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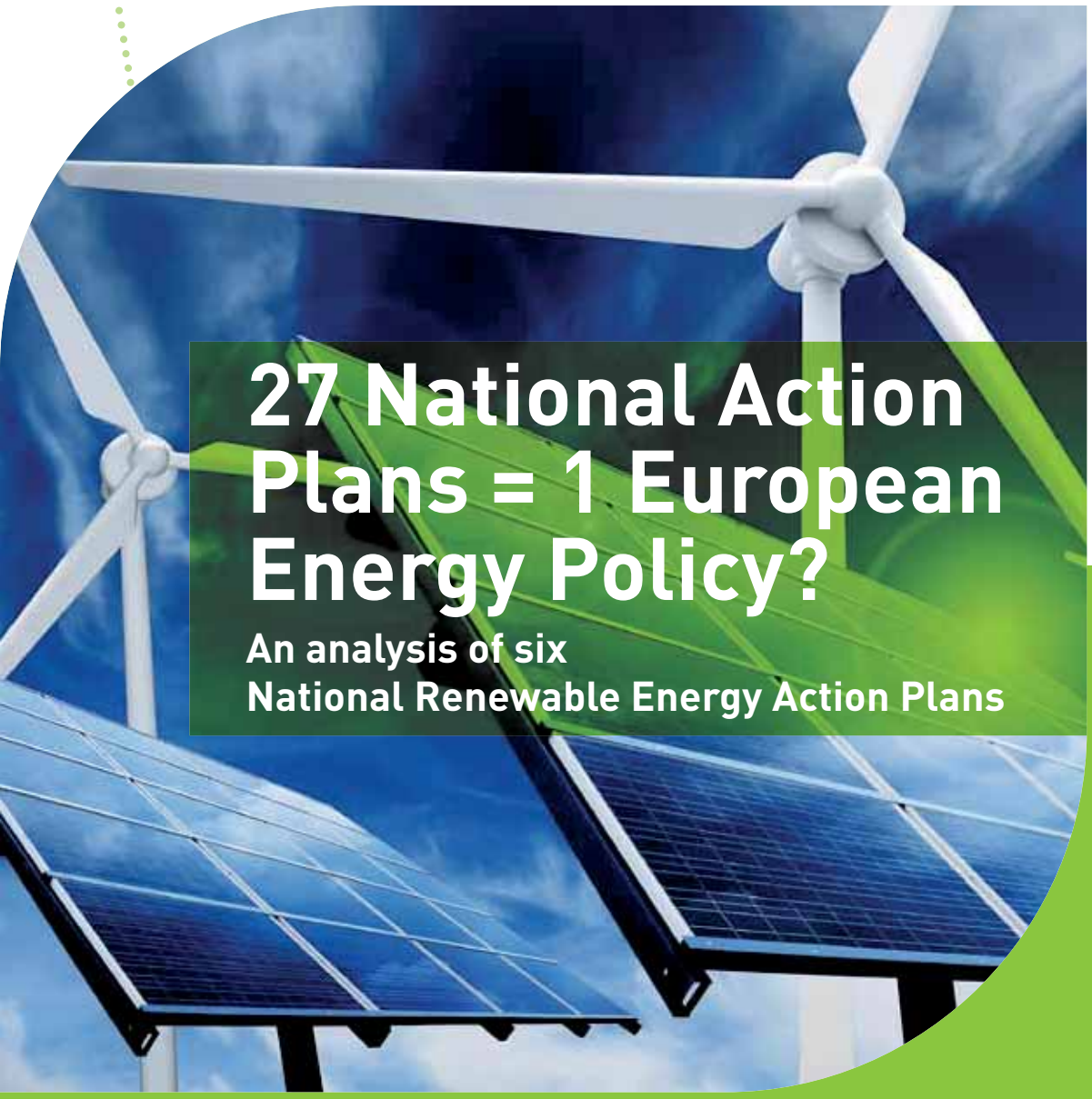

27 National Action Plans = 1 European Energy Policy?

An analysis of six National Renewable Energy Action Plans

HEINRICH BÖLL STIFTUNG

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Foreword

27 National Action Plans = 1 European Energy Policy?

The fact that Heads of States have been participating on a regular basis in the COP meetings[1] indicates the high priority that the fight to control climate change now has on the agenda of most governments. While these topics have always been at the centre of green politics, climate change and resource efficiency have now entered the core of the political discourse. Moreover, parts of the business world have realised that huge business opportunities lie in the development of new energy sources and energy efficiency technology. The share of renewable energy sources in the European energy mix is growing quickly, as is investment in renewable energy. Yet, despite transnational projects such as Desertec, offshore wind parks, and the implementation of EU rules and regulations to electricity markets, energy policies in the EU remain a domain of national competence.

The Lisbon Treaty did not bring about any shift in competency for the development and enforcement of a European energy policy, despite all the advantages a coordinated European energy policy could have, especially in respect to the development of renewable energies. A good example of this ambiguous situation is the approach to the so called 20-20-20 targets, which appears to have all the characteristics of an integrated EU Project. These targets aim to create a more resource efficient Europe by the year 2020, by decoupling economic growth from the use of resources in order to bring about a more sustainable economy. They are to be achieved by increasing the use of renewable sources, by modernising the transport sector and by promoting energy efficiency. One of the key objectives is to increase the share of renewable energies in final energy consumption in Europe from 8.5% in 2005 to 20% in 2020.

In order to meet the 20-20-20 targets however, the EU commission has defined individual targets for each member state, and it is left to the member states to develop their own national strategy to achieve these targets. As a result, 27 member states have developed 27 different action plans to reach one common European target. The potential benefits from a common approach for the European Union remain underexploited. Ideas for the creation of a European Community for Renewable Energy (ERENE) or a European Energy Community, as proposed by Jerzy Buzek and Jacques Delors, appear to have been set aside for the time being.

It is common knowledge that in the electricity industry investment decisions today will determine the energy mix for the following decades. Given this fact, it is doubtful that a strategy targeting 2020 will pave the way for a transformation of the European energy system into a system based on renewable energy sources. If we wish to tackle climate change over the long term by achieving a complete transition to renewable energies, we have to set the right course now, and we cannot confine ourselves to the 20-20-20 targets.

The Green European Foundation, as the European platform for green political foundations, has initiated the evaluation of the National Action Plans of six EU member states. Four Green political foundations have joined together to undertake the analysis - the Heinrich-Böll-Stiftung based in Germany and the Czech Republic, Cogito in Sweden, the Grüne Bildungswerkstatt in Austria, and the Stichting Wetenschappelijk Bureau Groen Links in the Netherlands. Based on the issues raised above, the analysis has focused on two main questions: firstly, do these national renewable energy action plans take into consideration the long term goal of 100% of electricity generation coming from renewable sources, and secondly, do they recognise or take advantage of the potential benefits that arise from an increased European cooperation in order to meet this goal?

We hope that with this project, and with this publication specifically, we are fostering the important debate on a common and sustainable European Union energy policy.

Pierre Jonckheer
Co-President Green European Foundation

Ralf Fücks
Co-President Heinrich Böll Stiftung

1 Conference of the Parties meetings as part of the United Nations Framework Convention on Climate Change.

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Green energy for all! The future of renewable energy in Europe
An interview with Claude Turmes MEP

The EU Directive on the promotion of the use of energy from renewable sources, decided in December 2008 and published on 23 April 2009, for the first time, set legally binding renewable energy targets for EU Member States. Each Member State was apportioned individual targets by the European Commission, and was directed to produce a National Renewable Energy Action Plan (NREAP) indicating, amongst other things, projections of how they expect to reach these targets.

The template for the NREAPs contains a number of detailed and specific questions. They thus offer a unique insight into the expected development of renewable energy in Europe over the next decade. Whilst they are formulated at a national level, they are designed in reference to European targets, and with clear implications for the EU as a whole.

In this publication, the Green European Foundation has brought together analysis of six individual NREAPs. In order to help place this analysis in the wider European context, Mats Abrahamsson, author of the Swedish analysis, spoke to Claude Turmes MEP.

Claude Turmes served as rapporteur on the 2008 Directive on the promotion of renewable energies, and as such, has a unique insight into the context in which national renewable energy action plans (NREAPs) are placed, and the role they play in encouraging renewable energy generation in Europe. In the first place, Mr Turmes believes the NREAPs to be an important tool to measure the concrete progress in favour of renewable energies in Europe. From now on, Member States will need to offer detailed information on their concrete policies to promote renewable energies. They will have to show how the required level of renewable energy will be reached, and give information on the conditions and obstacles for investors. The NREAPs will not only be evaluated by the EU Commission, the relevant local, national and European actors will also be involved in the discussion.

In discussion with Mats Abrahamson, Mr Turmes revealed his thoughts on what will be the major trends and challenges in the years to come, and the structural problems which exist today.

Mats Abrahamsson: From an EU citizen's perspective, how would you describe the state of renewable energy in the EU today?

Claude Turmes MEP: The situation is encouraging. Certain technologies like wind and photovoltaics are now moving to, what I would call, a more "mature" technological stage. As a result, cost curves are falling down rapidly, and this gives us the possibility for a broad portfolio of different types of renewable energy. On the research side, we are investing in upgrading these technologies and reducing costs; we are conducting research into the numerous issues concerning tidal and wave power.

The market reality is positive. In 2009 and 2010, wind will be the single largest area of investment in the European power sector. Wind, solar and biomass had a 65% market share of all new investment over the last two years. And the EU official energy scenario for the next 10 years which was published in October expects that at least 70% of all power sector investments will come from renewable technologies. As far as renewable energy is concerned, it is no longer just a case of talk, but of real investment.

MA: This sounds encouraging, indeed, but there are also considerable concerns, amongst academics, NGO representatives, the Green community, to name a few. What are your biggest concerns when it comes to European energy and climate policy?

CT: My biggest worry is the counter lobby effort now underway from some of the big electricity providers, such as RWE, but also from coal and nuclear lobbyists. These groups are trying to orchestrate a coordinated campaign to try to prevent the EU from moving to targets of greenhouse gas reductions of 30% by 2020, and are campaigning against the acceptance of the need for renewables within the general public and with our leaders.

MA: From your perspective as rapporteur on the renewables directive, how do you see the development of the directive in the context of European energy policy; and, three years after it came into effect, how has it has been received by Member States?

CT: Given that the directive in 2002 did not contain binding targets, we were extremely pleased when, during 2008, we were able to get an agreement on binding targets at a national level for renewable energy between the European Parliament and the 27 Member States. Moreover, it is a directive containing a lot of other important elements. In addition to the requirement for Member States to produce detailed NREAPs, the directive introduced measures for the priority dispatching for renewable electricity (which ensures transmission system operators always give priority to generation stations using renewable sources), "one-stop shops" for planning permission, an obligation to alter building regulations in order to increase the share of renewables used in the building sector, and sustainability criteria for bio fuels. This all means that the directive of 2008 is a huge step forward for renewable energy, for climate security and for energy security in Europe. It is undoubtedly one of the most important milestones in EU energy and climate policy.

MA: What do you think are the main developments since the directive was adopted?

CT: I think what is happening now is that we are building up a more complete picture regarding the state of the renewable energy sector in Europe. As of now, 23 of the 27 action plans have been sent to the Commission. There are two main conclusions which can be drawn from the early analysis. The first is that governments will accede the minimum 20% renewable energy targets set for Europe. The second is that 99% of what is being done to encourage renewables will take place at national level, building on national support schemes, and Member States plan to make only marginal use of the cooperation mechanisms which have been proposed in the renewable directive.

MA: What is your opinion on the level of ambition contained within the NREAPs?

CT: It is too early to have a very detailed assessment of the NREAPs. The advantage of the studies contained within this publication is that we have, at least, a first analysis of some of the NREAPs. As expected, there is a mixed picture; the pre-conditions for investing in renewable energies still vary a great deal depending on the political orientation of the government. Certain governments are well organised, whilst others governments still need to develop a deeper understanding of the framework conditions which are used for renewable deployment. Once they have gained this deeper understanding, they will hopefully use it to upgrade their respective national laws with new renewable energy legislation. I would use Germany, and to a certain extent, Sweden, as positive examples of how to maximise opportunities for renewable investment. A negative example would be France, where the nuclear lobby is still largely influential over energy policy and is successfully pushing policymakers to introduce artificial administrative barriers blocking the breakthrough of renewable energies.

MA: What contribution do you think the NREAPs will make in reality to the achievement of national renewable energy targets, and do you think policy-makers are using all the tools they have at their disposal?

CT: It is very helpful that member states were forced to use the template which was drafted by the European Parliament in the directive, and then proposed in detail by the European Commission. All relevant questions are contained within these templates, such as what is the potential for renewable development, are the support schemes designed in a way so that investments will flow and are planning regimes too cumbersome and do they need revision? All of this has to be addressed by governments, and the Commission will thoroughly analyse the answers to their questions. What may still be lacking for certain countries is a vision for the period after 2020. So I think therefore, pro-renewable stakeholders will have to work on defining the type of policies which will be needed after 2020, and work on defining the longer term perspective for the sector. I basically agree with the different studies which show that it is possible for 100%, or close to 100%, of electricity to be generated from renewable sources in Europe. This longer term perspective is missing from the NREAPs, as well as a perspective on broader energy policy issues, such as the various alternative tools for stimulating the development of renewables which you mention.

MA: Regarding the use of alternative tools, what is your opinion on feed-in-tariffs, which have been deployed so successfully in Germany? What do you think the relative benefits of feed-in tariffs are compared to, say, renewable electricity certificates?

CT: Feed-in tariffs are by far the most effective way, both in cost, and in terms of volume, of promoting renewables. They are the best way to

provide security for investors and reduce capital costs. Some of the renewable electricity certificate models are catching up. The reason they are doing so however is because governments introduced banding, which accords suppliers with different levels of income based on which sources of energy are most in need of support, and you can clearly see this when you look to the example of the UK. By introducing banding, the certificate systems can overcome some of the problems they had in the beginning, when they were not technologically specific. All governments have now understood that if you want to promote renewables, you have to promote a broad portfolio, and even if you stay within a green certificate model, you have to be more technology specific.

