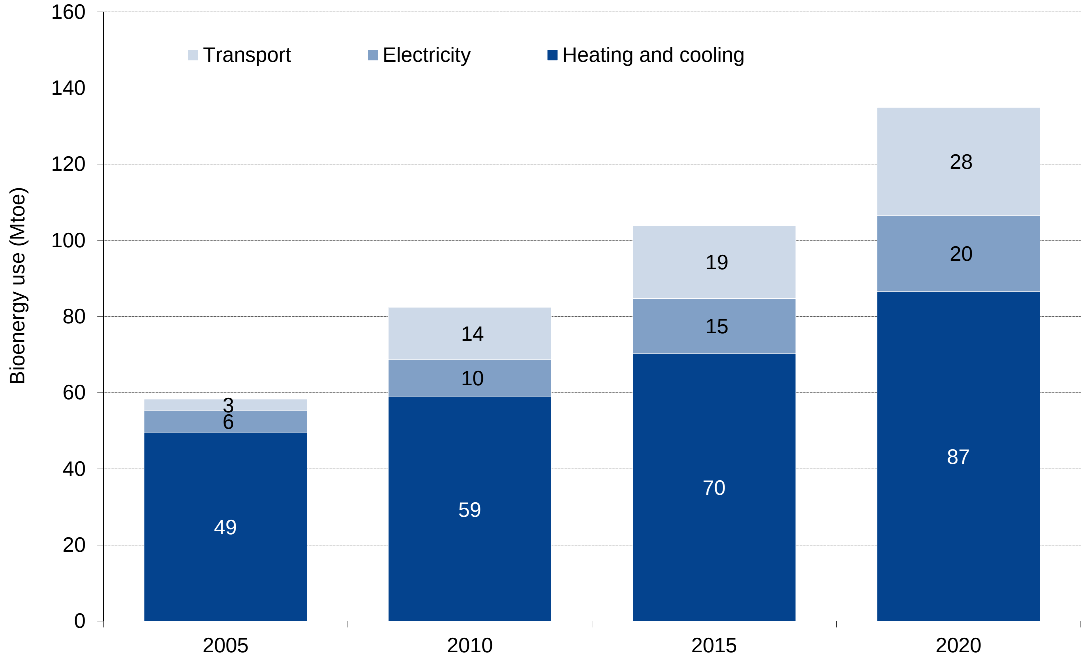


Figure 14: Bioenergy use by sector in the national plans (Source: Pöyry)

3.4.3 Biomass demand, availability and import

The analysis in this section is underpinned by a project carried out by Pöyry Energy Consulting for VGB Powertech and EURELECTRIC, entitled "Biomass imports to Europe and Global Availability", and completed in September 2011. Much greater detail on this study is contained in the EURELECTRIC report "Biomass 2020: Opportunities, Challenges and Solutions".

Biomass demand:

In quantifying the current and projected use of biomass, it is necessary to distinguish between final and primary figures for biomass use. The amount of primary biomass is defined as the energy content of the primary input fuels to the energy conversion process, whereas final energy expresses the gross amount of useful energy, e.g. electricity or heat (except in the case of transport biofuels, where only the energy content of the biofuel is counted, not the useful energy produced from it).

As described in section 3.1.2, the NREAPs provide estimates of final energy use of biomass in order to reach the national 2020 renewables targets – a total of 135 Mtoe in 2020. For this report, our primary interest concerns solid and gaseous biomass used in the electricity and heat sector, rather than liquid biofuels used in the transport sector, and we therefore focus on the final energy use of these sectors in 2020. In accordance with assumed efficiency levels, we estimate that between 146-158 Mtoe of primary biomass will be needed to produce the projected final energy of 107 Mtoe – depending on how much plant efficiency increases in accordance with the table above.

Biomass availability:

The NREAPs estimate of primary biomass supply amount to a total of 135 Mtoe in 2020. However, we consider that these estimates are too optimistic. More realistic estimates provided by Pöyry

Energy Consulting suggest a supply of 120 Mtoe in 2020, resulting in a supply gap of 26-38 Mtoe, which will need to be imported from outside the EU (as indicated in Table 10).[11]

Total final use of bioenergy electricity and heating production (NREAPs)	Total use of primary solid and gaseous biomass in electricity and heating, calculated using assumed plant efficiencies (table 9) (EURELECTRIC/ POYRY)	Estimated EU production of solid/ gaseous biomass in 2010 (EURELECTRIC/ POYRY)	Estimated EU production of solid/gaseous biomass in 2020 (EURELECTRIC /POYRY)	**Total import requirement for solid/gaseous biomass in 2020**
107 Mtoe	**146-158 Mtoe**	**82 Mtoe**	**120 Mtoe**	**26-38 Mtoe**

Table 2: Final use, primary requirement, EU production and import needs of biomass for electricity and heating according to NREAPs and EURELECTRIC/POYRY (Pöyry for EURELECTRIC/VGB, 2011)

However, this supply gap could be even larger depending on whether EU production of biomass grows in line with the projections in the table above, i.e. from about 82 Mtoe in 2010 to 120 Mtoe in 2020. As indicated in Figure 18 the main growth is foreseen in the agriculture and waste sectors. Biomass from agriculture is foreseen to grow from just under 13 Mtoe in 2010 to 36 Mtoe in 2020, and the waste sector from under 6 to almost 14 Mtoe in 2020. In comparison the foreseen growth in the forest sector is rather moderate, increasing from just under 64 to 71 Mtoe in 2020.

Biomass availability in Mtoe **Biomass sector:**	**Projection 2010**	**Projection 2015**	**Projection 2020**
Forestry	**63.7**	**68.6**	**71.4**
Agriculture	**12.8**	**18.4**	**36.3**
Waste	**5.7**	**9.5**	**13.9**
TOTAL	**82.2**	**96.5**	**121.7**

Table 3: Biomass availability by sector within EU, 2010, 2015 and 2020 (Pöyry for EURELECTRIC/VGB, 2011)

Growth in biomass production will therefore strongly depend on the development of biomass from agriculture and, inter alia, upon incentive and promotion systems in this sector. In the forestry sector, biomass growth depends on which mobilisation scheme is implemented. Whilst strong growth in this sector is not foreseen, changes in the structure of the pulp and paper sector, which reduce the availability of secondary forestry products, will present a significant challenge in itself. In the waste sector, the key determinant is development of waste management policy and public acceptance.

11 The variation of the supply gap is due to the three different scenarios for advances in plant efficiencies assumed in the calculations, as shown in Figure 18.

4. COMPARISONS OF RES DEPLOYMENT IN NREAPS WITH OTHER MODEL RESULTS

KEY POINTS:
Compared to modelling scenarios for reaching the 2020 RES targets the NREAPs show:
- a slight higher reliance on RES-Electricity than most modelled scenarios
- marginally higher ambitions for advances in energy efficiency
- in the electricity sector, a significantly higher dependence on offshore wind and solar
- compared to modelled scenarios, the capacity factors for wind in the NREAPs seem fairly realistic, but for solarpower they appear over-optimistic

4.1 Introduction and sectoral comparison

In order to evaluate the level of realism in the national plans, particularly with respect to technology mix and costs, a comparison was undertaken with a number of energy modelling scenarios to reach the 2020 targets. The modelling studies compared with the NREAPs were as follows:

1. PRIMES RSAT: Scenario for reaching the 2020 RES target including renewables trading between EU countries, according to PRIMES modelling (2008)[12]
2. PRIMES NSAT: Scenario for reaching the 2020 RES target without renewables trading between EU countries, according to PRIMES modelling (2008)[13]
3. EU Energy Trends to 2030, using PRIMES modelling (November 2010)[14]

These studies all produce results achieving the 2020 RES targets and the 20% target for reducing carbon emissions against a 1990 baseline. All studies use the PRIMES model, the main energy modelling tool used by the European Commission, and operated by the National Technical University of Athens. Scenarios 1 and 2 use the 2007 version of the PRIMES model, whilst study 3 uses the updated 2009 version.

A first comparison considered the figures for final energy demand in the NREAPs and the three modelling scenarios, shown in the figure below:

[12] *Capros et al (2008) Model-based Analysis of the 2008 EU Policy Package on Climate Change and Renewables Report for EC DG Environment*
[13] *Ibid.*
[14] *Capros et al (2010) EU Energy Trends to 2030: Update 2009 Report for EC DG Energy*

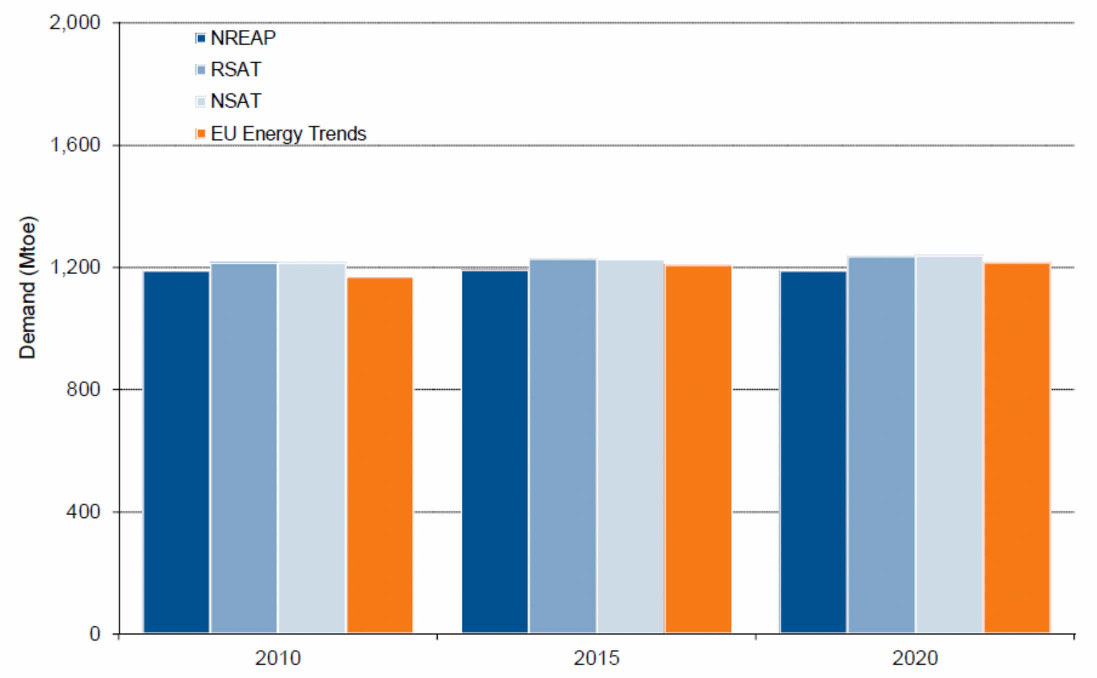


Figure 15: Comparison of final energy demand between 2010 and 2020 (Source: Pöyry)

According to this comparison, the overall demand figures in the NREAPs are slightly lower than those in any of the modelled scenarios, by the order of a few percentage points. In principal, it appears that the NREAPs assume greater levels of energy efficiency up to 2020 than the models, but the small margin of difference does not raise significant challenges to the NREAPs.