We are surprised however that, under the pressure from certain lobbies, the Commission wants to restart the debate on whether we should harmonise at EU level the support schemes by introducing a green tradable certificate regime at the European level. This is frustrating, principally because we debated this during the formation of the directive. At that time, after analysis, we rejected the original proposal of the Commission for the guarantees of origin trading regime, because we were able to show that such a system, because it is a marginal cost system, would cost between 80 and 120 billion euro more for consumers in Europe to promote the same volume of renewables. So in this respect we took the right decision, to keep national support schemes, and not allow for billions of Euro worth speculation and windfall profits for certain generators, probably the bigger companies and also for energy traders. For this reason, the bigger energy generators and the European Federation of Energy Traders (EFET) decided to introduce a complaint against the directive. Given that this complaint will be defeated by the Commission, it is all the more surprising that Commissioner Öttinger is without caution taking up arguments from EFET. Luckily, both the EU Parliament, as indicated in its vote in November on the 'Report on Towards a new Energy Strategy for Europe 2011-2020' by Lena Kolarska-BobiÐska, and Member States, share these concerns. I am pretty optimistic that we will again have the same coalition in place to reject the Commission's move to follow the arguments of one or two lobbies who are against the use of renewables, such as RWE, and those lobbies who want to make new renewable build more expensive, in order to make windfall profits from trading, such as EFET.

MA: You mentioned earlier that you don't think Member States have a sufficiently long-term perspective in their NREAPs, what in your opinion would be needed to assert this longer term perspective?

CT: What we need now is for the renewable community and Member States to be fully involved in the discussions on the Europe 2050 roadmap. In addition to the analysis within this publication, we also have studies from the European Climate Foundation, SRU (*Sachverständigenrat für Umweltfragen*) which is the German sustainability panel, EREC (European Renewable Energy Council), Greenpeace, and from the Danish climate change panel; all of which suggest that their countries, or Europe as a whole, could run on 100% renewables. We now need to build on the scenarios contained within these studies. We also need to make EU states aware that 2020 is not the end of the story, but a beginning of a success story for Europe and its citizens.

MA: The NREAPs are all obliged to contain a section on opportunities for cooperation on a European level. How can the European Community encourage this cooperation and drive it in the right direction?

CT: I think we have to keep in mind there are four issues which are of most importance regarding what the Europe Community could do, or what the Commission could do at this moment. The first issue would be to promote infrastructure. This means getting clear picture of what kind of cross national cables would need to be built in order to speed up the market penetration of renewables, and especially to exploit wind potential. The second would be, from a financial perspective, which instruments could be used in order to lower the capital cost for renewable investments. One solution could be to set up funds with money taken from the European budget, administered by the European Investment Bank or other similar public banks, to support investments in renewable energy. This would help to diminish the risk, and significantly lower capital costs for renewables investors in Europe. The third issue is that the Commission should speed up the harmonisation of the electricity balancing markets (the markets which match supply and demand in national grids), and introduce more transparency to the balancing markets across Europe. This is because balancing markets are not sufficiently transparent at present, it is too

difficult for small scale actors to participate in them, and they have become the new cash cow of the big energy oligopolies.

In the fourth order of priority, I would then put the cooperation mechanisms. It would be welcomed if the EU Memberstates would now start to work on practical implementation of the possibilities for cooperation. The cooperation possibilities foreseen by the Directive could in some cases, for instance in the case of Sweden, lead to a faster expansion of offshore wind energy in particular. I think however that the best tool to promote cooperation would be to work on concrete cases, while also making sure that by building up cooperation mechanisms we do not put into danger national support schemes. What has to be done is to demonstrate the potential of cooperation with some practical examples. This could be done for instance with some joint offshore wind parks or one or two big biomass projects. And perhaps even realise one or two solar or wind projects with Morocco in the framework of Article 9 of the directive regarding joint projects between Member States and third countries.

MA: Could you describe your vision for a Green energy Europe, and how do you think the European Parliament can contribute to bringing this about?

CT: The vision would be that we have to use our ingenuity, and use all kinds of designs and devises, to promote much more radical energy efficiency than we have up to now. When it comes to electricity generation, we should not forget that the cheapest form electricity is the electricity which is not consumed, so we have to continue to work on minimum standards and labels for all kinds of appliances, office equipments and electric motors. We should also be more vigourous in replacing the old inefficient technologies like direct electric heating. In France alone, replacing inefficient electric heating would provide for enough energy to run all the cars in France on electricity twice over. Implementing programs to speed up the penetration of efficient electric motors into small and medium-size enterprises and industries in Europe would also be a big cost saver in a more competitive world. In the EU Parliament we recently passed new laws on building regulations prescribing that all new buildings in Europe from 2020 will have to be near zero energy standard. We also need to work on the renovation of poorly insulated buildings, where the biggest problem above all is how to lower the capital costs. The last issue is transport, for which the single most important issue will be implementing a high standard for vehicular CO_2 emissions in 2020; this should be in the region of 70 or 75 grams of carbon per kilometer. This would be the single most important measure to protect Europe from price peaks in oil in the future. After efficiency, the second most important area is renewable energy, and I expect to see great success in this regard. Already in 2020, we will have 35% of electricity in Europe coming from renewables. In 2030 we expect to see a highly flexible electricity generation sector with 55% to 65% of electricity from various renewables, alongside a significant proportion of natural gas. This would be a good platform to move to 100% renewables in Europe's power system, and from there we would be in a position to fully decarbonise the building and transport sector.

MA: Finally, what further steps should we in Europe be thinking about taking now?

The next important step is to have good national transposition of the directive itself, whilst taking lessons from the NREAPs. Following this, the question of infrastructure will have to be addressed. The third most important issue will be to lower capital costs for renewable energy. The fourth issue will be retraining the work force; and doesn't just mean the workers who will be needed for the emerging renewable energy generation sector, but architects, engineers, policy makers at all levels, and the financial community. One last issue of terrific importance is that we will need to continue the efforts of utilising renewable energy as part of the democratisation of energy policy. Renewable energy is the energy of the regions, cities and citizens *par excellence*. In January 2011 we will start an initiative where we bring together city regions, citizens and supply companies form the renewable sector, to create a real bottom up European renewables movement.

In conclusion, it is important that energy policy develops a longer-term vision that goes beyond 2020. This publication points out the areas in which further measures need to be taken so that the transformation of the energy sector is seriously addressed. The work of the EU Commission, national governments, local authorities, NGOs and, last but not least the business sector and the financial community, is required in order to ensure that the energy transition becomes reality.

We should not forget however that renewables are a big job provider. Investing in renewables and in energy efficiency in Europe is in essence replacing finance sent to often foreign, oil, gas and uranium mining companies. Investing in renewables in Europe will create jobs and investment in technology in Europe. It is clear that in the long run, the only possible way of meeting the world's energy needs will be with renewables. Continuing to keep Europe as a market leader in renewables is the best guarantee for European companies to be competitive in global energy markets. There is growing evidence that shows in the medium to long term it is possible to obtain up to 100 percent of the energy supply from renewable energy sources. Water, wind, biomass, solar and geothermal energy resources are sufficiently available, and combined with increased efforts for energy efficiency, can make the energy supply in the EU clean, safe and affordable. The technologies are available. Now we need the political will. The energy future belongs to those who focus on green energy.

Claude Turmes, Member of the European Parliament for Luxembourg's Green Party, served as rapporteur on the 2008 directive on the promotion of the use of energy from renewable sources. He is Vice President of the Greens/EFA Group of the European Parliament, and serves as the Group's energy and climate policy spokesperson.

He has been involved in Green activism though his involvement with Friends of the Earth Luxembourg since the 1980s. He was elected to office in June 1999, and since then he has been consistently pressing the case for tackling climate change and making better use of renewable energy. In addition to serving as joint rapporteur for the second directive on the liberalisation of the energy market, he is the co-initiator of the platform "Energy Intelligent Europe". In 2005, the European Parliament adopted a resolution based on the own-initiative report drafted by Claude on the share of renewable energy in the EU and proposals for concrete actions. He is currently a member of the Committee on Industry, Research and Energy, as well as a substitute member on the Committees on Internal Market and Consumer Protection and on Employment and Social Affairs.

Analysis of the NREAP-AT (Austria) – An Economical and Ecological Critique and Assessment

Erwin Mayer - September 2010
denkstatt

With support from
die grüne bildungswerkstatt

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1. Terms of reference

The National Renewable Energy Action Plan for Austria, in short NREAP-AT, is to be examined on the basis of economic and environmental criteria, taking into consideration the positions of the Greens. This study will consider short-term (to 2020) and long-term (to 2050) developments and the requirements of climate and energy policies from a green perspective. The study will examine, in particular, whether a European aim of generating 100% of electricity from renewable energy by 2050 can be achieved with the measures passed and planned in Austria and what improvements would be needed.

2. Austria's measures to achieve the EU target of 34%

The measures planned and partially already implemented by Austria to achieve the EU target of 34% final energy consumption generated in Austria by renewable sources by 2020 are cited in the NREAP-AT. Alongside other targets and measures that go beyond the remit of the NREAP-AT, these measures can essentially be divided into the following areas.

2.1. Expansion of large-scale hydroelectric power stations

A significant proportion of electricity generated in Austria has traditionally come from (large-scale) hydroelectric power stations. For over a century, this form of energy has been used for economic reasons and also because of its local availability in the Alpine region that is abundant in water and, especially after the Second World War, also along the River Danube. In the 1990s, it already constituted over 70% of total electricity production. Due to rising fossil fuel prices since then, and the resulting higher electricity prices in Europe, the production of electricity from new large-scale hydroelectric power plants in Austria once again became economically attractive to the now more liberalised European electricity market. The expansion of pumped-storage power stations to produce electricity at times of peak demand is also discussed in the NREAP-AT.[1] There have been plans for some years by the Austrian energy industry to expand large-scale hydroelectric power stations, completely independently of renewable energy and climate protection targets, which have now been included in the Austrian Energy Strategy to facilitate their political implementation.

The obstacles in the way of the expansion of large-scale hydroelectric power lay, and lie, not so much in its financial viability but rather in resistance by the nature conservation movement and the Green party (Hainburg 1984), and, more recently, in the conflict over the strict interpretation of the EU Water Framework Directive. Owing to the competitive market that already exists, the Energy Strategy does not provide for any financial subsidies for large-scale hydroelectric power with a bottleneck capacity of over 30 MW.

2.2. Green electricity act

In the electricity sector, the regulation of feed-in tariffs and, to a certain extent, the regulation of investment subsidies for green power plants is fixed in the Green electricity act. There are different levels and varying terms for fixed feed-in tariffs for electricity generation from wind turbines, photovoltaic plants, biomass/biogas and geothermal plants, and from small-scale hydroelectric power installations specified in the Feed-in Tariff Directives published by the Ministry of the Economy. After the percentage of large-scale hydroelectric power fell to just over 50% of total electricity generation, as a result of power consumption increasing on average at over 2% per year while new hydroelectric build was reduced, (subsidised) green power generation became the second-largest source of power amongst the renewable types of energy at just under 8.1%.

2.3. Solar thermal

Solar thermal power has been heavily supported at state level for decades and, alongside Greece, Austria is one of the countries with the highest square meterage of collectors per head of population. There is also support for this form of energy at all levels in the current NREAP-AT.

1 NREAP-AT in chapter 4.2.6.

2.4. Biomass heat

Like large-scale hydroelectric power, Austria has also intensively utilised the biomass available to it, thanks to its extensive forests, and has even been doing so since before the Industrial Revolution. In terms of domestic heating, this "old" form of biomass was still very much in use up to the 1980s and 1990s and was also responsible for the relatively high percentage of renewable energy generated in Austria. This "old" form of biomass that was often used for heating in multi-purpose furnaces in the home has since been massively overtaken in almost every region of Austria by the intensive expansion of natural gas networks and gas heating systems. This development was more pronounced up to the start of the new millennium than the development of "new" biomass, such as the use of wood pellet-based district heating systems. The NREAP-AT concentrates on the expansion of this "new" and primarily clean use of biomass. The percentage of heat generated from biomass therefore is only rising slowly due to these two opposing developments, with the exception, that is, of its development from 2008 onwards (see below).

2.5. Local and district heating networks

The Austrian Energy Strategy and the NREAP-AT both include measures for the expansion and funding of the use of waste heat and cooling from fossil fuel power plants, as well as from power plants using 100% renewable energy. To date the majority of the funding has gone to the operators of fossil fuel power stations in the larger conurbations.

2.6. Subsidised housing

The concept of subsidised housing was initially to create more residential property and to reduce the cost of rent and ownership (loan repayments) for people looking for housing. Nowadays, subsidised housing is financed by federal taxes, awarded by the federal states, and is currently the largest lever to influence thermal energy efficiency. Linking housing subsidies to requirements for the use of renewable energy is stated and planned in the Austrian Energy Strategy but still has to be negotiated with the federal states. Subsidised housing still plays a lesser role, in spite of subsidies for PV for instance, in the renewable energy generation sector.

3. Evaluation of the planned measures

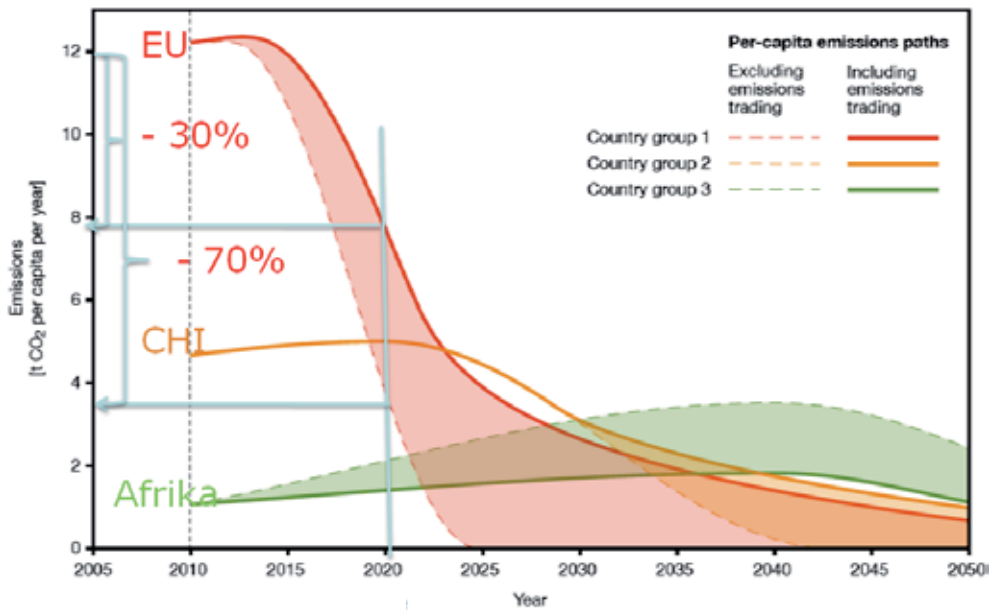
The NREAP-AT is the Austrian Government's answer to Regulation 2009/28/EC issued by the European Parliament. It prescribes that Austria must demonstrate that it can produce 34% of its final energy consumption from renewable energy by 2020. Austria must pursue an indicative and non-binding target attainment path with annual intermediate targets between 2010 and 2020. In order to ensure as broad a formal, yet only partially actual, involvement of as many stakeholders as possible, the Ministries of the Environment and the Economy have developed an Energy Strategy (www.energiestrategie.at) that serves as the basis for responding to the questions raised by the EC Template (2009/548/EC). However, this analysis and assessment not only primarily examines the responses on the part of the Austrian Federal Government to the EC Commission's questions, but also examines Austria's actual Energy Strategy for climate protection focusing on renewable energy with targets, tools and measures that have not been included in the official Energy Strategy nor in the NREAP-AT.