The comparison between the NREAPs and the model scenarios on the basis of ambition for the three RES sectors (electricity, heating and cooling, and transport) brings up a more interesting result: the NREAPs show significantly less ambition for RES transport than the models and a higher reliance on RES electricity than in all modelled scenarios apart from EU Energy Trends.

Mtoe	Electricity	Heating and Cooling	Transport	TOTAL
NREAP	103	112	32	247
RSAT	95	112	47	254
NSAT	99	118	40	257
EU Energy Trends	104	107	39	250

Table 4: Renewable electricity, heat, and transport comparison in 2020 (Source: Pöyry)

The remaining discussion in this section concentrates only on RES electricity.

4.2 Comparison of RES electricity technology mix

The figure below shows the RES-E technology mix in terms of generation across the NREAPs and the three modelling scenarios. A clear result from this comparison is that the NREAPs show a lower reliance on biomass power generations than the modelled scenarios (especially compared to RSAT and NSAT) and considerably more use of solar power, and to a limited extent, wind power. However, the NREAPs do show a relatively similar profile to the EU Energy Trends. Given that the latter model appears to assume lower costs for RES technologies than the RSAT and NSAT scenarios, this result could be expected.

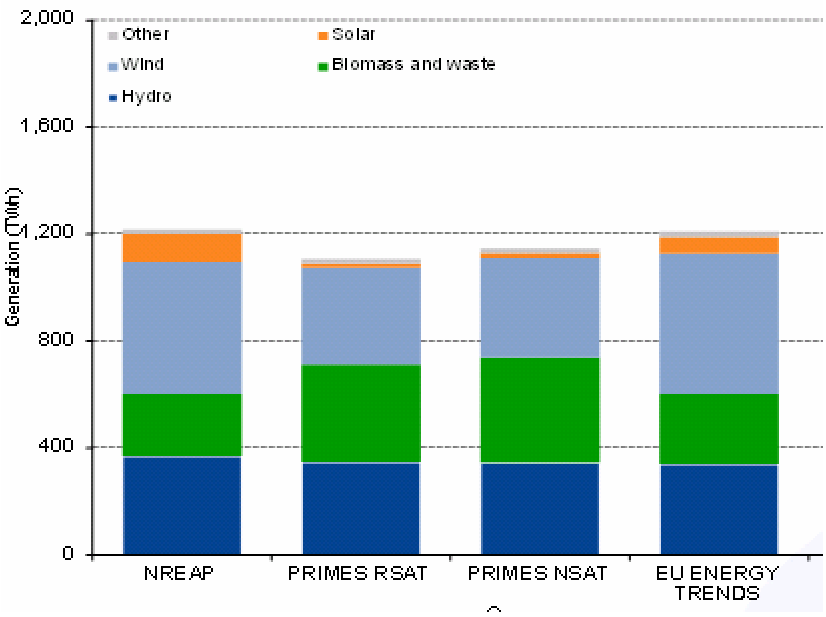


Figure 16: Production of RES Electricity capacity in NREAP compared with other projections of pathways to NREAP target (Source: Pöyry)

However, the NREAPs still show a significantly higher reliance on solar power than even the Energy Trend modelling, with 103 TWh of solar production in 2020 compared to 63TWh in Energy Trends. As solar power has very low capacity factors even in comparison to other intermittent renewables, the NREAPs' high reliance on solar partly explains why they expect considerably higher installed RES capacity in 2020 than all other models, as shown in the figure below.

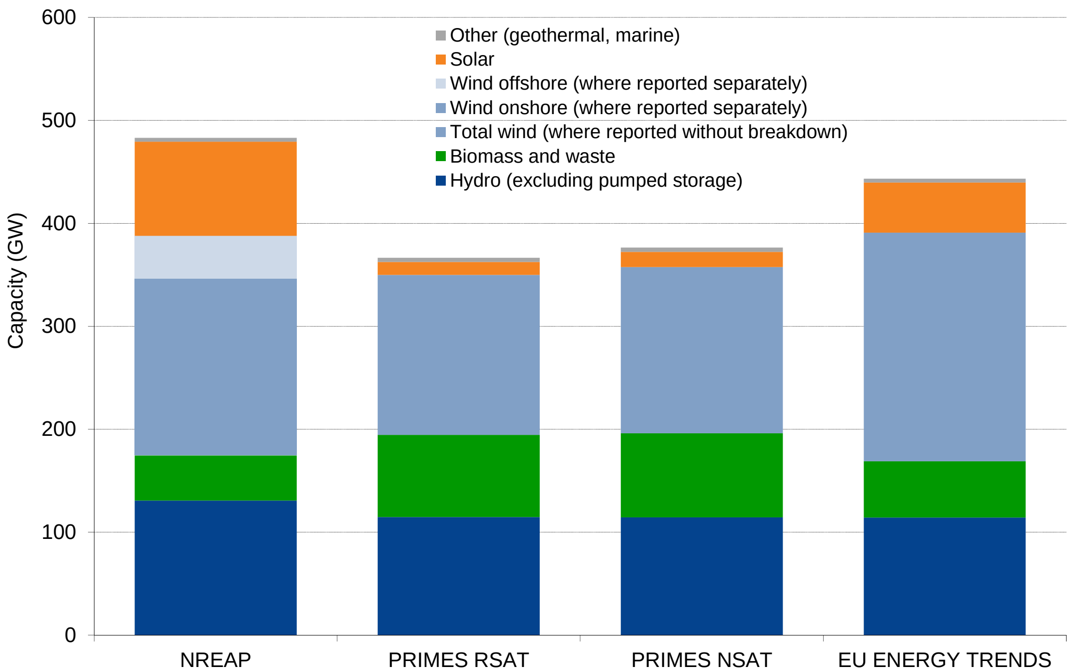


Figure 17: Comparison of RES Electricity capacity in NREAPs compared with other projections of pathway to NREAP target (Source: Pöyry)

Taking this analysis further, one can consider the assumed capacity factors for RES electricity technologies inherent on the NREAPs and the scenario results. In figures 17 and 18, the capacity factors for both wind power and solar power are compared across the scenarios, for each member state.[15]

For wind power, exact conclusions are difficult because only the NREAPs distinguish between offshore and onshore wind. As offshore wind typically has higher capacity factors due to better wind conditions, this distinction is important. However, Figure XX does indicate that the capacity factors in the NREAPs are largely comparable with those in modelling scenarios, with a number of exceptions. For countries such as Bulgaria, Hungary and Slovenia, the NREAPs show much higher capacity factors (of the order of 20%) compared to the modelled scenarios indicating factors of 10-12%. The key explanation here would appear to be that the models indicate unrealistically low capacity factors that do not reflect actual wind conditions; indeed, wind power would need extremely high subsidies to be economic at a capacity factor of 10%.

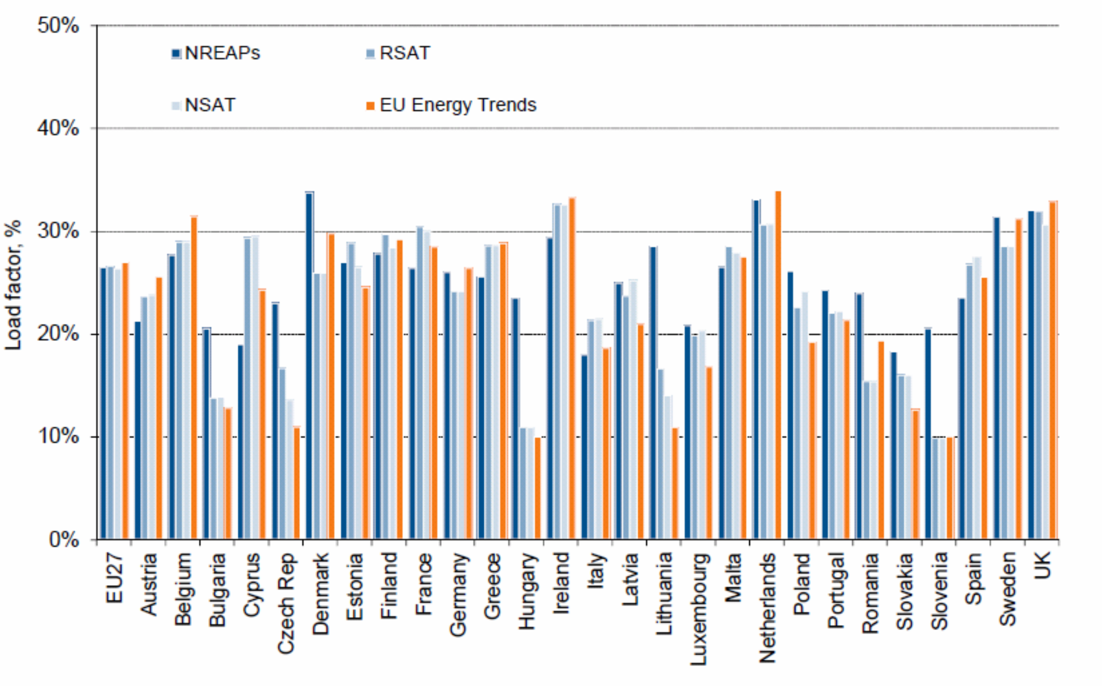


Figure 18: Capacity factors for wind-generated electricity in 2020 (Source: Pöyry)

For solar power, the comparison of capacity factors shows more differentiation. A few NREAPs appear to have entirely unrealistic assumptions compared to modelled results. This is particularly the case for Latvia and Lithuania, which assume capacity factors of over 20%. A more realistic assumption would be 6-10% as indicated in the models and by results for countries with similar solar irradiance values (e.g. Poland). The higher capacity factor in the NREAPs for countries such as Spain and Cyprus can be partly explained by their plans to utilise solar concentrating power, which typically has a higher capacity factor than solar photovoltaics.

[15] *Although a comparison to historical capacity factors can also be interesting, it can be misleading, especially in the case of wind power. This is because the NREAPs contain significantly more offshore wind than has historically been in place, while onshore sites with the best wind conditions have already been utilised and future onshore installation are therefore likely to have lower capacity factors.*

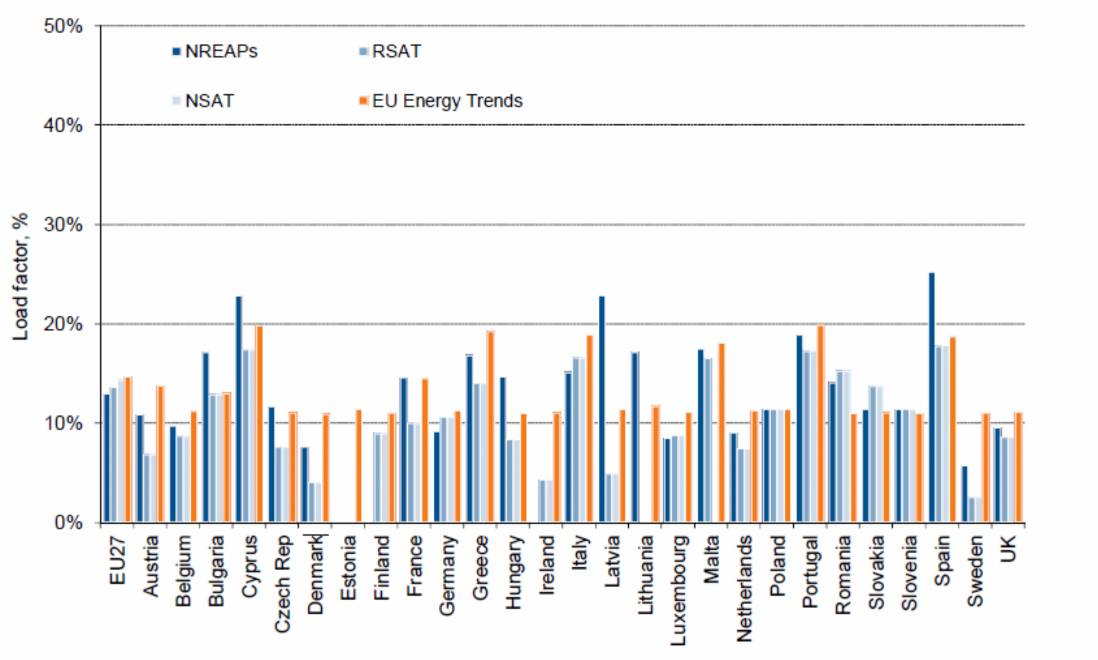


Figure 19: Capacity factors for solar-generated electricity in 2020 (Source: Pöyry)

5. COST-EFFECTIVENESS COMPARISON OF NREAPS WITH MODELLED RESULTS

KEY POINT:

Compared to modelled scenarios, the NREAPs represent a relatively costly technology mix for reaching the 2020 RES target, a significant factor being the high proportion of offshore wind – which is still at a relatively early stage of the learning curve - and solarpower.