3.1. The EU 20/20/20 Package

The expansion of renewable types of energy is part of the EU 20/20/20 Package, which alongside the expansion of renewable energy generation to 20% also provides for a 20% reduction in greenhouse gas emissions between 1990 and 2020 as well as a 20% increase in energy efficiency.

The targets of the EU 20/20/20 Package are not capable of achieving the greenhouse gas reductions which are required by industrial nations in order to remain below the 2°C global warming figure, compared with pre-industrial figures. To do so, the EU would have to reduce greenhouse gas emissions by at least 40% between 1990 and 2020. According to calculations by Prof. Rahmsdorf,[2] the EU would have to cut emissions by 30% from 2010 to 2020 without the option of purchasing CO_2 certificates and by up to 70% with the option of emissions trading.

2 Lecture given in Vienna in November 2009.



Source: Rahmstorf, Vienna Nov 2009 with additions. Own translation.

3.2. An economic / market based approach or a sectoral and technology-specific approach?

In compliance with the provisions of the EU Template the approaches taken by the Austria Energy Strategy outlined in section 2 to achieve the 34% target are characterised by the fact that they generally provide for independent measures, mostly subsidies and standards, for each individual sector. Cross-sector and technology-neutral approaches are the exception for the most part.

By contrast, the need to reduce emissions shall mainly be achieved by setting a sufficiently high CO_2 price, whether by means of CO_2 taxes or international emissions trading. The IEA predicts in its 2008 World Energy Outlook of prices of up to 180$/t of CO_2 by 2030 being required globally in order that atmospheric CO_2 remain under 450 ppm and, thus with 50% probability, to remain below the 2°C limit for global warming. Should the EU, as part of annex 1 to the 1992 United Nations Framework Convention on Climate Change (UNFCCC), continue to accept the CBDR (Common But Differentiated Responsibility), and opt to meet the intensified requirements domestically without the additional purchase of CO_2 pollution rights, then CO_2 prices amounting to several hundred dollars per tonne of CO_2 would be needed by 2030. To date no such extrapolations have been made on this issue.

This market based solution has the advantage of being **technology-neutral** and **sector-neutral** and of leaving it up to the market to define which technologies will prevail in which sectors by 2020 or even in the long-term by 2050. Technology-specific and, even more so, sector-specific provisions and targets are preventing the possibility of achieving CO_2 emission reduction at the lowest possible cost to the national economies. Unlike investment-based funding tools, changes of behaviour can be positively influenced within companies and households using market based tools. **The rebound effects**[3] of a climate and energy policy, predominantly based on subsidies and standards that then increase greenhouse gas emissions again, can largely be avoided by this.

In view of tighter budgets and the much higher reduction targets, described above, that are needed to avert catastrophic climate change, the Greens must also take an interest in the most efficient form of climate protection, in terms of CO_2 abatement per euro of investment.

3 An excellent overview of the discussion surrounding rebound effects can be read at http://en.wikipedia.org/wiki/Rebound_effect_(conservation)

A comparative study from the USA, my.epri.com, shows how relevant the issue of the efficiency of climate protection can be for the choice of climate protection tools.

Upstream[4] CO_2 trading, comparable to an upstream CO_2 tax, is compared by EPRI[5] with the US Corporate Average Fuel Economy (CAFE).

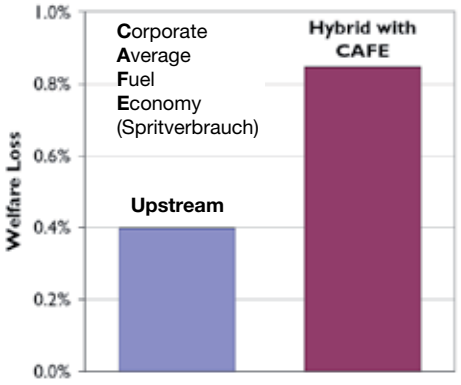


Figure 2. Welfare losses under alternative scenarios for carbon trading systems.

3.2. Technology-neutrality and nuclear energy, fossil fuel CCS

However, from a green point of view, in its rejection of nuclear energy and fossil fuel CCS,[6] relying only on CO_2 prices determined by the market runs the risk of these technologies being used to a large extent to meet carbon reduction targets and being used as the answer to climate protection. Above all, as long as the risks and external costs of these old and new risk technologies are not internalised, for instance by introducing unlimited liability regimes for the operators of nuclear power plants, or the taxation of fuel rods[7] etc., there is rather, on the contrary, a need for technology-specific climate protection tools and expansion targets.

In addition, with its 20% target for renewable types of energy the EU is also breaching the right of free choice of fuel source. There is a mandatory provision for a continuously rising percentage of primary energy sources, namely renewable energy. Nuclear energy and fossil fuels, with or without CCS, are being forced back by the expansion target for renewable types of energy and are continuing to lose market share. With this expansion target particularly in the electricity generation sector, Austria is of key significance for the European phase-out of nuclear energy. Alongside stricter liability regulations for nuclear, the expansion target is the most powerful political tool against nuclear energy.[8]

Nevertheless, it should constantly be examined, in deviating from market-based approaches, whether this is necessary for the reasons given here or whether otherwise a unified CO_2 pricing regime in Austria and in Europe, should form the core of climate and energy policies. Given sufficiently high CO_2 prices through CO_2 taxes or emission trading, further interference in the market for instance, in heating and cooling and transport policy, might not be necessary, or might even increase costs. The reason for this is that it would limit inter-technology and cross-sector decision-making options through standards, efficiency regulations and subsidy pots at all administrative levels (EU, federation, state and local authorities).

It would therefore be a feasible challenge specifically for Austria's Energy Strategy and the NREAP-AT to achieve the necessary climate protection targets without fossil fuel CCS and without imported nuclear power, which currently constitutes up to 10% of the Austrian power mix. This would mean that Austria's efforts, in terms of energy efficiency and Renewable Energy Strategy (RES), would be greater than in other EU states. Environmental associations and renewable energy associations are nevertheless calling for Austria to be generating 100% of its electricity requirements from renewable types of energy (large-scale hydroelectric power plus green energy as per the Green electricity act) by 2020 or 2030.

4 The primary carbon sources, such as oil refineries, coal reloading points, natural gas pipelines, are taxed with upstream trading, as with an upstream CO_2 tax. The price charged on carbon is then spread evenly across the entire national economy.
5 Climate brief – Upstream and Downstream Approaches to Carbon Dioxide Regulation, www.epri.com
6 The Austrian Government does not yet have a unified position on this. The Ministry of the Environment is sceptical, verging on being hostile, to the CCS approach; the Ministry for Economic Affairs, the interests of the industrial associations and the Austrian Association of Electricity Companies (VEÖ) regard it more positively. This contradiction is reflected in the Energy Strategy.
7 Here in the summer of 2010, Germany is examining and planning the introduction of a tax on fuel rods.
8 Stricter or Europeanised safety requirements introduced into the process by the Federal Government, such as Environmental Compatibility Tests (ECTs) for nuclear power plants, are regarded with a great deal of scepticism here. Historically they have not significantly contributed to the phase-out of nuclear energy; in contrast they have often helped to promote its acceptance.

3.4. Expansion target for power from renewable energy sources

Even prior to the 20/20/20 Package, the EU guideline 2001/77/EC had set expansion targets for the EU and for Austria to promote power generation from renewable energy sources in the domestic electricity market. According to these provisions, the percentage of renewables should be increased from 13.9% of gross power consumption in the EU in 1997 to 22% in 2010. National targets were also defined – the Austrian target being 78.1%.

Austria is currently significantly below 70% (verified figures to 2008). Therefore, according to the NREAP-AT report, the percentage of electricity from renewable energy sources should be increased from 60.8% in 2005 to 70.6% in 2020; 69.1% is specified for the previous target year of 2010. Although the expansion of green power plants continued specifically from 2002 to 2005 during the short phase of an uncapped Green electricity act, the average increase in electricity consumption of 2%/year on the baseline of 1997 has meant that the percentage of electricity generated from renewable types of energy has not significantly increased and the target for 2010 has been missed by some way. The Austrian Federal Government is therefore continuously emphasising that this EU target was only "indicative" and that there are therefore no legal consequences to fear from the Commission.[9]

3.5. Will Austria achieve its renewable energy target of 34%?

Austria's Federal Government is convinced that it will achieve this target and has formulated this in a reply to the EU Commission:[10]

The Austrian Federal Ministry of Economy, Family and Youth refers to your letter dated 13 October 2009, in which you allude to the duty of notification on the part of Member States by 31.12.2009 pursuant to Article 4 Clause 3 of the Directive on the Promotion of the Use of Energy from Renewable Sources.

We would advise in this respect that Austria is convinced that it can meet the objective of the respective Directive 2009/28/EC to be able to meet 34 % of its domestic gross final energy consumption with renewable energy by 2020 in accordance with the definition stipulated in the Directive.

The evaluation of the NREAP-AT, commissioned by the Federal Government, as to whether the target can be achieved with the planned measures, has not been made public nor is available at request. There are only quotes in the Climate Strategy that a number of renowned institutes would confirm the possible achievement of the target. "Expected effects: The Austrian Energy Agency, the Austrian Federal Environment Agency, Energie-Control GmbH and a consortium of the Austrian Institute of Economic Research (WIFO) have evaluated whether the targets of the Energy Strategy can be achieved with the proposed measures."[11] The report concludes that it is plausible that the targets will be achieved.

External factors have been decisive to date

The issue as to whether or not Austria achieves its expansion targets for renewable types of energy has been determined up to now, above all, by the development of oil, gas and coal prices. When the price of these fossil fuel sources increased significantly from 2005 to 2008,[12] the percentage of fossil fuels as a proportion of energy consumption fell immediately (more steeply than if energy prices in general had risen) and the percentage of renewable energy sources increased automatically. The reduction in consumption needed for a rapid rise in renewable types of energy was also achieved in a very short span of time during these three years.

In the 3 years from 2005, the percentage of fossil energy declined by nearly as much as the Energy Strategy and the NREAP-AT had planned from 2008 to 2020. The target of 34% therefore corresponds to a massive deceleration in the expansion of renewable types of energy compared to recent history, and not to increased growth rates.

9 To date there has also been an ongoing debate with the Commission about whether Austria has to achieve 78.1% of 57 TWh, corresponding to 1997 consumption levels, or whether 78.1% of the actual 2010 consumption is to be achieved, as stated by the Commission.
10 Reference No.:BMWFJ-552.800/0067-IV/2/2009.
11 Austrian Energy Strategy, page 10.
12 http://www.oilnergy.com/1obrent.htm#since88

Final energy consumption 2005, 2008 and 2020

Final energy consumption in PJ

Source: Austrian Energy Agency. Own translation.

It is worth noting here that the economy only collapsed towards the end of 2008 and that the demand for (fossil) fuels also fell sharply because of this. However, by far the major part of the decline in demand from 2005 to 2008 is due to the increase in the price of fossil fuels, even during periods of economic growth.

It is decisive when comparing the two periods, that the price elasticity in demand over a longer period of 12 years with similarly high price signals is considerably higher than over a shorter period of 3 years. This means that, with similarly high price increases, for instance due to an EU-wide or Austrian CO_2 tax, there will be a far greater decline in the demand for fossil fuel sources by 2020.

EU ETS CO_2 price

The EU ETS[13] is not questioned in the EU Commission's Template on the NREAP-AT, probably also because the reduction targets of the EU ETS that were -21% at that time, the allocation of permits or the price of permits were not in the sphere of influence of the individual member countries.[14] In spite of this, the current CO_2 price for the sectors covered by the EU ETS (which represents 40%, soon to be 50% of total EU emissions), is highly relevant for the development of renewable types of energy in the member states. The CO_2 prices for coal-fired and gas-fired power stations are also decisive in terms of expansion targets for electricity generated from renewable energies. Current CO_2 price increases from the somewhat low 15 euros/t CO_2 to 30-40 euros/t CO_2 would improve the competitive situation for the generation of renewable electricity and would, at the same time, provide an incentive for reducing electricity consumption due to higher electricity prices.

EU Energy / CO_2 Taxes

The development of the planned EU CO_2/energy tax in the area of effort sharing (the non-ETS sector) would have a decisive effect on the growth in the percentage of renewable energy, however far less than the EU ETS will have on the electricity sector.

The development of the learning curves of renewable energy technologies and the anticipated economies of scale of energy efficient (EE) and renewable energy technologies, are more influenced by global developments, in particular due to the planned initiatives in China, India and the USA.

European Water Framework Directive and FFH Regulations

There are also domestic factors which will determine whether Austria will reach its renewable energy target, such as the expansion of hydroelectric power, the handling of the European Water Framework Directive and the EU Flora Fauna Habitat (FFH) Regulations (natura 2000). With a lenient, "appropriate" and "moderate"[15]

13 European Union Emission Trading Scheme.
14 However, the Austrian Federal Government has spoken out against increasing the EU's reduction target for greenhouse gases from the current -20% to -30% by 2020 and therefore also higher reduction targets for the EU ETS.
15 Refer to http://oesterreichsenergie.at/masterplan-wasserkraft.html

interpretation of both of these regulations for nature conservation by the Federal Government and the EU Commission, Austria could significantly expand its large-scale hydroelectric power generation above the 30 MW bottleneck capacity. 7-13 TWh annual production would be, according to representatives of the Austrian Association of Electricity Companies (VEÖ) and the former Minister for Economic Affairs Mr. Bartenstein,[16] an economically reasonable expansion target. This could also be further increased with higher CO_2 prices. From a technical point of view an increase to 18 TWh would be possible.[17]

Ceiling on the Green electricity act

The 2002 Green electricity act has been amended several times but was decisively changed in 2005. From 2002 to 2005 the Green electricity act resulted in a sharp rise in the expansion of green power plants using wind, biomass, biogas and small-scale hydroelectric power plants. The use of wind energy in particular mushroomed over this period. The social partners, in this case the Federal Chamber of Commerce and the Chamber of Laout (AK), as well as the Austrian Trade Union Federation (ÖGB), demanded a cap on the financing of new renewable power plants. Following this, the Government restricted funding to 17 million euros for new plants, a figure that was raised to 21 million euros in the course of drafting the National Energy Strategy. In addition, very low feed-in tariffs were prescribed for wind energy in 2009, with the result that the funds set aside for the subsidisation of wind energy were not exhausted and Austrian wind power operators invested abroad. This led to not a single large-scale wind turbine park being built in Austria during this year.