In this section we investigate the cost implications of the NREAPs and compare these to the modelled scenarios in section 4. A key problem in making this evaluation concerns the future cost data for the different Renewables technologies and across 27 countries. The cost assumptions and detailed methodology are provided in the original consultancy report from Pöyry, publicly available on the EURELECTRIC website[16].

This analysis considers the additional levelized cost of RES-Electricity compared to the default non-renewable alternative (or 'counterfactual'). This additional cost, sometimes referred to as the 'resource cost', represents a measure of the subsidy required to encourage renewable energy over conventional energy. The cost measure here is the resource cost in 2020 alone of new renewable energy technology deployed between now and 2020. Therefore, this is the additional economic support required in 2020 for the extra renewable energy needed in 2020 (whilst in reality, such support required in one year, whereas in fact most support schemes will pay the subsidy for 15 or 20 years. Note also that this measure does not account for subsidies being paid in 2020 in respect of existing renewable energy generation; instead we are considering the additional cost to reach the NREAP targets from the 2010 position (effectively considering any renewable deployment to date as a 'sunk cost').

As shown below, the average resource cost for electricity under the NREAPs is in itself significantly higher than for other studies – the resource cost for solar PV in Germany alone is around €9bn.

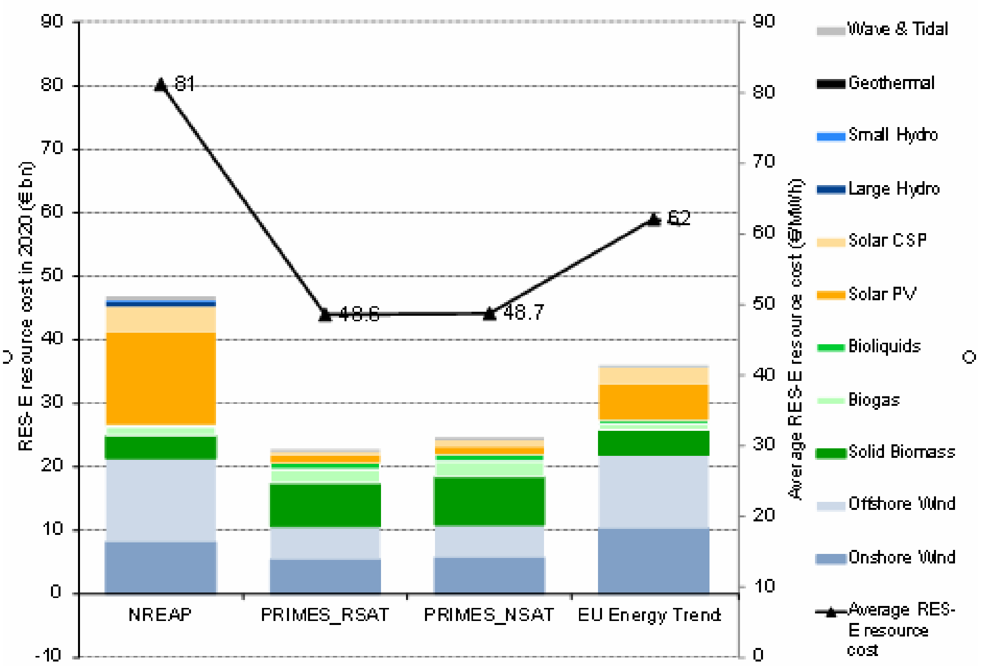


Figure 20: Comparison of resource cost of RES Electricity in 2020 according to different visions of reaching 2020 RES-Electricity target (Source: Pöyry)

[16] *Pöyry Energy Consulting (2011) An Evaluation of National Renewable Energy Action Plans Report for EURELECTRIC – available at www.eurelectric.org/RESAP*

For renewable electricity technologies, the NREAPs have the highest average resource cost of all the studies, higher even than Green-X, and around 67% higher than the cheapest Primes case. Examination of the breakdown of costs reveals that this is a result of the disproportionately high weighting of solar technologies in the NREAPs – solar is the most expensive of the those technologies which will be deployed at scale. Offshore wind, another relatively expensive technology, is also deployed more in the NREAPs than in the Primes-based studies, while cheaper technologies such as onshore wind and biomass are proportionately less well represented in the NREAPs. However, it needs to be recognized that offshore wind is still at a relatively early stage of a learning curve, and whilst there is uncertainty, significant cost reductions can be foreseen, possibly even steeper than those used as the assumed 2020 generation costs used in the modelling (the modelling assumes 21% CAPEX cost reduction and 19% OPEX cost reduction for offshore wind by 2020 compared to present costs).

The resource cost of hydro is small in all cases because there is relatively little new build and the cost of hydro is relatively cheap compared to other renewable electricity technologies. In absolute terms, the total resource cost for renewable electricity in 2020 is around twice as expensive (i.e. around €24bn more) than the cheapest Primes case, partly as a result of a higher volume of renewable electricity generation but mainly as a result of a more expensive technology mix. The NREAPs and the EU Energy Trends projection have almost identical volumes of renewable electricity, but the NREAPs are around 30% more expensive because of their more expensive technology mix.

6. POLICY MEASURES IN PLANS FOR DELIVERING TARGETS?

6.1 Support schemes

KEY POINTS:

- **With a large number of the NREAPs including targets that demand much more activity and growth rates within RES-E as well as RES-H, it is surprising to see so few changes in the proposed support schemes; the support schemes appear insufficient to reach the targets**
- **Recent lack of stability in support schemes – due either to state budget pressures or impacts on consumer prices is very concerning and has significantly affected investor confidence. The schemes must be more stable, but in many cases high cost will only be reduced by use of co-operation mechanisms an progressive integration of support schemes**

The NREAPs follow formal requirements in explaining which support mechanisms member states will use in order to reach their national target, as defined in Annex I A of the directive. The European Commission has been tasked with evaluating each individual NREAP to ensure that the plan is consistent with the overall national renewable energy target by 2020.

The description in the plans of current and planned measures has to be detailed, answering each question asked in the template: for example covering support schemes, where member states might choose between a wide range of options; or administrative procedures, planning, electricity connection or biomass policy where national administrative, legal and geographical circumstances might limit possible options.

For most NREAPs the table presenting measures for achieving the targets (Table 5 in the NREAPs) is long, with each member state presenting a wide range of measures. This section only looks at specific countries and focuses on measures for electricity. A table at the end of this section gives the current status of funding mechanisms for RES electricity and RES heating & cooling. It also shows the source of these funds – i.e. whether from customer tariffs or state budgets.

Support schemes for electricity

Looking at the overall picture of support schemes for RES electricity in the EU-27 reveals a patchwork of different measures (see figure 20). There have been significant changes in support schemes in many member states in the last years. Recently, countries like France, Spain and Germany have significantly changed their levels of support.

With a large number of the NREAPs including targets that demand much more higher growth rates within RES-Electricity as well as in RES-Heating, it is surprising to see so few changes in the proposed support schemes. In the majority of countries changes are merely small adjustments to existing measures in order to increase the investment in renewable energy technologies. However, eight countries plan to introduce new instruments for the heat sector.

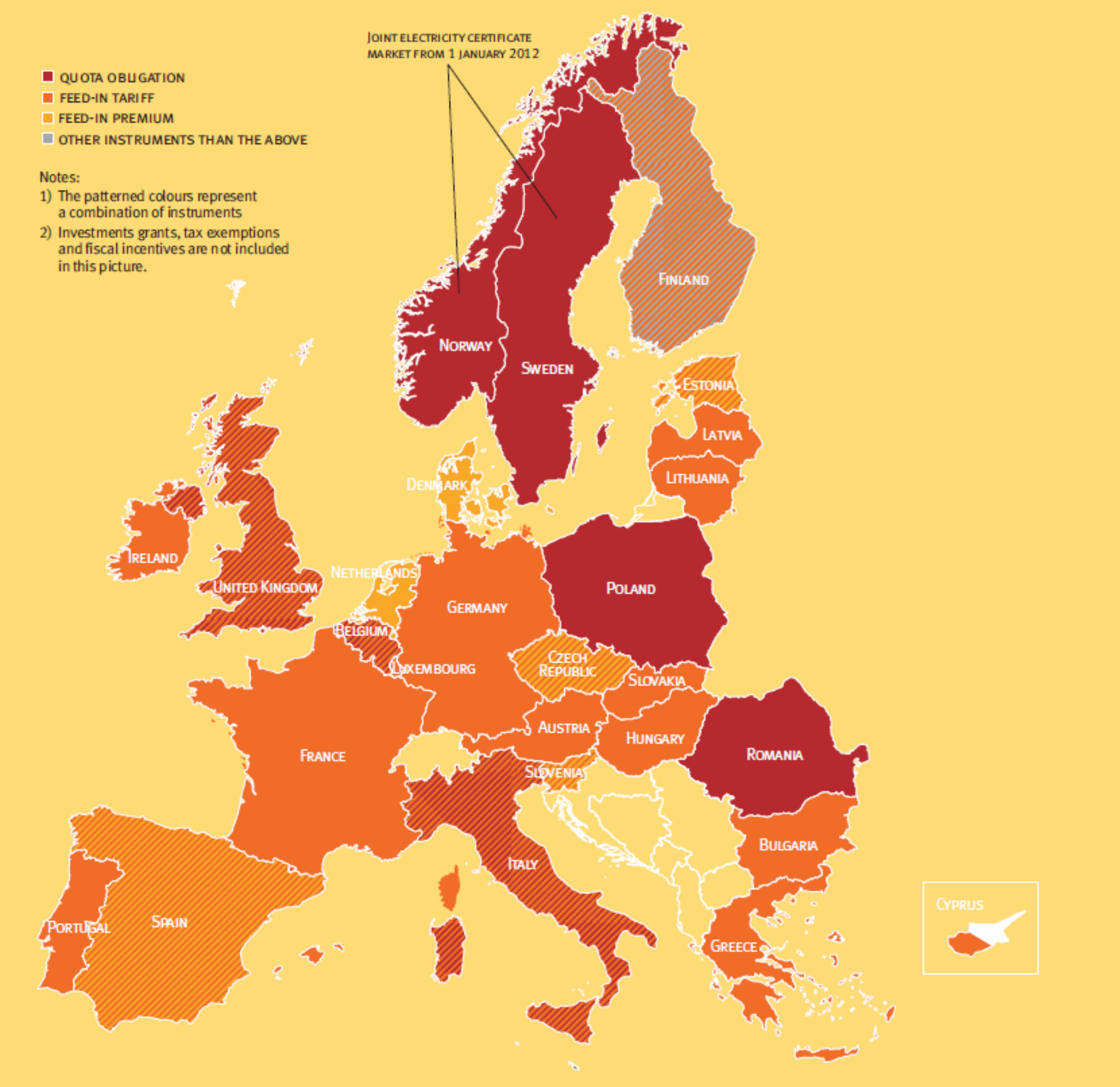


Figure 21: Illustration of main RES-E instruments in EU- 27[17]

Since the submission of the NREAPs several countries have had discussions on the financing of renewables and its impact on state budgets. In some countries this has even lead to reductions in support that are not yet reported in the NREAPs. These continuous changes are of course a result of the fast developments in the sector at the moment, but at the same time undermine the stability in financing measures that is needed for the necessary investments to take place. In order for Europe to reach its 20% renewables target by 2020, constant changes in energy policy instruments (taxes, support mechanisms for power generation and supply chains) need to stop. At present, we are most concerned in terms of investment stability with RES-Electricity support measures that have a high reliance on state budgets – given pressures on national finances. As the table below shows the main RES-Electricity support measures in 3 Member states are solely dependent on state budgets (FI, MT, NL) – while in many member states supplementary RES-E support measures such as grants and tax deductions are also in place, which are of course by definition dependent on state budgets. For RES-Heating, almost all support schemes reliant on state budgets. Despite our particular concern with budget financed measures, we also do not exclude the possibility that customer backlashes against high electricity tariffs (pushed up by RES support) will become a major source of instability in future years. As figure 21 below shows, the unit cost of RES support for all types of RES in 2009 shows very large variation between member

[17] *Adapted and updated from: Ecofys et al (2011) Financing Renewables in the European Energy Market Report to EC DG Energy*

states so there is clearly an opportunity for greater cost-efficiency by member states both by optimising existing schemes and co-operating together. Use of co-operation mechanisms, and greater progress towards common support schemes between member states would significantly reduce costs and therefore create more stability.

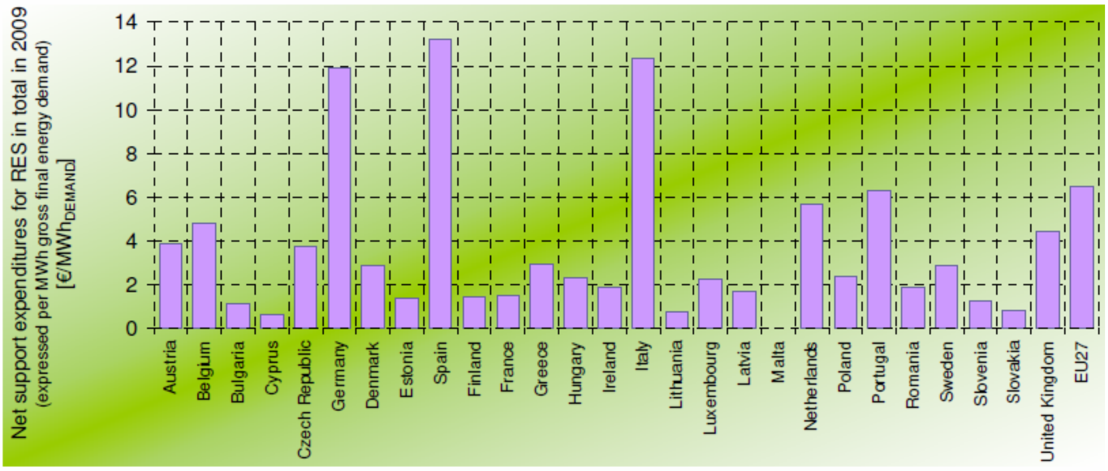


Figure 22: Net support expenditures on RES technologies (all sectors) in 2009 expressed per MWh[18]

In general, we would consider that RES-certificate/quota based support schemes would be the easiest form of support to implement as a joint system (e.g. the joint certificate system being established between Sweden and Norway, which is referred to in greater detail in section 7.3). It is therefore concerning that several member states with certificate based schemes already in place – such as Italy and UK, are actually planning to replace these scheme with feed-in tariffs in the next year (though the Netherlands plan to go in the opposite direction). However, this is not to say that joint support schemes based on feed-in tariffs by any means be impossible, just that we consider a joint certificate system to be more economically optimal than a joint feed-in tariff. The real problem is actually more in the instability of support, indeed support scheme convergence itself would be difficult in the face of such policy changes

Abbreviations used in table of support schemes on following pages:

RES-E – RES-Electricity

RES H&C – RES Heating and cooling

Add. -Additional

Colour coding in table for RES-Electricity support scheme type:

GREEN SHADING – Feed-in tariff/premium

RED SHADING – Green certificate/quota obligation

[18] *Ecofys et al (2011) Financing Renewables in the European Energy Market Report to EC DG Energy*

Member State	Primary RES-E Support Mechanism	Primary RES-H&C Support Mechanism	Cost on Consumer or State Budget
AT	**Main:** Feed-in tariff (Technology and size-specific)	Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Investment grants for small to medium hydro and liquid biomass power		State budget
BE	**Main:** Quota-based Green Certificates (with price floor)	**Main:** Investment grants for primarily small installations	RES-e: Consumer RES-h: State budget
	Add.: Investment grants	**Add.:** New support for RES-H under consideration	State budget
BG	Feed-in tariff (Technology -specific support level and duration) for all except large hydro and biomass	Investment grants	RES-e: Consumer RES-h: State budget
CY	**Main:** Feed-in tariff (Technology-specific) for large installations	Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Investment grants for small installations		State budget
CZ	**Main:** Feed-in tariff or premium (Technology-specific)	Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Tax exemptions	Tax exemptions	State budget
DK	**Main:** Premium (Technology-specific)	Tax exemptions	RES-e: Consumer RES-h: State budget
	Add.: Feed-in tariff for some technologies	Investment grants	RES-e: Consumer RES-h: State budget
EE	**Main:** Feed-in tariff (Technology-specific)	Under investigation	RES-e: Consumer

Member State	Primary RES-E Support Mechanism	Primary RES-H&C Support Mechanism	Cost on Consumer or State Budget
	Add.: Investment support for wind power		
FI	**Main:** Feed-in tariff (Technology-specific)	Plans to promote wood pellets and heat pumps	RES-e: State budget
	Add.: Investment support and subsidy for hydro		
FR	**Main:** Feed-in tariff (Technology-specific)	**Main:** Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Tax relief for small-scale solar, wind, hydro and biomass	**Add.**: Tax relief for heat pumps, biomass, solar heat	State budget
DE	**Main:** Feed-in tariff (Technology and size-specific)	Investment grants for solar, biomass heat and heat pumps	RES-e: Consumer RES-h: State budget
	Add.: Low interest loans		
GR	Feed-in Tariff (Technology and size specific)	Technology and size-specific investment grants and/or tax relief	RES-e: Consumer RES-h: State budget
HU	Feed-in tariff (Technology and size-specific)	Investment grants	RES-e: Consumer RES-h: State budget
IE	**Main:** Feed-in tariff (Technology-specific)	**Main:** Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Tax relief	**Add.:** Tax relief	State budget
IT	**Main:** Quota-based Green Certificates (differentiated assignment based on technology)	**Main:** White Certificates	Consumer
	Add.: Feed-in tariff (Technology and size-specific)	**Add.:** Tax relief	RES-e: Consumer RES-h: State budget

Member State	Primary RES-E Support Mechanism	Primary RES-H&C Support Mechanism	Cost on Consumer or State Budget
LV	**Main:** Feed-in tariff (Technology and size-specific) and planned premiums	Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Investment grants		State budget
LT	**Main:** Feed-in tariff (Technology and size-specific)	Investment grants	RES-e: Consumer RES-h: State budget
	Add.: Investment grants		State budget
LU	**Main:** Feed-in tariff (Technology and size-specific)	**Main:** Feed-in Tariff (Technology and size specific)	Consumer
	Add.: Investment support for individuals, companies and agricultural operations.	**Add.:** Investment support for individuals, companies, agricultural operations and local communities.	State budget
MT	**Main:** Investment support	**Main:** Investment support	State budget
NL	**Main:** Flexible premium (tech. specific and adjusted to wholesale prices)	**Main:** investment support for households and housing corporations.	State budget
	Add.: Fixed premium (still in use but no new grants), fixed feed-in tariffs for RES-e from fermentation, tax deductions for investments in RES-e, R&D support green energy.		State budget
PL	**Main:** Tradable green certificates (technology-neutral but banding is considered)	**Main:** Investment support and beneficial loans.	RES-e: Consumer RES-h: State budget
	Add.: Investment support for companies, local government and associations.		

Member State	Primary RES-E Support Mechanism	Primary RES-H&C Support Mechanism	Cost on Consumer or State Budget
PT	**Main:** Feed-in tariff (Technology and size-specific)	**Main:** Feed-in tariff for co-generation	Consumer
	Add.: R&D support, call for tenders	**Add.:** Tax rebates and investment support for SMEs and individuals	State budget
RO	**Main:** Tradable green certificates (technology neutral)	**Main:** Investment support for construction of RES installations and replacement of existing heating equipment	RES-e: Consumer RES-h: State budget
	Add.: Investment support for companies and local government		State budget
SK	**Main:** Feed-in tariff (Technology and size-specific)	**Main:** Investment support	RES-e: Consumer RES-h: State budget
SI	**Main:** Feed-in tariff or premium (Technology and size-specific)	**Main:** Investment support for solar (households) and biomass heating (households & companies) and district heating (companies).	RES-e: Consumer RES-h: State budget
ES	**Main:** Feed-in tariff or premium system (optional)	**Main:** Same as for RES-e for cogen + investment support for heating	RES-e: Consumer RES-h: State budget
	Add.: Investment support for new technologies and in some cases tax deductions.		
SE	**Main:** Tradable green certificates (technology neutral)	**Main:** Energy and CO2 tax rebates for biomass heating. For co-gen in addition income from TGC system.	RES-e: Consumer RES-h: State budget
	Add.: Investment support for wind power planning (local gov.), wind power pilot projects (comp.) and PV installation (anybody).	**Add.:** Investment support for replacing direct electricity heating, installation of solar heating	State budget
UK	**Main:** Tradable green certificates (differentiated assignment based on technology)	**Main:** A planned scheme for feed-in tariffs for RES heating.	RES-e: Consumer RES-h: State budget
	Add.: Feed-in tariffs (tech. specific) for households, small companies, communities and organisations to invest in low-	**Add.:** Investment support for installation of biomass heating in industry, commerce and	State budget

Member State	Primary RES-E Support Mechanism	Primary RES-H&C Support Mechanism	Cost on Consumer or State Budget
	carbon generation.	local gov.	