The cap on the financing of new renewable power plants therefore makes the guaranteed achievement of renewable power targets impossible. It is also not up for renegotiation in the NREAP-AT, although the template outlined in 4.3a explicitly asks for corrections if the target is missed.

Statistical Corrections "overnight" to 28 (29)%

Austria "benefits"[18] from a new method of calculating the percentage of renewable energy. A new method for calculating hydroelectric power and bioenergy, the inclusion of the burning of fossil plastic as a renewable energy and the rapid decline in the consumption of fossil fuel energy in 2008 resulted in the 23.3% for 2007 suddenly becoming 28% and, according to many sources, even 29%[19] for 2008. The maximum percentage figure of 28% for 2020, stated in the 'Master Study'[20] (which we will come to later in more detail), was therefore already more than met in 2008, according to this calculation method and even the indicative target achievement path would be met by 2015. As a result of these recalculations it is not yet clear if the EU will increase the renewable target for Austria, based on a recalculation of the percentages in the baseline year.

3.6. What does the Austrian Federal Government want in the renewable energy sector?

On 9 December 2008, the then new Minister for Economics Affairs and former General Secretary of the Chamber of Commerce in Brussels, Reinhold Mitterlehner, commented on Austria's targets during the EU 20/20/20 Package negotiations. The Austrian Press Association report is as follows:[21]

*"Austria hopes **that the EU targets for the expansion of energy** from renewable energy sources, such as water, wind, sun or biomass will be **further reduced**. In view of the already **high share of 23.3 percent** [of renewable energy in Austria], it would be very difficult for Austria to achieve the target of 34 percent by 2020, aimed for by the Commission", stated the new Minister for Economics Affairs, Mr. Reinhold Mitterlehner, on Monday (8 December) on the verge of discussions with his EU departmental colleagues.*
Therefore the attempt was made at the EU Summit "to achieve a reduction of 34 percentage point target within the framework of an overall settlement". Admittedly Austria is not completely out

16 Hydroelectric Power Master Plan, presented on 5 May 2008 by Martin Bartenstein, Minister for Economics Affairs and President of the Association of Austrian Electricity Companies Mr. Windtner.
17 http://oesterreichsenergie.at/masterplan-wasserkraft.html
18 Every percentage point less of renewable energy is a profit, as stated by Federal Minister Mitterlehner.
19 "In Austria, the percentage of renewable energy was approximately 29% of total energy consumption in 2008." http://www.umweltbundesamt.at/umweltschutz/energie/erneuerbare/?wai=1
20 "Assessment of Austrian contribution toward EU 2020 Target Sharing Determining reduction targets for 2020 based on potentials for energy efficiency and renewables" Austrian Institute of Economic Research (Wifo), Wegener Center, Energy Economic Group at the TU Vienna, Nov 2007 P 1 Executive Summary.
21 http://www.oem-ag.at/service/news/3487612922/

on a limb with this attempt, "but it will nevertheless be downright difficult to achieve that as a whole," emphasised Minister Mitterlehner. "Every percentage point that we reduce by is beneficial to us, because it is more realistic than now". The fact that an earlier government program spoke of raising the percentage of renewable energy to 45 percent is "of no help whatsoever," he concedes....

Each percentage point of extra energy from water, wind, sun or biomass costs 150 to 200 million euros, according to the Ministry for Economics Affairs. According to an Austrian study, only an expansion to 28 percent is realistic. "As we have only one Danube and no more, it will be very difficult to actually guarantee that we can achieve the target," states Minister Mitterlehner. If the guidelines cannot be met within Austria, then Austria must purchase offsets from abroad and that would mean that there would be less funding in Austria for environmental projects. Furthermore, there are still some unanswered questions relating to the purchase of offsets that need to be clarified.

"Master Study"- 28% - Study

The Austrian Federal Government commissioned and approved the results of a study in 2007 that served primarily to prove that it would only be justifiable in economic terms for Austria to achieve a percentage of 28% from renewable energy of its total production by 2020.[22] "**A share of renewables** consistent with a scenario that meets in 2020 a 3% emissions target below 1990 and covers **28% of total energy supply** by providing 445 PJ per year."[23]

The study argued that exceeding this percentage could result in disproportionately high costs (see above) and would be damaging to the national economy. This study was considered to be an aid to arguments in the negotiations with the EU Commission and other member states, which thought that Austria was capable of achieving a higher percentage of renewable energy. For this reason, the study was compiled immediately in English and was not translated into German.

The Federal Chamber of Commerce not only relied on the favourable consideration of its concerns by Reinhold Mitterlehner, now Minister and former Deputy General Secretary of the Federal Chamber of Commerce, but also addressed Federal Chancellor Fayman in a public letter:[24]

"In terms of the mandatory minimum quota of renewable energy in the final energy consumption, it is worth pointing out that the **quota of 34% is significantly higher for Austria than the Master Study commissioned by the Austrian Federal Government had thought feasible under ideal conditions (28%)."**

Austria could thus be forced, as with the Kyoto target, to cover the shortfall by means of offset purchases from abroad instead of using this money in Austria. The key assumptions related to the economic cycle and the prices of oil and natural gas until 2020, and the non-occurrence of these assumptions following the publication of the study, seriously puts its overall results into perspective. Firstly, the sudden rise in the price of oil and gas from 2007 to 2008,[25] and approximately six months later the collapse of the real economy at the end of 2008, seriously reduced demand for fossil fuel sources in Austria. This led to lower energy consumption, to greater energy efficiency and, without further political help, led to renewable energy contributing to a significantly higher percentage of Austria's total energy use. The central statement by the Federal Government that Austria could only achieve 28%, "underpinned" by this study, was thus refuted one year after its publication by actual consumption figures. Moreover, the stated high costs associated with the expansion of renewable energy are strongly dependent on the prices of fossil fuels and the demand for investment in energy. These costs were therefore already considerably overestimated in 2008.[26]

22 At this stage there was still talk of production percentages, but only from 2008 onwards was the percentage calculated on the basis of the total energy consumption, according to EU regulations. There is now no significant difference in Austria between these two variables. Transport losses and in-house consumption by the energy producers cannot explain the difference between 28% and 34%.

23 "Assessment of Austrian contribution toward EU 2020 Target Sharing Determining reduction targets for 2020 based on potentials for energy efficiency and renewables" Austrian Institute of Economic Research (Wifo), Wegener Center, Energy Economic Group at the TU Vienna, Nov 2007 P 1 Executive Summary.

24 St0015/St/nk DW 4750 02.12.2008.

25 The price of oil rose from 70 $/bbl in 2007 to around 140 $/bbl in 2008, with the price of gas being tied to the price of oil with a delay of six months.

26 Not least because of this, EU Climate Commissioner Hedegaard proved in a current study that the cost of achieving the target of a 20% reduction in greenhouse gases by 2020 would be significantly lower than had been assumed in 2007. http://ec.europa.eu/environment/climat/pdf/2010-05-26communication.pdf

The Ministry for the Environment[27] stated the following target for renewable energy in May 2008 in the preface to a position paper entitled '**Renewable Energy in 2020**, Potential in Austria, Conclusions of the "Renewable Energy" Task Force.'

"The Austrian Federal Government has defined committed targets for renewable energy sources in the current government program. The percentage of renewable energy should therefore rise in 2010 to 25 % and in **2020 to 45 %.** The percentage of electricity from "renewables" should rise to 80 % in 2010 and to **85 % by 2020**, and in the transport sector alternative fuels should rise initially to 10% and then onward to 20 %."

These targets can be achieved, according to this paper, with an EU-compliant increase in energy efficiency (increasing energy efficiency by 20 %, corresponding to a fall in energy use by 13 % to **1,253 PJ**).

The current Austrian Climate Strategy[28] from 2010 regards the target of 34 % by 2020 as being difficult to achieve with a target total energy consumption of **1,100 PJ**. All of the national energy efficiency and renewable energy targets that go beyond the EU provisions disappeared with the demise of the old government. The current government program from December 2008 no longer includes any national targets. The conclusion by the Federal Government drawn from the numerous missed environmental targets was not to make efforts to achieve the targets, but to avoid all self-defined higher targets in future. This is why there is also no interest, as is the case in other countries, such as the UK or Germany, in defining climate protection targets up to 2050 and in introducing as high as possible percentages of renewable energy in Europe or in Austria as a means to avoid using nuclear energy.

3.7. PR and image-orientated climate and energy policies

Now that climate protection and the expansion of renewable energy have become very popular amongst the population, and are often cited as being the most important political issues in many opinion surveys, the funding policy for renewable energy has become part of mainstream political discourse, even more so during the run up to elections. Criteria, such as the number of press releases, homepages etc. and the production of images portraying the policy outcomes per euro funding in a good light, dominate the debate ahead of the efficiency and the effectiveness of the climate protection tools.

"Funded with support from..."

Climate protection tools that do not clearly show the direct link between ministries and ministers to the renewable energy projects financed by them, such as a relatively anonymous Green electricity act (ÖSG) based on the Energy Economics Group (EEG) model or an Ecological Tax Reform (ÖSR) with a CO_2 tax component, fade into the background in the light of the above mentioned debate. Affixing labels to projects saying "Funded with support from..." appears far more attractive to the Federal Government than the facilitation and release of the same amount of investment by equal and stable pricing incentives from a revised Green electricity act or an Eco-Tax. It is all about visibility and creating a clear correlation between the funder and the project they are funding.

In order to cater to this project funding logic, with the 2006 amendment to the Green electricity act, the most attractive and least harmful[29] form of renewable energy, photovoltaic power, with a peak output of less than 5 kW, was taken out of the Green electricity act and funding was provided by the Climate and Energy Fund (Klien). Funding for less attractive technologies which are only of importance to small groups of voters, for instance for photovoltaic systems with an output of more than 5 KWp, thus remained within the Green electricity act and were limited there by the Eco-Power cap.

At the same time budgets can be set aside, for instance by Klien,[30] for photovoltaic systems or electromobility,[31] that are partly used to run extensive advertising campaigns in the media.

27 "Our internal coalition unity and our position towards Brussels by Federal Chancellor Faymann and Minister for the Economy and Labour Mr. Mitterlehner" mean that the Ministry for the Environment's position has no influence on the position of Austria.
28 "The target figure for final energy consumption in Austria in 2020 is therefore 1,100 PJ" Pillars of Energy Strategy Austria, p 6.
29 With biomass plants, there is an ongoing debate, rightly or wrongly, about the production of fine dust; with wind turbines the debate is about the use of the landscape; with hydroelectric power the debate focuses on the environmental effects on the riverbed and the storage space.
30 Climate and Energy Fund.
31 Generally the Federal Government means personal electromobility i.e. cars, motor bikes, electric bikes, non-electric trains.

This means that, alongside the desired PR and image effects of the ads, favourable reporting in the editorial sections of the media can be secured at the same time. This process is then also sold by the Government as "public awareness" and information campaigns, which can be found throughout the NREAP-AT.

Image transfer by climate protection pricing

A large number of prizes and awards for climate protection, energy efficiency and renewable energy schemes serve primarily to transfer part of the excellent image of the person or company receiving the award to the policy.

3.8. Handling of clientele and special interests

The provisions for the development of the Austrian Energy Strategy were written by the Austrian social partners[32] and by specific interest groups, such as the Austrian Association of Electricity Companies (VEÖ) in relation to the expansion of hydroelectric power (Master Plan) and the high-voltage grid, and by the OMV Group in relation to the expansion of oil and gas pipelines (NABUCCO – Turkey-Austria gas pipeline). The Energy Strategy was thus not a *tabula rasa* when it came to the development of energy and climate policy. Even after the comprehensive and long stakeholder process, a number of interest groups that were closer to the larger political parties were far more successful than other stakeholders, for instance those from the field of new "alternative" energy sources, such as PV, wind and biomass, and independent environmental conservation groups. These were the interest groups which were close to government, which were privileged in terms of the release of funding.

More critical lobby groups that are independent of the Government can be pointedly disciplined through the sudden cancellation or redeployment of funding. This differentiated handling of political players would not be possible with a statutorily regulated and technology-neutral climate policy and energy policy-related tools, as was the case with the Green electricity act, based on the German Regulation for Renewable Energy (EEG) model; or with an Eco-Tax with CO_2 tax components for all source groups with a uniform CO_2 tax rate.

3.9. What do the associations for renewable energy want?

The associations for renewable energy published a study of potential and a catalogue of instruments required to meet Austria's renewable targets on 4 May 2010 parallel to the Federal Government.[33]

They also support technology- and sector-neutral instruments, such as a CO_2 tax and support efficiency regulations in the building sector. Their central demand in the electricity sector is the **lifting of the cap** on the financing of renewable power plants **within the framework of the Green electricity act**.

Outside of the electricity sector there are, mainly due to fiscal political reasons for balancing the budget, but also for climate protection reasons, sensible approaches towards "environmentalising" the taxation system in the Energy Strategy that avoids discussing the topic of revenue-neutrality.

"An Ecological Tax Reform was intensively discussed as an essential tool to achieve the goals in the energy and climate protection sector. The measures should be regarded in a revenue-side and expenditure-side synopsis. Within the framework of the Energy Strategy, there is no recommendation for the introduction of a particular tax or the implementation of a particular tax increase, but rather a recommendation to use tax reform as a means to achieve energy policy and climate policy targets and to implement this tax reform taking into account the effects on competitiveness and distribution issues."

3.10. Proposals for the improvement of the European Climate and Energy Policy in terms of the expansion of renewable energy plants

European

A Europe-wide CO_2 tax, even better than an Energy Tax, would be ideal for forcing down the percentage of fossil energy sources and significantly increasing the percentage of renewable energy. Specifically in the electricity sector, it would also need the reduction target in the EU ETS to be changed from -21% to -34% by 2020 before a CO_2 tax applicable for all sectors would take over from the EU ETS. Guaranteed Europe-wide minimum

32 "Challenges in the Energy Policy – White Paper by the Austrian Social Partners" No. 82, 2009.
33 This can be accessed at http://www.biomasseverband.at/biomasse/?cid=40973

feed-in tariffs for renewable types of energy are needed to prevent nuclear energy and fossil CCS from winning a greater market share, this would also result in the available investment capital being used beyond national borders to find and use the best locations and technologies.

The **"common achievement of targets"** and cooperation of members states in the expansion of renewable energy provides advantages and disadvantages that need to be weighed up.