Sweden

In Sweden the main instrument for RES promotion is a quota system in which quota obligations are linked to the trade of certificates. The Electricity Certificates Act obliges energy suppliers to prove that a certain quota of their supplied electricity was generated from RES. Energy suppliers provide this evidence through tradable certificates allocated to the producers of RES electricity. The system applies to all RES-E, excluding waste but including peat combined heat and power. In 2010 the quota was raised from 17 to 25 TWh by 2020 in order to reach the national RES target. Introduced in 2003, the scheme is currently planned to continue until 2035.

Furthermore, electricity generated from wind energy is eligible for fiscal advantages consisting of a reduction of the real estate tax, as laid down in the Act on the Federal Real Estate Tax, and a reduction of the energy tax, as authorised by the Energy Tax Act. Investment support for wind and solar power and for heat exists (but is not planned to continue post 2012).

Denmark

In Denmark, the generation of electricity from renewable sources is promoted through many different measures depending on technology specifications like type and age. For several of the technologies a premium system is used, which provides a bonus on top of the power price received in the market. For some technologies the sum of the market price and the bonus is not allowed to exceed a statutory maximum per kWh, which depends on the source of energy used and the connection date of a given system. A guaranteed price is applied for offshore wind, solar and dedicated biogas. RES-H is exempt from energy fees. Investment support is given when replacing individual oil heaters with renewable heaters (including heat pumps).

Finland

Finland is planning to promote wind power and wood chips in energy production with feed-in tariffs. The tariffs are currently being reviewed by the European Commission, and support for renewable power generation is entirely on hold until the tariffs have been notified. It remains to be seen whether the support levels are adequate – different opinions have been expressed on this issue. Investments in fuel production will be supported by investment aid and possibly also NER300 funding. There is also support for shifting to heat pump based heating. However, the budget for that is limited.

The feed-in tariffs will be paid from state budget and it is questionable whether the Finnish state can afford all costs of support mechanisms. Like in several other countries, developments in RES costs are therefore important.

Germany

The German support system is based on a feed-in tariff, which the grid operator pays to the system operator. The costs are equally spread among all network operators, and in the end paid by the electricity customers. The tariff level is set by law and is usually paid over a period of 20 years. The eligibility criteria, the tariff level and the grid operator's obligation period vary according to the energy source.

Investment support (reduced interest on loans) is available for solar power, biomass smaller than 5MW, biogas, wind, hydro and geothermal power.

Poland

In Poland, the main means of promotion is a quota system that combines a quota obligation with a certificate trading system. The Energy Law Act obliges electricity generators and suppliers that provide electricity to customers to fulfil a specified quota of certificates of origin/ green certificates. These certificates are awarded to producers of RES electricity. RES-E receives investment support from national and EU funds and exclusion from tax excise.

Furthermore, the National Fund for Environmental Protection and Water Management grants low-interest loans to environmentally sustainable projects. This definition also covers projects involving renewable electricity generation.

In a new development, Poland is increasing support for RES-H in order to capture more of the potential in the heating sector.

Netherlands

In the Netherlands, electricity from renewable sources is mainly promoted through a price regulation in terms of a bonus payment. Furthermore, RES are promoted through subsidies and fiscal regulation mechanisms. Generators of electricity from renewable sources are exempted from the environmental tax, which is levied on electricity consumption (Ecotax). Furthermore, investments in installations that generate electricity from renewable sources are eligible for fiscal benefits (EIA).

United Kingdom

In the United Kingdom, the generation of electricity from renewable sources is regulated through a quota system based on a quota obligation and a certificate system. Electricity suppliers are obliged to supply a certain proportion of RES electricity ("quota") to their customers under the Renewables Obligation Orders. Suppliers' quotas are deemed satisfied if they present a certain number of green certificates. Furthermore, commercial and industrial users of traditional energy sources are subject to a tax called the Climate Change Levy (CCL). The Department of Energy and Climate Change (DECC) also subsidises projects in the renewable energy sector under the Environmental Transformation Fund (ETF).

The banded green certificate scheme started in 2002 will continue, in principal, until 2037. However, discussions are being put forward on more premium-like support schemes. For small-scale generation (<5 MW) a feed-in tariff scheme was introduced April 2010. The new UK Electricity Market reform plans to replace ceritificate scheme with a feed in tariff type mechanism from mid 2014, with contracts for differences from market price. The UK also plans to put in place auctions and tenders for major new generation, but this is not foreseeable much before 2020.

A Renewable heat incentive is planned to be introduced in the coming years, which would give financial support to most kinds of household renewable heat. However, no concrete initiatives have been put forward for now.

The importance of a cost efficient approach to RES Support: A cautionary tale from retroactive alterations to RES support – the Czech Republic

Due to a combination of generous rates in FITs or GB (green bonuses), technological progress and drop in start-up costs, solar deployment has for a number of member states become cost ineffective as the market overheated. In 2010 in the Czech Republic, the installed photovoltaic capacity doubled and ended at 1,958 MW (compared to 0.2 MW in 2002). The increase in electricity prices induced by so rapid development was estimated at 12% in household prices and 17 % for firms. Thus, the Czech government took a decision last autumn to take several measures to slowdown the price increase and create a monetary cushion. On the 1 January 2011, a new Act covering support of renewables came into force amending the existing Act No. 180/2005. The Act imposes a special fee on electricity produced from solar installations built after the year 2008 with the installed capacity over 30 kW in years 2011, 2012 and 2013 in the form of a 26% tax on FITs and 28% tax on GBs. Further starting from 2011, there is also a change in the FITs for installations with the installed capacity higher than 100 kW halving the state-guaranteed purchasing price down to 5,500 CZK per MWh. The Act also introduces a new fee to be paid from the land used for solar installations and, in order to fill up the mentioned fiscal cushion, a special 32% tax on the emission allowances that were allocated for free to the producers of electricity for the years 2011 and 2012. Although one can understand the necessity to control the fiscal effects of the deployment of green electricity, the above stated changes, mostly of retroactivity nature, ***significantly hamper the clarity as well as predictability of support scheme for the solar energy sector and thus do not ensure stability for investors.*** Foreign investors have already announced their readiness to claim their rights in international arbitrages and domestic investors are waiting for the decision of the Constitutional Court of the Czech Republic on the complaint submitted by the Czech Senators. This somewhat extreme example indicates the dangers of inefficient and expensive support of RES, potential backlash from consequent high electricity price rises, and subsequent damage to investment stability resulting from retroactive changes to support. Whilst retroactive change cannot be in any way justified, the key problem here is clearly designing support efficiently and economically from the outset.

France

In France, electricity from renewable sources is promoted through price regulation in the form of a feed-in tariff and tax benefits. On the regional level, renewable energy is promoted through subsidies. Operators of renewable electricity systems are contractually entitled against the suppliers (EDF and private suppliers) to payment for electricity exported to the grid. The feed-in tariff support scheme was implemented in 2000 and will continue, albeit with continuous adjustments to support levels. The scheme gives support to all RES-E, but the level and duration depends on the technology and the tender process.

RES electricity is promoted through several tax incentives. Persons investing in renewable energy systems are eligible for an income tax credit (Crédit d'Impôt). Furthermore, photovoltaic installations on buildings are eligible for a reduced VAT rate. Under certain conditions, persons installing a renewable energy system on a new building may also be exempt from real estate tax.

Investment support and reduced VAT also exist for RES-H installations.

Spain
In Spain, the generation of electricity from renewable sources is mainly promoted through price regulation. System operators may choose between two options: a guaranteed feed-in tariff or a guaranteed bonus (premium) paid on top of the electricity price derived on the free market.

6.2 Permitting – for generation and grids

KEY POINT: Planning and permitting remains a key barrier to development of both RES generation and grids; the European Commission and member states must work together to reduce these obstructions. In their first progress reports towards their 2020 target, member states should state positive intention to create a single administrative body for planning and permitting and time limits for decisions.

According to a report prepared for the European Commission[19], administrative hurdles like planning delays and restrictions, lack of coordination between different authorities, long lead-times in obtaining authorisations, and severe costs for obtaining permission are considered to be the some of the biggest obstacles for deployment of renewable energy.

However, national circumstances, as described in the NREAPs, vary quite a bit. For instance Denmark, Estonia, Cyprus, Belgium (and Ireland, Latvia, Portugal), claim that their administrative procedures contain no unnecessary obstacles or non-proportionate requirements, while France, Czech Republic, Bulgaria, Italy (as well as Latvia, Malta and Luxembourg) have found many obstacles.

Member states report long lead times for collecting permits, from 26 weeks to 10 years, with the Czech Republic claiming to have the lengthiest process. Grid processes tend to be lengthier than production installations. Some member states (e.g. Sweden) claim that grid permitting procedures are the main obstacle for developing new renewable energy installations. In most member states many authorities are involved in the administrative process. However some countries, including Denmark, the Netherlands, Cyprus and Italy, have established a one-stop shop to make the process easier for the applicant. In many member states a large part of the decisions is taken at regional and local level. This is problematic if national legislation is interpreted differently in the regions, as is the case in Italy and Sweden.

From this very brief consideration it is clear that planning and permitting remains a significantly barrier to RES generation and the necessary grid infrastructure in many countries, but that good practices do exist in a number of states. There is an excellent upcoming opportunity for member states to state their intention to follow best practice in this area. In the requirements in the Renewables directive (2009/20/EC) for the first

[19] *ECORYS (2008) Assessment of non-cost barriers to renewable energy growth in EU Member States Report to DG Transport & Energy*

progress report from Member States on their pathway to the 2020 Renewables target, states are required to notify whether it intends to establish a single administrative body responsible for processing authorisation, certification and licensing applications for renewable energy installations. In addition, it has also to state whether it will provide for automatic approval of planning and permit applications for renewable energy installations where the authorising body has not responded within the set time limits. These practices in themselves what we could consider to be current best practice in planning and permitting. We therefore consider that all member states should state their intention to implement these measures in their progress reports.

7. ROLE OF CO-OPERATION MECHANISMS

KEY POINTS

- **The low use of co-operation mechanisms in the national plans is concerning and possibly even threatens the feasibility of the target. In any case, the greater use of these mechanisms would lead to very significant cost reductions in achieving the target**
- **The development of the joint certificate schemes between Sweden and Norway is a positive development and could possibly be expanded to other member states**
- **The European Commission should establish a framework for utilisation of co-operation mechanisms and by creating a group for both member state officials *and* industry participants.**
- **The revision of the RES Directive in 2014 lead to the progressive implementation of an EU-wide opt-in RES support system which is compatible with a common European electricity market.**

7.1 Description of co-operation mechanisms allowed under the RES Directive

The Renewables Directive[20] provides for binding national RES targets to contribute to reaching the EU 20% RES target. It also encourages member states to pursue all forms of co-operation to reach the EU and the national RES targets by 2020.

This co-operation can consist of exchanging best practices or information but may also be exercised through what the text calls "new optional co-operation mechanisms between member states". These voluntary mechanisms may impact national target calculation and national target compliance.

The co-operation mechanisms are to be considered as an additional tool aiming to help member states to reach their RES target in a cost-efficient way. They imply co-operation between member states and even, under certain conditions, between member states and third countries. Operators also have a role to play in some circumstances.

The RES Directive provides for four co-operation mechanisms: statistical transfers, joint projects between member states, joint projects with third countries and joint support schemes.

Member states may use different co-operation mechanisms at the same time and have to indicate in their NREAP if they will use co-operation mechanisms to reach their national RES target[21].

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[20] *Directive 2009/28/EC on the promotion of the use of energy from renewable sources (hereafter the RES Directive)*

[21] *In the Member States NREAP, XX Member States have indicated that they will use them as provider or beneficiary.*

7.1.1 Statistical transfers[22]

Statistical transfers between member states are only possible where they do not affect the achievement of the RES national target of the member state which makes the transfer. It is a bilateral agreement covering RES-E, RES-H and/or RES-T of a duration of one year or more, to be notified to the Commission (Y+3 months) with the quantity and the price of the energy involved.
The calculation of the price of the RES energy remains rather unclear (which components will be taken into account?).

7.1.2 Joint projects[23]

Regarding RES-E and RES-H, several member states may co-operate on "joint projects" with the possible involvement of private operators.
This mechanism applies to new projects or new refurbished installations (i.e. post June 2009). It implies a notification of the agreement to the Commission, specifying inter alia the member state in whose favour the notification is being made, and the proportion and period during which the RES-E or RES-H will be counted towards the target of the other member state (this period running up to 2020).

7.1.3 Joint projects with third countries[24]

For RES-E only and under strict conditions, member states may also co-operate with third countries. As in the member states joint projects, private operators may be involved.
The RES-E produced in third countries may be taken into consideration for reaching the national RES targets if:

- it is physically transported to and consumed within the EU territory
- the RES-E has been produced by a new installation or a newly refurbished one (i.e. post June 2009);
- the exported RES-E did not benefit from a support scheme.

In the context of the construction of an interconnector with a long lead time and under strict conditions, RES-E produced and consumed in a third country may count for reaching the RES national target of member states.
As above, the EU Commission must be notified of agreements between member states and third countries.

7.1.4 Joint support schemes[25]

Two or more member states may decide on joint or partly coordinated support schemes. Member states may thus choose to harmonise their support schemes and for example recognise, where they exist, certificates issued in other member states.
This mechanism applies to both RES-E and RES-H and must be notified to the EU Commission.

Finally by December 2014, the EU Commission is to present a report where it will evaluate the implementation of the RES Directive and in particular the use of co-operation mechanisms to ensure that these mechanisms allow member states and the EU

[22] *Art. 6, Directive 2009/28/EC*
[23] *Art. 7 & 8.*
[24] *Art. 9 & 10*
[25] *Art. 11*

to reach their RES targets on the best "cost-benefit basis". Where appropriate the EU Commission could issue proposals e.g. to improve the effectiveness of co-operation mechanisms for achieving the 20% RES target by 2020[26].

7.2 Potential and use of co-operation mechanisms in the national plans

As discussed in section 2.4, the NREAPs show an overall deficit of 6.5Mtoe in 2020. Only two countries – Italy and Luxembourg – recognise that they will be in deficit and therefore need to make use of co-operation mechanisms (see Figure 22 below). Other countries such as Belgium recognise that they may be in deficit against the interim targets on the way to 2020, and therefore may need to make use of co-operation mechanisms during this period.

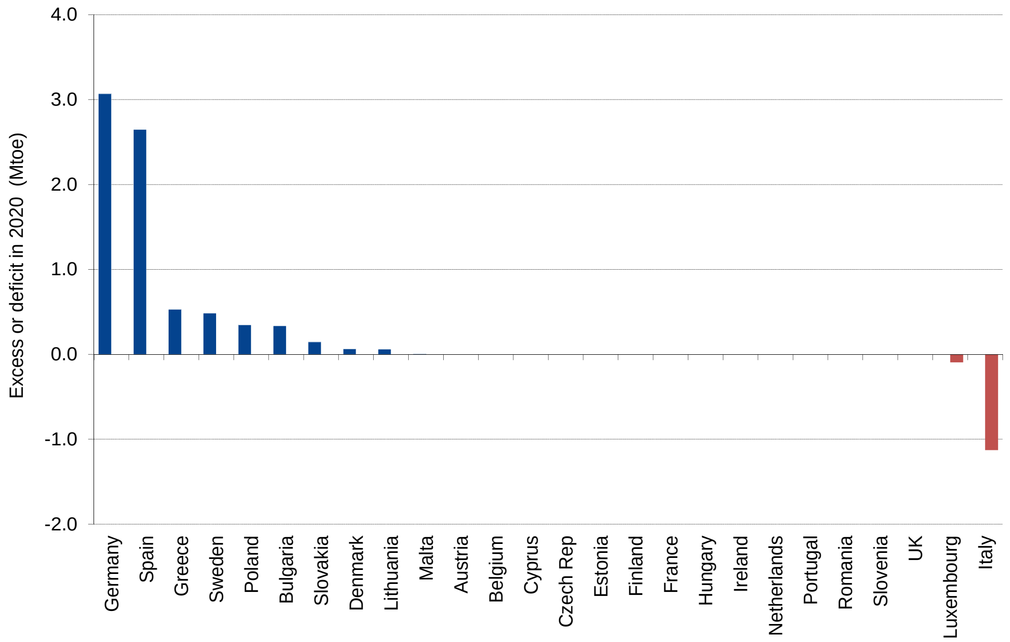

Figure 23: Reported surpluses and deficits states in 2020 (Mtoe) (Source: Pöyry)

This lack of intention to make use of the co-operation mechanisms is surprising in view of the fact that the national targets were partly defined according to GDP. This approach assumes that richer countries with lower RES resource potential could import RES towards their target from countries with higher resources. Indeed this fact is borne out by studies which look at the different costs of RES resources between member states, and similarly, the cost of member states reaching the target through purely domestic measures and through trade between member states. One such study was undertaken by Pöyry Energy Consulting for EURELECTRIC in 2008-2009. As shown in the figure below, this study indicated that a number of countries would face very high marginal RES resource costs if they attempted to reach their national target on a purely domestic basis.[27]

[26] *Art. 23 par. 8*

[27] *Principally, this is because a member state has limited availability of RES resources in its territory, forcing it to use relatively expensive technologies, and/or because the member state faces a very steep trajectory to reach its target, in which case it would need to use some technologies with shorter lead times but higher installation costs.*

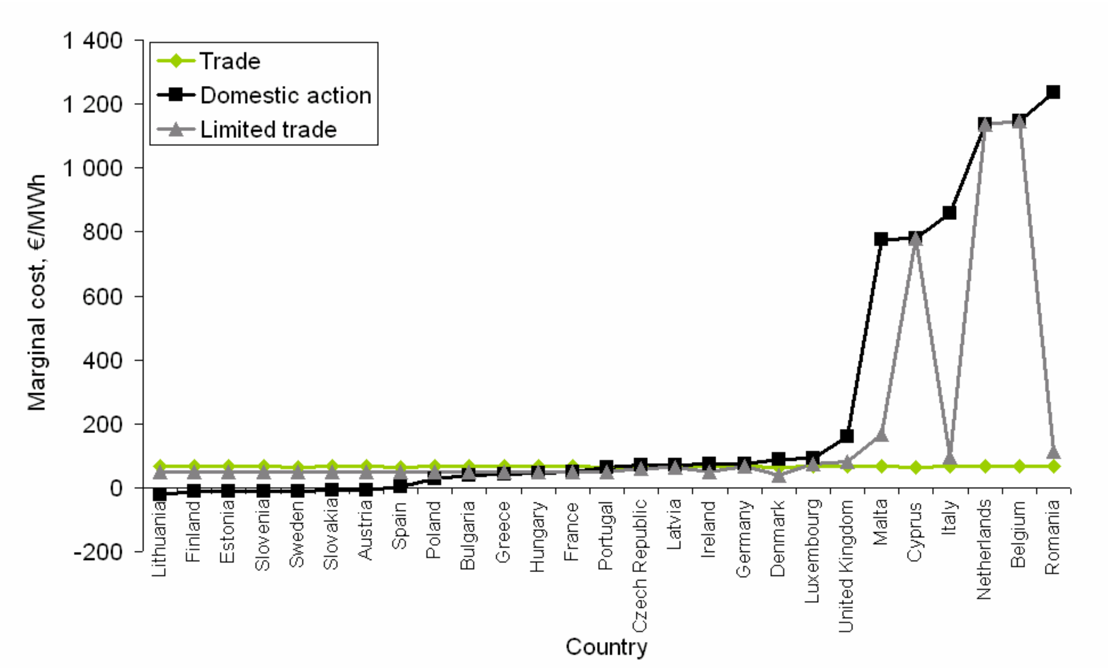

Figure 24: Country level marginal additional cost of RES-Electricity to reach overall national RES target[28]

As the figure shows, the countries facing very high costs from achieving the target on a purely domestic basis ("domestic action") include Malta, Cyprus, Italy, the Netherlands, Belgium and Romania. As mentioned above, only Italy and Luxembourg have stated that they will need the co-operation mechanisms to reach the target. It is therefore likely that the other countries will face extremely high costs to reach their target; indeed, we believe that the target for these countries is likely to be unfeasible without use of the mechanisms.

Another interesting finding concerns those countries on the left of the figure which could face slightly higher costs under a trading system ("trade") than using purely domestic actions. Whilst such a scenario of higher costs is unlikely given that the directive only allows for limited co-operation mechanisms rather than full RES trade, it is clear that these are the countries that could, in effect, be suitable exporters of RES. It is therefore notable that of these "low RES cost" countries, only some plan to have surpluses in their NREAPs (Sweden, Spain, Slovakia, Poland and Lithuania) while other countries with significant export potential (Finland, Estonia and Austria) do not.

In sum, the study indicated that full RES electricity trade in the EU-27 could lead to total cost savings of EUR17bn (2009 prices) in the year 2020 alone, while the limited trade scenario – more akin to the extensive use of co-operation mechanisms – would still equate to EUR13bn of savings.

In short the message is clear: full use of co-operation mechanisms, with a later progression to full RES trade, would produce significant financial savings for the EU as a

[28] Pöyry Energy Consulting (2009) *Reaching EU RES targets in an efficient manner - Benefits of trade* Report for EURELECTRIC (using EURENO model)

whole. However, for at least six member states, reaching the targets will prove extremely expensive and possibly unfeasible without the full use of the mechanisms.

7.3 Case study of co-operation mechanisms: joint certificate system between Sweden and Norway

At present, there is only one example of an imminent co-operation mechanism: a joint certificate system between Sweden and Norway. However, recognition of this as a joint support scheme for the purposes of the RES Directive is still subject to Norway, as a non-EU member state, implementing the essential parts of the directive, including enforcement of the renewables target for 2020, and full recognition of the scheme. The scheme was decided in September 2009, when the Swedish and Norwegian energy ministers agreed to set up a common green certificates scheme subsidising renewable electricity. The common scheme is set to start on 1 January 2012.