Advantages: The cheapest production costs at the best locations, for instance wind turbines on the Atlantic coast, PV and CSP in Southern Europe, can be employed to lower power generation costs per KWh. The option of selling "surpluses", that is over-fulfilled percentages of renewable energy, to other members states for remuneration, creates additional income and earning sources for states with a high potential for renewable types of energy.

Disadvantages: This could reinforce the trend towards centralisation (large wind parks, large solar plants, large distances to electricity customers) and could make a greater and expensive renovation and expansion of the high-voltage electricity grid necessary. Acceptance by the population to support renewable types of energy via higher electricity prices or via higher taxes could recede if the positive economic effects of the financed expansion take place "elsewhere" in the EU rather than at home.[34] In addition, an incentive could be created by the possibility for future trade in renewable energy certificates, to stipulate as low expansion targets as possible in EU negotiations, for instance post-2020, in order to be able to sell more renewable energy certificates as a result.[35]

In spite of the undeniable potential of European cooperation, Austria has not yet committed to the use of the common achievement of targets with other members states.

An ecological tax reform with a CO_2 tax component would be the technology-neutral and sector-neutral measure that would be the most efficient way of improving energy efficiency, setting incentives for saving energy and carbon and increasing the competitiveness of renewable types of energy.

To this end, the primary demand by the renewable energy associations to lift the ceiling in the Green electricity act must be supported.

4. Conclusion

The instruments and measures outlined in the Austrian Energy Strategy and in the NREAP-AT are only subsidiary factors and are not critical to breaching or massively reinforcing overlying external and internal trends and developments. Austria will not be able to prevent nor be guaranteed to achieve the 34% target with the tools specified to date.

This means that, by applying several supporting factors, Austria will achieve its expansion target, however if several driving forces act against this then Austria may not achieve its targets. There will be no structural reorganisation of electricity supply to 100% renewables although, without question, Austria has the potential to do so, especially if the potential of European cooperation is used.

The political will to date at EU level of allocating as low expansion targets as possible has also not allowed people to hope for ambitious targets in EU processes or in Austria. If a reversal of the trend is possible here, then it is most likely to be achieved, seen from today's point of view, by an environmental tax reform primarily planned in order to balance the budget, which could force tax on fossil energy sources perceptibly higher. The Eco-Power cap is not up for renegotiation and the expansion of hydroelectric power will be decided by the relative profitability of this form of energy and the handling of nature conservation law.

Image orientation, Austrian federal funding structures and the fear of market economic instruments could continue to mean relatively inefficient and only partially effective national action plans for the expansion of renewable types of energy, specifically in the electricity sector. In spite of the historically and economically justified high percentage of renewable energy in Austria, the political will to achieve 100% renewable energy in Europe will have to come from other countries, such as Germany, Sweden, etc.

34 Numerous surveys show the fundamental level of rejection on the part of the population towards the use of Kyoto protocol mechanisms and also towards CDM and JI projects, even when they finance renewable types of energy.

35 This phenomenon is comparable to the problem of the base line of CDM projects as well as national targets specified in the Copenhagen Accord. Whoever agrees to less can profit later from higher earnings.

Analysis of the National Renewable Energy Action Plan of the Czech Republic and alternative recommendations for development of the sector

Petr Holub – November 2010

With support from HEINRICH BÖLL STIFTUNG PRAGUE

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1. Summary

The Czech Republic's National Renewable Energy Action Plan (hereinafter "the Action Plan"), which was approved by the Czech Government on 25 August 2010, does not sufficiently fulfil the requirements of Directive 2009/28/EC. Paradoxically, the combination of the Action Plan and the Government's draft of a large amendment to the renewable energy law could lead to an inhibition of this sector. In the event that the Action Plan is not modified and the Government's draft amendment is adopted, the achievement of the 13% renewable target by 2020 will be at significant risk.

In order to achieve a 13% share for renewable sources of final energy consumption by 2020, the Action Plan focuses mainly on inefficient usage of biomass for electricity generation with low levels of heat utilisation (however, formally called high-efficiently cogeneration), incineration of mixed communal and industrial waste and imports of liquid biofuels. On the other hand, it restricts the use of decentralised and new renewable energy sources, which are often in the hands of small and medium-sized independent investors or municipalities. In the case of photovoltaics, for example, it is assumed that between 2010 and 2020 there will be annual growth in installed capacity of less than 10 MW. However, the market conditions are such that it could support annual growth of at least 100 MW in installed building-mounted solar panels alone.

The Action Plan does not evaluate the current system of support for electricity production from renewable sources, according to which producers have the option of choosing between receiving a long-term guaranteed feed-in tariff, or selling their electricity on the market and receiving a green bonus. The principle of this system should be preserved.

This strategic document should also offer specific steps for developing smart grids so that by 2020 there will have been significant progress toward their full deployment. Instead, it merely proposes simplifying the planning permission process for transmission line structures, which it is feared will serve mainly to connect centralised conventional sources.

The document does not identify a need to adopt a systemic support scheme for efficient heat production from renewable energy sources. Increased use of biomass is assumed in particular for forestry management residues (woodchips), while development of purposively cultivated energy crops is marginalised. Between 2010 and 2020, anticipated electricity production from biomass will increase 2.5 times, while anticipated heat production will only increase 1.4 times. This means there will be a significant reduction in the already low efficiency of utilisation of this renewable, but limited, source of energy.

In the transportation sector, the Action Plan anticipates that it will meet its 10% target through the use of biofuels, 28% of which will be imported. Conversely, there is no space devoted to the development of electro-mobility as a low-emissions alternative in particular for individual and mass transport in cities and as a possible component of a smart grid.

An unfavourable public perception of renewable energy sources, to which the Government itself as well as state institutions have contributed, remains a major barrier to their development. Poor state regulation and excessively attractive feed-in tariffs in 2009 and 2010 resulted in an overheated photovoltaics market, a situation which was seized upon by a campaign against renewable energy in general.

A series of wind energy projects and biogas stations have also been halted due to opposition from local residents, municipalities or a negative finding by environmental protection authorities – and in the case of wind energy, also as a result of flat rejection by several regional governments. The Action Plan should thus propose a communication campaign directed toward the public as well as state and local authorities which would refute certain myths about renewable sources and consequently improve decision-making regarding permission for concrete projects.

However, the Czech Government used the obligation to prepare the Action Plan as an opportunity to inhibit the development of decentralised and new renewable energy sources, by means of setting up targets for installed capacity for the various renewable technologies, which will also act as ceilings (if the Government's amendment to the renewable energy law comes into force). These targets were set very low, and funding is only provided to renewable energy installations until the targets are satisfied, once the target for installed capacity is exceeded installations using certain technologies loose the right to financial support or connection to the grid.

2. Legal Basis

The Czech Republic's National Renewable Energy Action Plan was prepared on the basis of a requirement of Article 4 of Renewable Energy Directive 2009/28/EC. The Action Plan was prepared by the Ministry of Industry and Trade, and it was approved by the Czech Government with resolution No. 603/2010 dated 25 August 2010.

The Action Plan is referred to by a new government draft law on supported energy sources (replacing Act No. 180/2005 Coll., on support for the utilisation of renewable sources). This draft law links the right to receive support for energy sources coming online in future to energy production limits (in the case of biomass) and installed capacity limits (in the case of other sources), which cannot be exceeded in any given year. If this draft law is approved by Parliament, the Action Plan will no longer be merely a strategic document, but will become a document whose contents directly raise or lower the right to receive support.

3. Consumption Scenario

The Action Plan anticipates final energy consumption in the Czech Republic in 2020 on the level of 1362 PJ or 32531 ktoe. This is a relatively high consumption scenario. The basic scenario developed by the Government's Independent Energy Commission (the so-called Pačes Commission) anticipates final consumption in 2020 at 1272 PJ (the so-called scenario C prepared for the Commission by the SEVEn consultancy firm).[1]

In setting an absolute target for the share of renewable energy sources, higher anticipated consumption means a higher figure and thus the need for a more progressive policy to achieve it. In principle, however, it is better to also allow for strong pressure to improve energy efficiency. Therefore, at most, the Action Plan should take as its default value the Pačes Commission's basic scenario, and the Government and Parliament should adopt tools in addition to the Action Plan for its fulfilment. It is also worth mentioning that the company SEVEn modelled a low, efficient scenario, which anticipates final consumption of less than 1150 PJ in 2020.

The Action Plan uses the energy units **ktoe** (kilotonnes of oil equivalent). The conversion to the now commonly used unit – **petajoule, PJ** – is as follows: **1 ktoe=0.041868 PJ.**

4. Feasibility of Achieving the Target

The Czech Republic has a binding target to achieve a 13% share of renewable sources in final energy consumption by 2020. In the Action Plan, the Czech Government even anticipates exceeding it at 13.5%, the absolute value of which is **185.5 PJ of energy from renewable energy sources**.[2] This represents roughly a doubling of the use of renewable sources as compared to the current level.

This target, as the studies of potential demonstrate, is achievable. The above-mentioned final report of the Pačes Commission puts the potential of renewable sources at 250 PJ of primary energy sources. This corresponds to 198 PJ of final energy consumption.[3] It is assumed that more than half of this will come from biomass.

If the Czech economy's energy efficiency increased, and progressive measures for renewable energy development are adopted, it is even realistic to consider increasing the Czech target to 15% or more.

5. Role of the Various Types of R enewable Sources

Having examined the justifications for the overall targets, we will turn now to the role of individual renewable sources. The breakdown of individual renewable sources in fulfilment of this target is unjustified, however, and does not reflect the conclusions of available studies. The Government itself confirms in the preamble of the Action Plan that the scenario is based on developmental trends rather than development potential.

1 Report of the Independent Commission for Assessing the Energy Needs of the Czech Republic in the Long Term. Version for review, September 2008; http://www.vlada.cz/assets/ppov/nezavisla-energeticka-komise/aktuality/zpravanek081122.pdf
2 The minimum target corresponding to an obligation of 13% is thus 176.5 PJ assuming a large consumption scenario, or 165 PJ assuming the basic scenario of the Pačes Commission.
3 When reduced by the discussed potential of biomass, this figure is 177 PJ of renewable energy. On the other hand, photovoltaics is already producing more electricity than was anticipated for the year 2020.

The potential contribution from decentralised and new renewable technologies are underestimated while, conversely, the Action Plan assumes a reliance on imports of biofuels, incineration of unsorted communal and industrial waste, and inefficient utilisation of biomass in large power plants, often involving co-incineration with fossil fuels.

The individual problematic areas are these:

Photovoltaics

According to the Action Plan, growth in installed capacity of photovoltaics after 2010 is estimated at only 0 to 10 MW annually. For 2009 and 2010, when very favourable purchase prices were in effect, 400 to 800 MW were installed or are being installed annually. Of this, 5 to 10% constituted installations up to 30 kWp on the roofs and façades of buildings. Even if feed-in tariffs are lowered and only roof installation up to 30 kWp are to be supported from 2011 on, **growth in installed capacity of at least 100 MW annually can still be assumed** due to a persistent decline in investment expenses and the fact that the market is already functioning. This corresponds to some 10,000 installations on family houses, apartment buildings and public buildings. For purposes of calculating the electricity produced, one can assume c. 950 hours of annual output utilisation in the case of roof installations. A feed-in tariff and preferential connection to the grid should be guaranteed to all projects regardless of reaching any capacity targets for the sector. Numbers in the Action Plan should serve as estimations of development, not for cutting off the support.

Wind Energy

At present there is almost 200 MW of installed capacity of wind energy. A series of projects have been halted primarily due to the negative attitude of several regional authorities – mainly in those regions with the highest wind energy potential. In other cases this has been due to opposition from local residents or a negative finding by environmental protection authorities. The potential of wind, respecting the criteria for protection of nature and landscape, is estimated at 5 to 6 TWh of electricity production annually, i.e. roughly 2500 MW of installed capacity (10 times the current level). Even taking into account the difficult planning permission procedures and the difficulty of connecting wind energy to the existing grid, **it is possible to reach 1200 MW of installed capacity by 2020. The Action Plan anticipates an installed capacity in 2020 at only 743 MW.** Nevertheless, the most important tool for the development of wind energy is the removal of administrative and informational barriers for its development, thus making the planning permission procedure more streamlined and transparent (see below). Otherwise, it will be difficult even to meet the Action Plan's estimate figure.

Small Hydro

The Action Plan anticipates modest growth (55 MW on top of the existing 140 MW) between 2010 and 2020 in the installed capacity of small hydroelectric plants up to 1 MW in capacity. The Ministry of Agriculture recently commissioned an analysis of suitable locations for the construction or renovation of small hydroelectric plants. The construction of new sources is suitable in particular where transverse structures (weirs) already exist, as it is attractive from the perspective of environmental protection. However, the ministry has not yet made this study public and thus the data cannot be verified. For plants with a capacity ranging from 1 to 10 MW, the Action Plan anticipates no growth, despite the fact that several projects are underway (two having already been constructed). The potential study for the Government's Independent Energy Commission estimates potential to be up to 110 MW for new installed capacity (for plants with a capacity ranging from 0 to 10 MW). **It can thus be stated that the estimate for small hydroelectric plants up to 1 MW in capacity is roughly in order; however, the estimate for small hydroelectric plants between 1 and 10 MW of capacity, one should assume growth in installed capacity of roughly 20 MW by 2020.** In order to fulfil this potential, it is necessary to unblock suitable locations in the possession of the state-owned waterway management enterprises – these enterprises must either invest in construction or reconstruction of small hydro in the near future (2 to 3 years), or conclude long-term lease agreements with private investors.

Geothermal Energy

The Action Plan anticipates essentially only one project to utilise medium and high-potential geothermal energy with installed capacity of a cogeneration unit of 4.4 MWe and annual heat delivery of 0.6 PJ. **This estimate is significantly (approximately 20 times) under scale as com-**

pared to its potential development. Of all the sources mentioned, it is hardest to estimate the potential utilisation of geothermal energy. Projects are sporadic at present, and those which utilise deep geothermal energy can face technical difficulties. In spite of this, a comprehensive geological survey was conducted at one site and preparations are being made for construction. Geological surveys have been conducted at three more sites and preparatory work has been begun at several other locations. Looking to the future, this is a viable source of energy, and plans should be made for its utilisation.

Solar Thermal Collectors

Between 2010 and 2020, the Action Plan anticipates the delivery of heat from solar thermal collectors to roughly triple. **Whilst the Pačes Commission anticipated 2.25 PJ of energy in 2020, the Action Plan anticipates only 0.9 PJ.** Presently, the most important tool for supporting the expanded use of solar thermal collectors in the medium term will be subsidy programmes like the Green Investment Scheme (for residential buildings) and the Operational Programme Environment(for public buildings). These tools can achieve far more significant growth than the Action Plan assumes, and it is this level of growth which should be planned for the development of this source.

Heat Pumps

According to the Action Plan, heat pumps will produce c. 5 PJ of heat in 2020. This represents some 40,000-50,000 installations in family houses and public buildings. This is a reasonable range and potential studies have indicated similar figures. To encourage the use of efficient heat pumps (with a higher coefficient of performance), subsidy programmes like Green Investment Scheme and the Operational Programme Environment will be important measures.

Biogas Stations

The Action Plan anticipates growth in biogas consumption from the current 90 MWe of installed capacity to 417 MWe of installed capacity in 2020. It also anticipates roughly a quadrupling in heat production from biogas stations. Certain studies estimate the potential by 2020 at up to 1200 MWe, i.e. **roughly 3 times more than stated in the Action Plan.**

6. Solid Biomass, Biofuels and Mixed Communal Waste

A special chapter in this analysis is dedicated to evaluating the Action Plan from the point of view of anticipated use of biomass, biofuels, and mixed communal and industrial waste.

Biomass is the renewable energy source which has the greatest potential in the Czech Republic over the next decade. Its potential can be divided in particular between wood biomass, which is amply utilised even today, and agricultural biomass, which is only beginning to be utilised (mostly with specially cultivated energy crops, be they plants or fast-growing woods). Woodchips, however, are mostly utilised inefficiently at present in co-incineration with coal at large power plants. With co-incineration it is also difficult to verify the quantity of biomass which is actually being used by the operator.

The potential of biomass as a primary energy source, while still preserving land for food security (over 2,000,000 ha), is estimated at 191 to 214 PJ in 2020. Estimated energy yield differs in particular according to whether the land is used to produce biofuels for transportation (lower energy yield) or solid biomass for combustion for heat and electricity production (higher energy yield).

The main problematic issues in the Action Plan are:

1. **Between 2010 and 2020, the Action Plan anticipates that growth in the production of electricity from solid biomass will increase 2.52 times, but growth in the production of heat will increase only 1.38 times.** Despite a declaration that biomass will be utilised in a cogeneration regime only, inefficient use of solid biomass will likely increase. The related draft government amendment to the law on supported sources defines highly efficient combined production of electricity and heat as production with only a 10% saving of primary energy compared to separate heat and power production. This approach contradicts provisions of Directive 2009/28/EC on efficient utilisation of biomass.

2. **In 2020, the Action Plan anticipates a mere 7.5 PJ (179 ktoe) of primary energy from purposively cultivated energy crops.** This is very little. For wood biomass, conversely, it assumes a growth in utilisation ranging from 64 PJ to 114 PJ. The poten-

tial study on the other hand anticipates the ratio between energy crops and wood biomass to be the other way around (roughly 4:1 in favour of biomass from agricultural land). A significant increase in the use of woodchips could be unfavourable for forest ecosystems. The utilisation of woodchips should be shifted from co-incineration in electricity plants to small and medium-sized boilers (household and municipal installations). Some wood residues may also be recycled as material.

3. Another problem with the Czech Action Plan is **support for incineration of mixed communal and industrial waste and declaring its unsorted biodegradable elements to be a renewable source**. Under the draft government law, this share of renewable sources qualifies such incineration for the higher green bonus for renewable sources. However, mixed waste should be considered a secondary source of energy with only the sorted biodegradable component enjoying support as a renewable energy source. This approach also respects the hierarchy of waste management – first, minimise waste; second, utilise the waste materially (sort and recycle); and only then utilise it for energy production. Support for mixed waste incinerators will lead to pressure to limit separation and recycling of waste.

4. The Action Plan anticipates a major increase in the utilisation of biofuels **up to 28% of which will be imported.** This cannot be considered a beneficial way of fulfilling the 2020 Czech target share of renewable sources. The Action Plan does not envisage the utilisation of second-generation biofuels.

5. The Action Plan does not mention the need to introduce a systemic support scheme for renewable heat production. This perpetuates the current unsatisfactory situation where financial support is provided only for electricity production, which encourages inefficient utilisation of biomass. For details, see the respective section of this analysis.

7. Political and Legislative Environment in the Czech Republic

At present, the political and media debate in the Czech Republic is very unfavourable to renewable sources. State bodies, using the estimates of half-state-owned energy company ČEZ, warn of the danger of a significant increase in electricity prices as a result of support for photovoltaic plants. Politicians are turning against all renewable energy sources. Due to the state's actions, therefore, exactly the opposite is happening to what Directive 2009/28/EC requires.

During the course of 2010, the Government and other state institutions took several steps which significantly complicated or could complicate the further development of energy utilisation from renewable sources: halting connections of renewable sources to the grid, preparation of a decree setting minimal efficiency standards for photovoltaic panels in an unsystematic manner, an unclear muddle of proposals modifying Act No. 180/2005 Coll. and the introduction of a 26% tax on revenues for photovoltaic plants put into operation in 2009 and 2010. Moreover, these measures were prepared without consultation with the renewable energy business sector, non-governmental organisations and the public.

8. Evaluation of Proposed Measures

Economic Framework of Support for Renewable Energy Sources

1. Production of electricity from renewable energy sources:

Act No. 180/2005 Coll. is at present in force. This was the means by which the Czech Republic implemented Directive 2001/77/EC on support for production of electricity from renewable energy sources. It is a well-written law, and grants producers of electricity from renewable sources the right to choose support in the form of a feed-in tariff, or a green bonus if the producer sells its electricity on the market. The law sets the feed-in tariff and green bonus for individual types and output categories of renewable sources in such a way as to guarantee a 15-year simple return on investment.

The law also includes a provision guaranteeing that the Energy Regulatory Office will not lower the feed-in tariff for new sources by more than 5% year-on-year. This provision was amended in the spring of 2010 so that it now states an exception whereby this rule shall not apply to sources whose return on investment decreases to less than 11 years. The amendment, which will come into effect for 2011 prices, is a reaction to the sig-

nificant decrease in investment expenses for the construction of photovoltaic plants. Unfortunately, the Government was late in proposing it and in 2009 and 2010 the photovoltaics sector enjoyed a boom with return on investment on certain projects falling to 6-8 years. In the meantime, the state reacted injudiciously when the state-owned ČEPS, a.s. (operator of the transfer grid) announced a suspension of the connection of all planned installations of renewable sources (including small roof units) which did not already have a signed contract for connection, due to a threat to the stability of the transmission and distribution grids.

The realistic impact of the support for photovoltaics will lead to an increase of 7-8% to the electricity bill of the average household (by contrast, ČEZ and the Government maintained that there would be an increase of as much as 22%). Support for renewable energy sources, when compared to the increase of some 90% since 2005 in the average price of electricity in the Czech Republic, is thus at an acceptable level.

The Government's new draft law only provides support in the form of a feed-in tariff to sources with an installed capacity of up to 100 kWe. For most of the decentralised sources with higher output, it suggests the possibility of support only in the form of a so-called hourly green bonus, which would react to the market price of electricity on an hourly basis. Given that the overwhelming majority of decentralised renewable sources operate in a regime of support in the form of a feed-in tariff, and that those which receive support in the form of green bonuses have long-term supply contracts for periods of one or more years; the new provisions will introduce an unacceptable degree of uncertainty into the market as far as investors are concerned. Small, independent investors will not be able to clearly predict the profitability of their projects, and these projects will pose a higher degree of risk for banks.

The Action Plan, however, does not contain an evaluation of the current system of support, which should be a necessary procedural condition for proposing (relatively fundamental) changes to it.

2. Production of heat from renewable energy sources:

At present, the production of heat from renewable energy sources is supported only through investment subsidies, in particular for communal projects under the Operational Programme Environment and for projects in residential buildings under the Green Investment Scheme financed through proceeds from the sale of emissions credits (AAUs) under the Kyoto Protocol.

The Ministry of the Environment and the Ministry of Trade and Industry have discussed the possibility of a systemic support scheme for medium-sized and large sources (over 200 kWt) in the form of operational support (bonus model), similar to the system of green bonuses for electricity production. A study conducted for the Ministry of Environment suggests that this scheme is the most suitable and effective for this capacity category.[4]

However, **in the wording of the Government's draft law submitted to Parliament, there is merely a provision which essentially maintains the current state of affairs** and only mentions the obligation of Government to consider the possibility of supporting the production of heat from renewable sources should an appropriate investment subsidy scheme be developed.

The above-mentioned study suggests that for small units up to 200 kWt (mainly local sources in family houses and public buildings), the most suitable approach is to preserve the current investment subsidy support in place under the Green Investment Scheme.

It should be mentioned that without exploiting the potential of renewable heat production, it will be impossible to meet the 13% target in 2020. The Action Plan should pay greater attention to this area.

3. Renewable energy sources in transportation:

At present there exists an obligation to blend a certain percentage of biofuels by volume into diesel (4.1%) and gasoline (6.0%). At the same time, high-percentage biofuel blends are tax subsidised – they are exempt from excise tax, although for certain types of high-percentage biofuel blends this exemption applies to approved pilot projects only.

4 Evaluation of proposals for renewable heat production support schemes. SEVEn, August 2010.

This practice is sufficient and should be preserved, although with the addition of a gradual increase in the share of added bio-components to a level that will ensure 10% renewable sources in final consumption of energy in transportation. **Space must be granted to the development of electro-mobility in combination with the development of smart grids where batteries can be used to help regulate the grid.**

Connection to the Grid and Operation of the Grid

In the spring of this year, the Energy Regulatory Office amended a decree on connecting to the grid. Previously, it was possible for certain investors to block access to grid capacity for other investors for speculative purposes. Such capacity was held in reserve for renewable projects, even when no progress was being made in their development. This resulted in a peculiar situation where, for example, a project which had already been rejected by a municipality was able to block grid capacity construction for another approved project. Moreover, offers appeared for the sale of such reserve capacity. The amended decree now sets an obligation for the investor to abide by the agreed timetable for preparing a project and to pay a deposit equal to half the anticipated cost for constructing the grid connection which is capped at CZK 50 million.

On the other hand, the approved decree contains provisions discriminating against renewables investors who apply to be connected to the grid. It sets a time limit for the actual connection of new production facilities to the grid at six or twelve months from the signing of the grid connection contract. In many cases this is an excessively long time frame which allows distribution companies to speculate on lower purchase prices for electricity produced from renewable sources in the following year and to delay, needlessly, their actual connection to the grid. Uncertainty as to the date of actual connection to the grid significantly reduces banks' willingness to finance renewable energy projects.

The Action Plan contains a proposal to simplify the planning permission process for transmission line structures, i.e. including high-voltage lines for connecting new sources. There is concern here that these provisions may be motivated rather by an attempt to accelerate the planning permission process for the 140 km connecting line for expansion of the Temelín nuclear power plant than to support the development of renewable sources.

Administrative Obstacles

The Action Plan does not devote sufficient space for analysis and proposals on the removal of unnecessary administrative barriers to the development of renewable energy sources. In fact, current political debate is focused on reducing the administrative demands of large infrastructure projects. The new law, by contrast, for example, requires that all new electricity sources exceeding 1 MW in output obtain official authorisation (the current threshold is 30 MW). This increased administrative burden would adversely impact most renewable sources.

In 2008, the Ministry of the Environment prepared an analysis of administrative barriers to the development of renewable energy sources and proposed actions to remove them. Only some of these could be implemented, however; the remaining ones should be updated and proposed for implementation in the Action Plan.

Biogas Injection into the Gas Grid

At present, the injection of purified biogas into the natural gas grid is supported indirectly on condition that the producer has a contract with a consumer in a different part of the grid and this consumer subsequently uses the gas to produce electricity. This is supported with a corresponding green bonus.

In the original discussion on the new draft law on supported sources, the introduction of direct support at the point of biogas injection into the grid (i.e. for the gas, not for the electricity) was mentioned; in the Government's proposal, however, this model was abandoned. From the suggested wording, it is not clear whether current practice will be preserved after the new law takes effect.

9. Long-term Development of Renewable Energy Sources after 2020

The combination of the Action Plan and the Government's draft law on supported energy sources means that the 13% target for 2020 also acts as a cap on the development of renewable energy. This is because each type of renewable source for electricity production which exceeds its quota loses its entitlement to support and even its entitlement to connect to the grid. In view of the fact that the Action Plan does not propose the introduction of any systemic support scheme for the production of heat from renewable sources, **further development of renewable energy sources after 2020 is unlikely.**

It is of course possible that certain renewable sources will be competitive by 2020 and will thus continue to develop even without state support. Nevertheless, the Government should not only provide economic support, but also provide the non-economic framework for their further development. In the case of electricity production, for example, it should set conditions for the development of smart grids; in the case of biomass, secure the conditions for creating a market for locally or regionally produced fuel etc.

10. Role of European Cooperation

The Action Plan does not anticipate using the mechanism of cooperation among EU member states for achieving the target for 2020. The Czech Republic expects to meet this goal only from domestic renewable sources. Local sources will also bring other economic and social benefits to the Czech Republic.

European cooperation is essential, however, for the development of renewable sources after 2020 and for the transition to a system of energy supply that in 2050 will be composed mostly of renewable energy sources. Although most renewable energy sources should be decentralised in character, it will be advantageous to develop in particular three cooperative projects within the framework of the EU:

1. Implementation of the Mediterranean Solar Plan. This will deliver electricity produced in solar concentration plants from regions of North Africa and the Middle East using high-voltage direct current cables to Europe (the so-called supergrid). The technologies for production as well as distribution are now known, and the consortium preparing the product anticipates the first deliveries of electricity as early as 2020.

2. Offshore wind parks located especially in the North Sea. This project is the second cooperative project for utilisation of renewable sources in Europe. Together they could deliver 20 to 25% of the electricity consumed in Europe by 2050.

3. Development of smart grids. Although a series of steps toward their development must be taken by individual member states, other aspects of their development – such as harmonisation of technical standards – must be pursued at the EU level.

11. Alternative Recommendations for Developing the Sector

The Czech Republic's National Action Plan for Energy from Renewable Sources, as approved by the Government and sent to the European Commission, does not offer sufficient motivation for the development of decentralised renewable sources and is missing certain basic measures which would ensure such development. The Action Plan must also be viewed in the context of the draft amendment to the law on support for renewable energy sources (or, formally, the new draft law on supported energy sources) which is currently being discussed by the Government and is expected to be passed to the Parliament in early months of 2011.

The recommendations (listed based on the structure of the Action Plan, not by importance, and applying to the new draft law only if there is a direct link to the Action Plan) are as follows:

1. The Government should use the basic consumption scenario proposed by the Independent Energy Commission, i.e. final consumption of energy at the level of 1272 PJ in 2020. A reassessment of the target and a possible increase to 15% is recommended.