Sweden has had a green certificate scheme since 2003. It has so far resulted in 9 TWh of new renewable electricity production. The cost for the consumer during 2009 was 0.008 euro/kWh, including VAT. The aim of the Swedish scheme is to introduce 25 TWh of new renewable electricity in Sweden by 2020.

In the common Swedish-Norwegian scheme, the aim is to introduce 26.4 TWh of new renewable electricity between 2012 and 2020. Each country will subsidise 13.2 TWh. According to studies made, more than half of the new electricity production may be built in Norway due to its greater potential of relatively low-cost hydropower. However, higher cost-levels may change this estimate.

The price of green certificates is not expected to fall significantly when Norway is added to the Swedish system. Onshore wind power will set the price in the future, as it does in the Swedish system today. The bill proposing a new law for green certificates passed the Norwegian parliament in June this year. The Swedish parliament is in expected to vote on necessary amendments to national law in mid-November this year.

As stated above, before the common scheme can be implemented, Norway must agree to implement the EU RES Directive, including a national target. Negotiations are now nearly finished and the final approval of the parliament should be a formality. Norway's national renewable target, as per the directive, is fixed at 67.5%, up from today's approximately 58%. Furthermore, the EU Commission must approve the common scheme.

EURELECTRIC believes that the Swedish-Norwegian joint certificate scheme could provide a model for the use of co-operation mechanisms, and provides the possibility, in the relatively short term, be extended to other countries, particularly those in the Nordic region.

***Conclusion and recommendations*:**
Overall, we are concerned that the lack of use of the co-operation mechanisms allowed under the RES Directive seriously threatens the feasibility of the targets. We urge the

Commission to go beyond its initial attempts to facilitate the use of the mechanisms by establishing a framework for utilisation of co-operation mechanisms and by creating a group for both member state officials *and* industry participants. We would also argue for the progressive implementation of an EU-wide harmonised RES support system which is compatible with a common European electricity market

8. COUNTRY CASE STUDIES

In this section, a number of case studies on the national plans of individual member states is given, in order to give some perspective on the widely varying plans for res development adopted by different member states, and the some of the key challenges that these states will face. A number of country examples have been chosen, as follows – Finland, Germany, Italy and Spain.

8.1 Finland

Key aspects:

- *In power sector, mainly relies on biomass and windpower, biomass also for heat*
- *Forest-based biomass needs supply chain stability*
- *High 20% target for transport biofuels*
- *New feed-in tariffs funded from state budget*

In Finland, the share of renewable energy in final energy consumption was 28.8% in 2005, and the target for 2020 is 38%.

Finland plans to rely mainly on forest biomass to increase the share of renewables. The share of renewable energy in primary energy was 25% in 2005, 28% in 2008 (preliminary data) and 26% in 2009 (preliminary data). With forest biomass making up 90% of renewable energy, these changes are mainly explained by changes in fuels dependent on the forest industry's production. The majority of renewable energy in Finland today is a by-product of the forest industry.

Finland plans to increase its share of renewable energy by increasing the use of wood chips (13.5 m^3 in 2020), heat pumps (8 TWh), biofuels for transport (7 TWh, 20%), wind power (6 TWh) and, to a lesser extent, hydropower, biogas, etc. With 5.4 Mm3, a record use of wood chips in energy production was reached in 2009. Thus, the use of wood chips has increased although the total amount of forest biomass has not increased due to the forest industry's difficulties.

Finland needs to use 133 TWh of renewable energy to reach its renewables target for 2020. Final energy consumption has been estimated to be 327 TWh in 2020. Fuels dependent on forest industry production have been estimated to account for 56 TWh. Thus the extent of forest industry operations in Finland will be the most important single factor influencing whether the renewables target is reached.

Finland is planning to promote wind power and wood chips in energy production with feed-in tariffs. The tariffs are currently being notified to the European Commission, and support for renewable power generation is entirely on hold until the tariffs have been approved. It remains to be seen whether the support levels are adequate – different opinions have been expressed on this issue. Investments in fuel production will be supported by investment aid and possibly also NER300 funding. There is also support for a move to heat pump based heating. However, the budget for this is limited.

The following challenges are slowing down or preventing investments in wind power and the increased use of wood chips in energy production:

- The feed-in tariffs are being paid from the state budget and it is questionable whether the Finnish state can afford all costs of support mechanisms. The development of renewables costs is thus also important. Development of a more international biomass market with high support levels in some countries may increase biomass prices in Finland. The price of wind power technology is an equally important factor.
- Both energy companies and companies in biomass supply chains are facing constant changes in energy policy instruments (taxes, support mechanisms for power generation and supply chains). There is a need for more stability.
- Availability of wood is an issue, although there are enough forests from the perspective of sustainability and other domestic uses of forest biomass. The profitability of supply chains, availability of work force and forest owners' willingness to sell are issues that need to be tackled in this context.
- Long and complicated land-use planning and permitting procedures especially slow down wind power investments.
- There are acceptance issues regarding wind power especially on the coastline where wind power generation is most profitable. Interest groups (e.g. defence forces, NGOs) have lobbied for requirements that significantly slow down or prevent investments in large parts of the country.
- Achieving the 20% target for biofuels in transport depends largely on whether investments in fuel production take place.

Significant improvements in these areas are needed for Finland to reach its renewables target.

8.2 Germany

Key aspects:

- ➢ *Main emphasis on wind and solarpower, and biomass especially in heat sector, planned surplus over target*
- ➢ *NREAP is quite consistent in reaching the defined targets in terms of support measures, but with some questions concerning the heating & cooling sector*
- ➢ *In general, there is strong political commitment and public support; however, there is growing concern with regard to costs*
- ➢ *Infrastructure, system and market integration, and the overall cost-effectiveness remain major challenges*

The RES Directive requires Germany to have a RES share of 18% of total energy consumption in 2020, starting from 5.8% in 2005.

In its NREAP, the German government expects to exceed this target and to reach nearly 19.6% in 2020. Broken down by sector, Germany is expecting a RES share of 38.6% for electricity (an increase from 5,301ktoe in the base year 2005 to 18,653 ktoe in 2020), a RES share of 15.5% for heating and cooling and of 13.2% in transport. In the respective legal provisions the sectoral targets are defined as follows: at least 30% for electricity, 14% for heating and cooling, and an increase in the share of biofuels in transport to about 12% (fixed as a 7% net reduction of greenhouse gases). The share of electricity has since been increased with the revision of the German Renewable Energy Law (EEG) in 2011 to 35%. Furthermore, one million RES-powered electric vehicles are planned to be on the road by 2020 – which using the special RES transport counting method for vehicle using RES-Electricity increases the total share of RES transport to 13.2% in 2020.

The German NREAP considers that the necessary measures and instruments to achieve the national target have basically already been established, but should be constantly evaluated and, if necessary, adapted or developed further. The NREAP announces a focus on the greater system integration of RES (more demand-oriented power feed-in, load management and direct marketing of RES electricity) as well as the adaptation of grid connection requirements, grid reconstruction and development, and the promotion of storage technologies.

In the **electricity sector**, the Renewable Energy Act (Erneuerbare Energien Gesetz, EEG), amended in 2011, is the key instrument for delivering the target, including electricity from combined heating/cooling and power production from renewable sources (supplemented by the Combined Heat and Power Act, KWKG). Its main characteristics are the following: feed-in-tariff system with guaranteed priority access and dispatch, with guaranteed – though for new plants every year digressive – fees, depending on the energy source, the technology applied (e.g. in biomass plants) and the size of the installation (only power generation plants using exclusively renewable energy sources or mine gas), usually over 20 years (15 years for large hydro) plus start-up year, following the principle of cost-covering compensation.
In 2005, the largest contributor to the production of RES electricity was wind energy with 43%, followed by hydropower with 32% and biomass with 23%. The strongest build-up until 2020 will take place in the use of wind and solar energy. In 2020, the share of wind energy in electricity will amount to 48%. Electricity from biomass will make up 23%, electricity from photovoltaic 19% and electricity from hydropower 9%.

Germany plans to reach its target domestically. It might make use of the **co-operation mechanisms** in so far as it considers transferring the excess amount of 1.6% to other member states. But despite regarding the co-operation potential as an interesting option for the future, it does not explicitly plan to make use of it. Co-operation mechanisms have not been transferred into national legislation, yet.

Regarding **infrastructure,** the NREAP postulates that for the time being the necessary measures have already been taken, most notably requirements for grid development by operators, including optimisation and enhancement as well as grid development planning reports every two years. However, the NREAP recognises that complex planning and authorisation procedures are considered to be the main reasons for protracted planning periods and delays in infrastructure development (approx. 10 years). The Infrastructure Planning Acceleration Act (InfrastrukturplanungsbeschleunigungsG, 2006), the Transmission Lines Development Act (Energieleitungsausbaugesetz, 2009) and the Grid Development Acceleration Act (Netzausbaubeschleunigungsgesetz, 2011) introduce expeditive measures like shortening deadlines, waiver of the suspending effect of appeals, legal pre-effect of expropriation, preferential treatment of 110 kV underground cables (dependent from their costs), testing of 380 kV underground cables, realignment of the responsibility for the planning and approval process of transmission lines etc. The plan acknowledges that the effect of these measures needs to be observed.

Is the NREAP realistic?
The targets and trajectories set out in the German NREAP are very ambitious. However, it seems quite likely that the targets will be over-achieved. Germany is firmly pursuing a penetration of renewable energies as main source of energy – independently of the political parties in government. Hence, although the targets and measures of the German NREAP were already made obsolete several weeks later by the German Energy Concept until 2050, in which e.g. the target for RES-electricity for 2020 was corrected upwards to 35%, the general development is expected to favour an even higher share of renewable energies, especially given the planned nuclear phase-out to 2022.

The Renewable Energy Act (EEG) is an important factor in favour of this development, at least in the electricity sector. Despite recent modifications in particular of the tariffs for electricity from photovoltaic, the EEG generally gives investors high security and has proven its effectiveness in bringing renewable energies into the system.

However, several shortcomings exist, especially concerning the described measures in the plan, which have to be tackled if the targets should be reached:

Regarding the **electricity sector**, a very important concern are the expected system costs and therefore, in the long run, the effect on public acceptance, which has so far been very favourable. Especially due to the enormous take-up of PV, costs have recently exploded, leading to an adaptation of the tariffs for new build plans. Nevertheless, the NREAP assumption that the EEG supplement on tariffs would rise from 2 ct/kWh in 2010 to max. 3 ct/kWh has already proven to be unrealistic, as more than 3.5 ct/kWh were already reached in 2011. In the coming years more than 50% of support will go to PV, a technology which contributes only marginally to German electricity production. While the high contribution of PV in the NREAP might be feasible, questions arise as to the costs. It seems much more sustainable to make a greater use of more efficient technologies and/or the co-operation mechanisms than to continue targeting a large deployment of PV.

Taken together with the envisaged wind deployment as the most important RES source in the German plan, the issue of **system stability and security** is becoming increasingly critical. Fluctuations of 30 GW in the residual load within 12 hours already occur quite regularly; in 2020 a gradient of 50 GW is expected. The NREAP acknowledges the necessity of enhanced market and system integration but does not go into any detail. However, the discussions on the revision of the EEG in 2012 appear to be moving in the right direction.