2. When looking at the structure of renewable energy sources, the Government should focus on decentralised, domestic and new sources of renewable energy; utilisation of these sources offers the greatest positive economic and social synergetic effects.

3. In accordance with the above, the anticipated utilisation of individual types of decentralised renewable resources should be raised according to the comments offered in this study. In particular, it is necessary to abandon the proposed provisions to the draft law on renewable energy sources, which links the right to receive support for electricity production to capacity or production limits for individual types of sources which cannot be exceeded, as specified in the Action Plan.

4. In contrast, the Government should rethink the anticipated role of incineration of mixed communal and industrial wastes, inefficient utilisation of biomass in boilers with low efficiency (condensation only power plants and heating plants with a low level of annual utilisable heat) and biofuel imports.

5. It is necessary to evaluate the current system of support for electricity production from renewable energy sources and only then propose eventual modifications to it. We should retain the possibility for small and medium-sized projects involving decentralised renewable energy sources to choose feed-in tariffs as a method for support. Modifying the method of purchasing and trading for the electricity generated from these sources and related revenue streams (in accordance with the Government's draft amendment) is a step in the right direction. The proposed wording creates an appropriate framework to further increase renewably energy's share.

6. An analysis should be performed (or the analysis performed by the Ministry of the Environment should be updated) of administrative barriers to the development of renewable energy sources, and measures for their removal should be proposed. It is necessary to also propose measures for ensuring the simple and transparent functioning of state administration in this area, according to the requirements of Directive 2009/28/EC.

7. The Government should remove the requirement that all new electricity sources exceeding 1 MW in capacity obtain official authorisation (there is already a licensing requirement). In addition, they should discontinue the licensing requirement for the smallest sources up to 30 kWe integrated into buildings (i.e. in particular for small photovoltaic installations, private individuals shouldn't have an obligation to register as enterprises with all the administrative and tax consequences).

8. Sites for the construction of small hydroelectric plants which are in the administration of the state-owned waterway management enterprises should be unblocked. The Government should insist on investment in the sites belonging to the state enterprise in the short term (2-3 years), or allow long-term leases to private investors. In addition, they should ensure transparent discussion of the decree on setting minimal residual flows for operators of small hydroelectric plants.

9. Concrete steps for developing smart grids in order to integrate a greater number of decentralised renewable energy sources should be proposed. The Action Plan should detail very specific steps towards the introduction of smart grids by 2020 which would include, amongst other things, the installation of smart meters in 80% of consumption locations in accordance with EU legislation. The Action Plan should not focus on accelerating the planning permission process in order to facilitate the construction of the 140km 400kV electric line for connecting the new blocks at the Temelín nuclear power plant.

10. There should be a requirement of minimal efficiency for biomass utilisation for heat production of at least 85% in the communal sector, and 70% in the industrial sector, as a condition of any financial support according to the requirements of Directive 2009/28/EC. There should also be a requirement for a 60% real annual utilisation of energy at least, for combined heat and power production. For large projects, preference should be given to purposively cultivated biomass from agricultural land; in particular, wood and waste biomass should be left to small and medium-sized projects. Support should also be proposed for farmers for the cultivation of fast-growing woods as well as plant crops for energy.

11. There should be a new systemic support scheme proposed for heat production from renewable energy sources, probably the so-called bonus model of operational support for medium-sized and larger sources (above 200 kWt). The Government should ensure continued investment support for small sources (especially in residential and public buildings) similar to that currently provided by the Green Investment Scheme. The continuation of this programme after 2013 could be financed through the revenues from auctioned emissions allowances within the framework of the EU ETS.

12. A new support scheme based on either feed-in tariffs or green bonuses should be proposed for inserting purified biogass into the natural gas grid, similar to those used for renewable electricity production.

13. A roadmap should be prepared for the development of electro-mobility as a low-emissions alternative, in particular, for individual and mass transport in cities. The batteries of electric vehicles could also serve to regulate the electrical grid (as a component of a smart grid). The development of electro-mobility should not lead to an increase in installed capacity of conventional electricity sources.

14. Support for biofuels should focus in particular on domestic production, especially on second-generation biofuels with better energy output and emissions parameters in their lifecycle. It is necessary to adopt a system of controls for sustainability criteria, as was proposed in a 2009 amendment to the law on air protection (although this amendment has not yet been approved). The exemption from excise tax for high-percentage biofuel blends should be preserved (and expanded to all types with no need to approve pilot projects).

15. A long-term positive information campaign on renewable energy sources should be effected for the public as well as for state, regional and local administration. This will dispel certain myths which are circulating in these groups, ensure better acceptance and – in the case of state administration – improve the quality of the planning permission process.

16. The Government should introduce sustainable energy into the curriculum at all levels of formal education. New academic specialisations in this area should be created at universities.

17. At the European level, support should be given to the formulation of a framework for introducing smart grids (especially the creation of technical standards) and for realising selected large pan-European projects involving renewable sources, specifically the Mediterranean Solar Plan and offshore wind parks in the North Sea. The Czech Republic should support these plans.

Analysis of the National Action Plan of France

Marc Jedliczka - September 2010

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1. Introduction

For the first time in France a consultation process on energy issues, introduced by a speech from Sir Nicholas Stern, brought together all the players in society (the State, local communities, companies, trade unions and environmental NGOs) for several months commencing in the summer of 2007, with a view to defining the objectives and means to tackle the major global environmental challenges, including climate change in particular.

Brought to a close in 2007 by a commitment by President Sarkozy himself to make France the European leader for renewable energy, made in the presence of Al Gore and José-Manuel Barroso, this process has been followed up with considerable policy work carried out by the Administration and the Parliament as regards the enforcement laws, known as "Grenelle 1" and "Grenelle 2", which were finally approved in August 2009 and July 2010.

The French National Renewable Energy Action Plan (NREAP), outlining how France will meet its EU renewable energy targets, sent to the European Commission at the end of August 2010, a few weeks behind the proposed schedule, almost exclusively re-iterates the numerical data and the policies and measures contained in the laws and regulations produced by the consultation process.

Developed on a strictly national basis, none of the texts produced during the process leading up to the NREAP, nor the NREAP itself, make reference to the possibility for European or International cooperation, something which is not currently on the agenda in France.

2. Overview of the French National Action Plan

France's overall objective is to increase the proportion of renewable energy sources in final energy consumption for all uses (heating/cooling, electricity and transport) from 9.6% in 2005 to 23% in 2020.

Given the forecasted reduction of total energy consumption from 167 million tonnes of oil equivalent (Mtoe) in 2005 to 155 Mtoe in 2020, this represents an increase in use of renewable energy from 16.1 Mtoe in 2005 to 36.5 Mtoe in 2020. In other words, this is an increase of 20.4 Mtoe, of which 10.3 Mtoe are for heating/cooling, 6.6 Mtoe are for electricity and 3.5 Mtoe are for biofuels.

It should be noted that the electricity used to heat premises using inefficient systems such as convection heaters or air to air heat pumps, which are used in a very substantial number of residential and office buildings (more than 70% of new residences built each year and almost 40% of all such buildings in existence), is recorded as electricity consumption and not as heating consumption, which could bias energy accounts and the definition of energy strategy.

Moreover, whereas the surplus electricity exported in summer is essentially of nuclear origin, the energy imported in winter to meet the ever increasing peaks in consumption caused by electric heating is, in the most part, coal or even lignite-based. This imported energy is therefore a major producer of greenhouse gases, but these emissions are not taken into account in the French energy and environmental balance.

2.1. Measures proposed for the electricity sector

Renewable electricity shall increase from 6.1 Mtoe (71 TWh) in 2005, representing 13.5% of the total electricity consumption, to 12.7 Mtoe (147 TWh) in 2020 representing 27% of consumption. This therefore means there will be a doubling of both the production of renewable energy and its share in the electricity mix.

The increase in production shall be distributed between the sectors as follows:

- **Hydroelectricity:** hydroelectricity currently provides 80% of all renewable electricity produced in France, of which 70 TWh are produced annually on rivers (run-of-the-river and dams) and 5 TWh by pumped-storage plants. The NREAP envisages an increase in annual hydroelectric production of 9 TWh (5.7%) between 2010 and 2020, which should, for the most part, be obtained by an increase in the installed capacity of pumped-storage plants (2,400 MW) and large installations (600 MW) and, to a lesser extent, small and medium installations (180 MW).

- **Wind Turbines:** the installed capacity of onshore wind turbines must be increased from 5,500 MW in 2010 to 19,000 MW in 2020, i.e. an increase of

3.5 times. Offshore wind turbines, which do not exist in France in 2010, should account for 6,000 MW in 2020. In this way, the 58 TWh of total wind turbine power production envisaged for 2020 should be broken down as 2/3 onshore and 1/3 offshore.

Solar: the national action plan envisages a total installed capacity of 5,400 MW in 2020, of which 4,860 MW would come from photovoltaic panels (i.e. 10 times more than in 2010) and 540 MW would come from concentrated solar energy, thus producing a combined total of 6.9 TWh of solar electricity per year.

Biomass: the NREAP envisages an increase in the production of biomass electricity from 3.8 TWh in 2010 to 17.2 TWh in 2020, by doubling solid biomass electricity production (wood and household waste) and tripling biogas electricity production. The incineration of household waste (currently representing more than 50% of solid biomass electricity production) should remain the same, it is therefore wood and biogas that should provide the additional 13.4 TWh.

Geothermal: the NREAP envisages doubling the capacity of the experimental deep geothermal installation (→5,000m) at Soultz-la-Forêt in Alsace (from 1.5 to 3 MW) and significantly increasing the capacity of the installations in use in the French West Indies, resulting in a total increase from 0.1 TWh in 2010 to 0.5 TWh by 2020.

Marine Energy: the NREAP envisages obtaining a total capacity of 140 MW from various experimental technologies currently producing 0.65 TWh per year, which shall be added by 2020 to 250 MW of capacity produced by the La Rance Tidal Power Plant (Brittany) which currently produces 0.55 TWh per year.

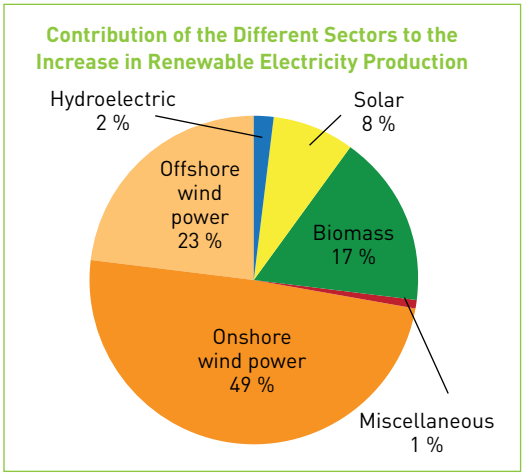
The table below shows the envisaged energy breakdown between the sectors.

	2005		2010		2020		2020/ 2005	2020/ 2010
	Capacity (MW)	Production (GWh)	Capacity (MW)	Production (GWh)	Capacity (MW)	Production (GWh)	(GWH)	(GWH)
Hydropower, of which:	25 349	**70 239**	26 221	**69 023**	30 296	**71 702**	**1 463**	**2 679**
<1 MW	*433*	*1 796*	*441*	*1 694*	*483*	*1 759*	*-37*	*65*
1-10 MW	*1 618*	*6 111*	*1 647*	*5 766*	*1 807*	*5 990*	*-121*	*224*
<10 MW	*18 995*	*62 332*	*19 333*	*61 563*	*21 206*	*63 953*	*1 621*	*2 390*
Pumped-storage stations	4 303	**4 705**	4 800	**5 130**	6 800	**7 268**	**2 563**	**2 138**
Wind, of which:	752	**1 128**	5 542	**11 638**	25 000	**57 900**	**56 772**	**51 230**
onshore	*752*	*1 128*	*5 542*	*11 638*	*19 000*	*39 900*	38 772	28 262
offshore	*0*	*0*	*0*	*0*	*6 000*	*18 000*	18 000	18 000
Solar, of which:	25	**22**	504	**613**	5 400	**6 885**	**6 863**	**6 272**
Photovoltaic	*25*	*22*	*504*	*613*	*4 860*	*5 913*	*5 891*	*5 300*
Concentrated Solar	*0*	*0*	*0*	*0*	*540*	*972*	*972*	*972*
Biomass, of which:	707	**3 819**	1 052	**5 441**	3 007	**17 171**	**13 352**	**12 300**
Solid	*623*	*3 341*	*888*	*4 506*	*2 382*	*13 470*	*10 129*	*8 964*
Biogas	*84*	*478*	*164*	*935*	*625*	*3 701*	*3 223*	*2 766*
Liquid	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Geothermal	15	**95**	26	**153**	80	**475**	**380**	**322**
Marine energy	240	**535**	240	**500**	380	**1 150**	**615**	**650**
Total	27 088	**75 838**	33 585	**87 368**	64 163	**155 283**	**79 445**	**67 915**

Objectives for Increasing Renewable Electricity Production by Sector

2.2. National strategy

The French Government is of the opinion that, since it has an electricity mix that emits the least greenhouse gases in the world, thanks to its nuclear and hydro-electric existing infrastructure, the additional production of renewable electricity is mainly destined to cover the increase in electricity consumption owing to the development of the use of electronic devices, electric vehicles and heat pumps.



The main sources that must contribute to this increase are, in order of importance, onshore wind turbines (49%), offshore wind turbines (23%), biomass (17%) and solar energy (8%)

Nevertheless, the French Government claims to have chosen to diversify its electricity mix as much as possible, not wanting to neglect any particular technology.

The French strategy for emerging technologies, such as solar energy and marine energy, consists primarily in supporting research and development with the aim of becoming a leader in these technologies after 2020.

The production objectives for renewable electricity have been defined in the Multiple Year Investment Programming Report (PPI), which was examined without vote by Parliament in July 2009 and then confirmed by a ministry resolution in January 2010. These objectives have finally, for the most part, been taken up in the NREAP.

The production objectives are not legally binding for the suppliers, the consumers or the sub-national authorities (regional authorities, *départements, communes*) and the French Government declares that it aims to attain these objectives via the use of incentives (see details in the following paragraph).

However, the "Regional Climate-Air-Energy Schemes" that will have to be published jointly by the State and the Regional Councils during 2011, will have to include studies of potential and action plans for all renewable technologies.

Likewise, each local community of more than 50,000 residents must draw up its "Local Climate and Energy Programme" comprising a section on renewable energy, which shall be a kind of "road map" without being binding in any way.

2.3. Key policy instruments used for attainment of targets

Most of the incentives proposed for obtaining the NREAP objectives are already in place, and some of these have been in place for several years.