Another aspect of this problem concerns **infrastructure** development. The German infrastructure situation has so far been satisfactory. But with a concentration of RES production in the north (wind power) and the south (photovoltaic) and with major consumption centres in the west, the stress on the grid – on the transmission as well as the distribution level – is becoming increasingly evident. The need for new built or reinforced infrastructure on TSO level was calculated around 4.500 km until 2020 (source: DENA grid study I and II). Given current lead times of approx. 10 years this will never be achieved. The measures foreseen in the NREAP are by far not enough. However, the recently amended Grid Development Acceleration Act (Netzausbaubeschleunigungsgesetz, 2011) is a step in the right direction. Gaining public acceptance will be a challenge for all players. A more investment-friendly regulatory framework that allows an accelerated and smart infrastructure development will also be crucial. Finally, stronger support should be provided for the development of storage facilities, which the current regulatory framework – e.g. for pumped hydro storage – does not stimulate. A stronger focus on R&D is also necessary.

Despite the noted potential for improvements in the electricity sector, the most critical point seems to be the foreseen trajectory for the **heating/cooling sector**, which appears unrealistic in relation to the planned measures. Already today, comparing the recent developments, there has been a lack of investment. Considering the reduction of financing tools or low budgets from the start, an important speeding-up appears unlikely.

In particular the projected use of biogas seems questionable as there is no sufficient legal framework to stimulate a significant extension. For instance, biogas only counts towards the quotas of the EEWärmeG if used in CHP and in efficient condensing boilers in existing public buildings– therefore discouraging more efficient use in efficient condensing boilers.

In sum, the NREAP is quite consistent at least in reaching the defined targets, considering most of the measures in place, the political commitment and the recent developments and discussions. However, infrastructure, system and market integration and the overall cost-effectiveness remain major challenges. The energy industry is supporting the targets of the government and has developed concrete proposals for a better system and market integration.

8.3 Italy

Key aspects:

- Particular emphasis on solarpower
- Planned import of RES via co-operation mechanisms (about 1.2mtoe)
- Need support mechanism to be based on feed-in tariffs, existing certificate-basd system to be phased out

According to its national target, 17% of Italy's final energy consumption in 2020 must be covered by renewable sources, compared to 5.2% in 2005.

According to it national plan, this means that Italy's final consumption of renewable energy in 2020 must be 22.6 Mtoe. The Renewable target will be achieved by 26.4% of electricity (8.5 Mtoe), 17% of heat and cooling (10.5 Mtoe), 10% of transport (2.5 Mtoe)

and finally approximately 1% from cooperation with Member States or non EU countries (1.2 Mtoe). Indeed, Italy is the only state other than Luxembourg planning to use co-operation mechanisms for import in this way.
The baseline projection provide 166.5 Mtoe of final energy consumption in 2020. According to a post crisis scenario the trend expected by 2020 is 145.6 Mtoe. The forecast has been based on a 10 % energy efficiency scenario with respect to the 2020 trend projection taking into consideration the economic crisis effect.
In order to achieve the 2020 target the government provided different incentive mechanism differentiated by sector.

In the electricity sector the principal support mechanisms in force concern:

- Green Certificates scheme based on a minimum obligatory quota on producers and importers for all renewable plants except solar energy. The system provides one Green Certificates for each MWh produced from renewable energy and applied different coefficient differentiated by sources. In particular biomass receive the highest benefit with an additional increase in case of local materials.

- Feed-in tariff mechanism provided for all renewable plants with capacity under 1 MW (under 200 kW for wind) as an alternative to the previous mechanism Feed-in Premium so called "*Conto Energia*" applied only to solar plants. Tariffs are differentiated by type and size of plants. The larger is the plant the lower is the incentive.

Other support provided by the Italian regulatory framework concern the renewable priority dispatch, simplified authorization procedure and bonus in case of self-consumption.
These schemes represent a consolidated mechanism within the national energy system despite the frequent changes. In particular, during 2011 the Italian government published a new decree due to an unexpected increase of PV installed capacity by end of 2010 of around 7000 MW (Gse data) not far from the 2020 national plan target (8000 MW). The new legislation foresees on one hand a reduction on tariff and on the other hand an increase of total installed capacity eligible to benefit of the promotion scheme (23 GW).

Moreover, in line with the deadline of the EU Directive 28/2009 transposition, the government approved a legislative decree (Dlgs 28/2011) that defines the revision of the incentive scheme for all renewable sources with a phasing out of Green Certificates mechanism.

The decree foresees a feed-in mechanism, with a fixed tariff for power plants with capacity lower than 5 MW, while for bigger plants an auction mechanism will be implemented. In September 2011 secondary legislation is expected to be implemented. The new mechanism will be enter into force for plants starting operation from 2013.

The revised promotion scheme for renewable sources is aimed at stabilizing the incentive with a long term horizon perspective, taking advantage of the opportunity offered of the technological improvements, in order to reach gradually the 2020 target.

In the heating and cooling sector the incentives are set at national level and includes mainly fiscal incentives and white certificate scheme. The current incentive framework must be accompanied by further promotional scheme due to the growth expected in the use of renewable in the heating and cooling sector. Indeed, the white certificate scheme must be improved by several legislative actions aimed on stabilizing the mechanism.
The new decree 28/2011 provides not only a new legislation in the electricity sector but also new measures in the heat sector in order to reinforce the current mechanism and implement new procedures .

In the transport sector, the main instrument for mobilizing renewable energy is the obligation for parties which make fuels available for consumption for automotive purposes to also make a certain portion of transport biofuels available for consumption. The intention for the future is to increase the use of renewable sources in that sector in line with sustainability criteria.

Finally the Renewable Action Plan provided a contribution from cooperation between member states and non EU countries trough an improvement and an implementation of the infrastructure connection.

With regards to the National target the Italian renewable action plan foresees a significant contribution from the electricity sector, in particular giving an important role to solar and wind technologies.

The targets set out by National Action Plan are ambitious but realistic in particular given recent events. The unexpected increase of PV installations has increased the probability to reach the target. Nevertheless, the Italian government introduced a new decree in order to allow a more gradual development of the sector and above all in order to keep down the renewable costs. Moreover a higher stability of the incentive framework could be a positive way to accelerate renewable penetration through investors.

The revised promotion scheme for renewable sources aims to stabilise the incentive within a long-term perspective, make the most of technological improvements, and contribute to reaching the 2020 target in a sustainable manner.

8.4 Spain

Key aspects:

- *Main focus on electricity sector for delivering target, reliance on RES Heating and Cooling sector significantly lower than EU average, planned overall surplus over target*
- *Main emphasis on onshore wind and solar for new RES-E development*
- *Support measures for RES-Electricity sector appear sufficient but not for RES Heating and Cooling and RES-Transport*

According to its national target, 20% of Spain’s final energy consumption in 2020 must be covered by renewable sources, compared to 8.7% in 2005.

According to the NREAP, the gross final energy consumption of Spain will be reduced by 13.8% compared to business as usual. The transport sector will contribute the most, reducing energy use by 8,729 ktoe (58.3% of reductions in Spain). Transport is followed by the electricity sector (3,547 ktoe to be saved) and by heating and cooling (savings of 1,988 ktoe). This development is markedly different from the expected overall development for the EU-27, where the heating and cooling sector will contribute most to energy efficiency.

Compared to Spain 20% target, the NREAP expects to reach 22.7%, implying a surplus of 2,649 ktoe (about 31 TWh), the fifth largest surplus of the EU member states, and 9% of the total EU surplus (22,000 ktoe).

Spain has not yet decided to use any co-operation mechanisms. The potentially preferred options are statistical transfers and joint projects with third countries.

The electricity sector is the largest contributor to the goal, contributing about 150 TWh in 2020, 58% of total renewables. In contrast, the contribution of the heating and cooling sector will be of less importance than in the other EU member states (average EU contribution of 45.2%; only 25% in Spain).

Wind onshore would be the leading RES technology for the production of electricity in 2020, overtaking the currently dominant hydro technologies.

Solar energy would become the third largest RES technology, representing an impressive development of both PV and solar concentrated given that the installed capacity was almost zero five years ago.

Government measures to achieve the targets are numerous in the electricity sector. Renewable installations may choose between two alternative types of remuneration (regulated tariff or market price plus premium). In addition, they have priority access to the grid and receive a compensation for complying with technical requisites regarding reactive energy and reaction to voltage dips.

However, support to promote the use of RES in heating & cooling and transpor lacks clarity. Existing schemes include investment subsidies to promote heating and cooling, special tax rates for biofuels for transport, and promotion programmes for energy crops (e.g. land re-use) and energy uses of forest waste. Given Spain's potential in the RES-H&C and RES-Transport sectors, particularly for biomass applications, and it can be argued that Spain should propose a more ambitious target for their development.

New forecasts in Spain show a smaller surplus than expected in the NREAP. New predictions reduce the amount of offshore megawatts, solar, and hydro. It is currently expected that Spain will reach the required 20% with a small margin above the target.

9. LOOKING FORWARD: PROGRESS REPORTS AND INTERIM TARGET COMPLIANCE

Member states are due to submit biannual progress reports concerning their development towards the 2020 RES targets. The first of these reports is due by end of 2011. The second progress report, due by end 2013 has also to report on the member state's progress towards it's first interim target, which is measures over the reference year 2011-2012 (this interim target represents 25% of the progress from the 2006 baseline towards the 2020 national target). On the basis of each set of progress reports, the European Commission has to produce a report in the following year to the European Parliament and the council.
Some of the key content of the member progress report, laid out in article 22(1) of the Renewables Directive (2009/28/EC) is as follows:

i. The overall and sectoral (electricity, heating and cooling, and transport) shares of energy from renewable sources in the preceding two calendar years (and from second progress report interim target compliance)
ii. The introduction and functioning of support schemes in respect to those set out in the Member State's national renewable energy action plan
iii. Progress made in improving administrative procedures
iv. Measures taken to ensure the transmission and distribution of electricity produced from renewable energy sources
v. Developments in the availability and use of biomass resources for energy purposes
vi. Estimated excess production of RES energy from renewable sources compared to the indicative trajectory which could be transferred to other Member State
vii. In the first progress report, the member state is also obliged to state whether it intends to establish a single administrative body responsible for processing authorisation, certification and licensing applications for renewable energy installations and provide for automatic approval of planning and permit applications for renewable energy installations where the authorising body has not responded within the set time limits

In principle, we consider that Member States should closely follow the guidelines set out in the directive for content of the progress reports, and that the Commission's subsequent report should be a close critique of the reports, pointing out lapses and insufficient aspects. In particular the report must be clear on where the member state is deviating from its national action plan and what measures are being taken to address this. From the second progress report at end 2013 the adherence to the member state's interim target trajectory must be made transparent and so deviances from this should specifically addressed. The Commission should closely analyse these reports and take appropriate action.

Furthermore, in view of the discussion throughout this report, we make a number of policy recommendations for the medium term i.e. next 5 years:

- Progressive implementation of an EU-wide harmonised RES support system which is compatible with a common European electricity market

- Proper EU-wide system approach to reaching target, tackling the synergies between member states, in particular taking into account infrastructure (especially cross-border) and back-up generation
- Revisions to the content of the progress reports, which may need to be adjusted in reaction to member state's performance in reaching their first interim target, sufficiency of other measures for reaching their national target and other issues that arise on the path to 2020

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