This is the case for the Law on the liberalisation of the electricity market of February 2000, which introduced a requirement to purchase renewable electricity for the big energy providers (EDF and the local distribution companies) and created the two main market support instruments: feed-in tariffs, and the calls to tender (calls for bids) system for large renewable projects, whereby producers winning the tender have a contract with the electricity price they propose in the tender.

The feed-in tariffs (fixed purchase prices) concern all sectors, including cogeneration, with widely varying prices, from 4.5 euro cents/kWh for the incineration of household waste to 51 euro cents/kWh for building-integrated solar panels. The contracts are generally signed for 15 years, except for cogeneration (12 years) and solar panels (20 years), and are partially inflation adjusted, depending on the sector.

The calls to tender may concern all sectors, but have only been used 6 times to date (3 times for the biomass sector and once for each of the following sectors: onshore wind turbine, offshore wind turbine and solar panels) for a total capacity of 2000 MW, of which 770 MW are in operation at present. The projects are decided by the Minister for Energy and organised by the Energy Regulation Commission (CRE).

The other incentives already in existence should be maintained:

- Tax credit for 50% of the cost of the equipment and a reduced VAT rate of 5.5% for individuals who invest in renewable heat or electricity production systems for their homes. These measures created by the Law on Finance of 2005 have been renewed each subsequent year, and should be continued until 2012.

- Zero-interest loans created by the 2009 Law on Finance, that reduce the cost of borrowing for home insulation and supplying homes with energy from renewable sources.

- Accelerated depreciation of equipment owned by companies that invest in specific means for producing renewable energy (wind turbine, hydropower, biomass).

Finally, the new energy regulation for construction (RT 2012), to be published before the end of 2010, should promote the integration of renewable energy in future residential and office buildings.

As regards research and development, the *Demonstration Fund*, put in place for the period 2009-2013 and supplied with €325 Million in direct grants and €75 Million in government loans should be mobilised for projects on marine energy, smart grids and innovative technologies for solar electricity generation (photovoltaic and solar thermal energy systems).

2.4. Measures focussing on European Cooperation

The NREAP envisages that France's objectives shall be met using only renewable energy generated domestically and, as a result, no European cooperation measures have been envisaged. It is possible, however, that *joint project* mechanisms should be employed before 2020 to finance investments within the framework of the Mediterranean Solar Plan to which France is strongly committed.

The guarantee of origin system, which was established in 2006, is expected to change before 2012 in order to make it compatible with Directive 2009/28/EC and, above all, in order to avoid double counting with the private renewables energy certificate system (RECS), which certifies electricity that has benefited from the feed-in tariffs.

Finally, interconnections with several neighbouring countries shall be reinforced so as to increase the exchange capacity (with Belgium an additional 400 MW by the end of 2010, with Spain an additional 400 MW by 2013, and with Italy an additional 600 MW by 2012 and 1000 MW by 2017).

3 Analysis

3.1. Do the measures contribute to a fundamental change in the electricity mix of the country, or will the existing structures of the electricity mix not be touched?

The key elements of the government document setting out the structure of investment in the electricity sector, the *PPI électricité,* published in 2009, make any significant modification of the French electricity mix highly unlikely before 2020. The electricity mix is currently constituted by 75 to 80% nuclear energy and 10 to 15% hydroelectric.

The *PPI électricité* envisages a slight increase in annual production from the current nuclear installations (an additional 8 to 15 TWh/year, i.e. 2 to 4%) via one-off improvements. It furthermore explicitly considers in its central scenario that the lifespan of the French nuclear power stations, today aged 23 years on average, shall be prolonged to 40 years, even though it is the Nuclear Safety Authority that takes the final decision on a case-by-case basis. Finally it reiterates the decision to build two new nuclear 1600 MW European Pressurised Reactors (EPRs), which are scheduled to be put into service in 2012 and 2017. As for hydroelectricity, production is expected to increase by a maximum of 3 to 4%, i.e. 2 to 3 TWh/year.

Under these conditions, even taking into account the expected increase of 3.5% in total electricity consumption between now and 2020, the measures for the promotion of renewable electricity will, at best, enable France to improve its greenhouse gas emission balance, but are a long way from making significant changes to the structure of France's energy mix.

3.2. Will the measures proposed be sufficient to achieve the 2020 national targets?

The choice of feed-in tariffs as the main support instrument, coupled with the ability to make calls to tender, in principle, provides an adequate framework for attaining the 2020 objectives. However, some assessment and method errors in the NREAP, regarding both the consumption

and production of electricity, and the current situation in France today, are likely to render this very difficult, if not impossible.

On the consumption side, the NREAP shall integrate a requirement for a 38% reduction in energy use for existing buildings, which is effectively stipulated in the Grenelle 2 Law of July 2010, but no serious tangible measure has been envisaged to this end. It is evident, however, that the few tax incentives and subsidised loans already in place will not be enough to attain this ambitious objective, which would place France on a trajectory for a increase in resource efficiency by a factor of 4 or 5 by 2050.

Given the importance of direct electric heating in France (used in 70% of new residences in 2009 and between 30% and 40% of existing residences and still increasing), it is highly likely that electricity consumption will increase significantly more than has been envisaged in the NREAP if no new measures, particularly measures for the reduction of electric heating, are implemented.

On the production side, the NREAP probably overestimates the onshore wind turbine potential for 2020, not because the resource is insufficient, but because all the measures recently adopted by the Government or voted by Parliament tend towards increased administrative complexity which creates an unclear legal environment for investors and can only increase the time required for project development (currently 5 to 7 years).

This is particularly true for the law which decrees that only wind turbines within a "zone of wind power development" (particular areas which are accorded this status by the local authority) can benefit from the feed-in tariff. It is also the case with the classification of wind turbines as installations which are harmful to the environment, presented by the NREAP as a positive measure, although in fact it is an additional hurdle; and the obligation which stipulates that at least five wind turbines must be built in order to qualify for the feed-in tariff, that Parliament added to the "Grenelle 2" Law in July 2010.

The legal and administrative difficulties currently facing offshore wind turbine projects make their service launch prior to 2020 highly unlikely.

As regards solar panels, the 2006 feed-in tariffs focusing on solar integration with buildings have provided a huge boost to the sector and may well result in France exceeding its objectives, perhaps even by a factor of two.

However, an overly generous feed-in tariff for solar energy resulted in the speculative development of certain applications and the fear that consumers would see exponential price rises on their electricity bills. This led to three successive rate changes to the feed-in tariff between January and March 2010, and a number of politicians and high-ranking civil servants questioning the support given to this sector increasingly openly.

A consultation on further measures, including a possible cap of 500 MW of installed capacity per year, between the State and relevant experts, is expected to be held in autumn 2010. It will be necessary to await the results of this consultation before the prospects of photovoltaics in France over the next few years can be evaluated.

The development potential of hydroelectricity also appears to have been overestimated, since the 7 TWh from the pumped-storage stations are counted as renewable, whereas only the electricity generated from natural water infiltration at these plants, some 30% of the total, should be considered as such. The remaining 70% of the power produced at pumped-storage stations is produced by water pumped upstream as a way to store electricity (European standard average).

As regards biomass, although it is difficult to be sure, given the current low level of development of electricity generation using this method, the 2020 objectives appear to be reasonable and coherent regarding the developments planned for the production of heat and cogeneration.

In total, it seems reasonable to consider that, on the basis of the measures in the NREAP, and the current trends observed in the field, the production of renewable electricity shall be 20 TWh to 30 TWh less than that announced, i.e. 30% to 40% of the increase which was predicted in the NREAP.

Under these conditions, the production of renewable electricity could at best reach between 100 TWh and 120 TWh, i.e. between 20% and 22% of total consumption, which is well below the objective of 27%.

This would not be the first time France failed to meet renewable energy targets that it set itself. The POPE Law of 2005 (Article 4) set an indicative

target of 21% of renewable electricity for 2010, which stood at 13.5% in 2005. In 2009, however, the share of renewable energy still stood at 13.5%, owing in particular to a lack of precipitation. Even if we are to accept the figure of 15.5% for 2010 as stated in the NREAP, only 26% of the required increase in production was actually achieved.

The situation was exactly the same for renewable heating. The POPE law envisaged a doubling of renewable energy between 2005 and 2010, an increase from 13.6% to 27.2%, while at the end of 2009, the share held by renewable heating was only 15.7%, i.e. 15% of the increase in production which was required. Assuming the figure of 17% for 2010 as stated in the NREAP, the increase in production will still only be 25% of the required amount.

The record is a little better for biofuels. The objective was to increase the share of energy from biofuels from 1.2% to 7%, and the share held by biofuels at the end of 2009 was 5%, i.e. 65% of the required increase in production. This can be explained by the tax reductions for the main industrial sectors such as bioethanol and rapeseed oil methyl ester (but not locally produced pure vegetable oil) which were brought in under the pressure from the main farmers' unions, dominated by the energy crop producers who have a vested interest in the matter.

The general legal framework has definitely evolved, particularly with Grenelle Laws 1 and 2, but the measures intended to promote the development of renewable energy have not been substantially reinforced (it is even possible that the search for savings in the State budget will entail the reduction of some support within the next few years): it is therefore hard to see how or why objectives that are more ambitious than their predecessors can be obtained more easily.

3.3. Will the measures enable a transition to 100% renewable electricity generation by 2050? What are the measures required for a fundamental change to the electricity mix?

The transition towards a 100% renewable energy-based system does not currently figure on France's political agenda or even in public debate, let alone the transition to a 100% renewable electricity system. Perhaps unsurprisingly therefore, the measures proposed in the NREAP will not be sufficient to bring about a complete transition to renewable electricity by 2050; it is entirely plausible that they are not even enough to attain the 2020 objectives.

Measures to simplify administrative procedures and adjust the feed-in tariffs and the inflation adjustment mechanisms are critical if the French strategy for attaining its 2020 targets is to be credible. There cannot be a fundamental change in the French electricity mix however, without questioning the role of nuclear power.

The Government clearly states in the introduction to the NREAP that it expects to maintain its production of nuclear electricity, which currently represents around 80% of electricity consumption. This means that the objective of 27% renewable electricity by 2020 is only attainable if electricity consumption increases between now and then. Given the probable increase in use of electricity and the move away from energy generated by hydrocarbons outside the electricity sector, particularly in the transportation sector, this will at least have a positive effect on greenhouse gas emissions.

However, the combination of the extension of the operating lifespan of the existing nuclear power stations to 40 years and the prospect of an operating lifespan of 60 years for the future nuclear EPR power plants, will mean that the French electricity mix will inevitably become fixed as it stands today, and the door will be closed on any increase in the production of renewable electricity in France beyond 2020, despite the fact France has the highest potential in Europe.

Even if the French NREAP carefully avoids the question of the future of the electricity mix post 2020, questions pertaining to the development of renewable energy after 2020 obviously underlie the entire document, and this means that the authors have to contort the language in all sorts of ways in order to avoid explaining how it is possible to solve the major contradiction of claiming to be the champion of renewable energy whilst maintaining, or even increasing, its nuclear power potential.

3.4. Can the targets for 2020 and the aim of covering the total demand for electricity with renewable energies by 2050 be made easier and less expensive through European cooperation and if so, by using which measures?

Meeting 100% of European electricity consumption with renewable sources would mean the end of

nuclear power for France, which is not conceivable for the current French Government and does not figure on the agenda of political discussions except for the Green Party, which has been calling for an end to nuclear power since it was founded in 1984.

If a European objective of 100% renewable energy were to be retained, cooperation with the other Member States would probably be indispensable, although the conditions for such cooperation would need to be defined.

Until the decision to reduce nuclear energy has been made, the choice not to cooperate appears to be a better option for France. In fact, since it is unlikely that France will be on the right trajectory, non-cooperation would sooner or later force France to take corrective action, unless it wanted to renege on its commitments to the European Union.

To this end, the European Commission should remain vigilant regarding the Mediterranean Solar Plan, should it be implemented before 2020, so that it isn't used as a way out of meeting domestic renewable targets and a way of escaping the contradictions entailed by attempting to increase the share of renewable electricity whilst still increasing the use of nuclear.

However, the nature of France's dealings with neighbouring states is more often characterised by competition than cooperation.

In fact, if, as envisaged in the NREAP, the current nuclear generation capacity is augmented by the addition of two new nuclear EPR plants totalling 3200 MW capacity, so that the total nuclear generation capacity is increased by 8%, and the production of renewable electricity is increased to 155 TWh by 2020, the moderate increase in consumption will be far outweighed by the increase in production. The surplus production, which was 28 TWh in 2009 (the lowest since the nuclear installations were brought online) would therefore increase to more than 120 TWh by 2020.

Given the obligation to have 27% of its electricity produced by renewable sources, the implicit assumption of the NREAP is that this surplus shall be exported to neighbouring countries, as has been the case in the past with surpluses from the production of nuclear power.

However, there is no precedent for exporting such large quantities of surplus electricity as is envisaged in the NREAP (the record was 79 TWh in 2002). There is no doubt that the arrival on the European market of such quantities of low-price electricity would make waves, and could work against the renewable energy objectives of other Member States, especially if they have not provided in their own NREAPs for the mass importation of French nuclear electricity.

If it cannot be exported, this surplus electricity would discourage increase in production of renewable electricity in France and thus work against France's own objectives.

Over the long term, and in a France which is no longer a prisoner of the nuclear dogma that was adopted in the 20th century, the extraordinary physical potential that it possesses in all renewable energy sectors and its location at the centre of Western Europe, represent opportunities that must be utilised as part of a strengthen economic and technical cooperation with all neighbouring countries for the benefit of the entire European Union.

Today, however, this is in the realm of science fiction. No such measures to this end are conceivable until there is a profound change in vision among politicians and high-ranking civil servants, whose education and training has been shaped by the "all nuclear - all electric" ideology which has dominated France for almost 40 years and has never been questioned, despite the contradictions, and technical and economic dead ends it entails.

4 Conclusion

Given the explicit presuppositions regarding the continuation of nuclear power, the French NREAP not only has no real long-term vision for the development of renewable electricity, but it also contains errors, assumptions and omissions which lead one to doubt the actual possibility of attaining the 2020 objectives by the measures described alone.

The impression given is that of a Government dealing with a piece of homework, up against a deadline and hurrying to finish it by copying existing documents, without really reading it through and without answering any questions beyond those which are strictly necessary. It is as if the homework isn't really important and isn't worth taking seriously.

Analysis of the German Federal Government's National Renewable Energy Action Plan

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1. Introduction

Within the framework of its energy and climate policy, the EU has committed to reducing its greenhouse gas emissions by 20 percent compared to 1990 levels and to an increase in the share of renewable energies to 20 percent of total energy consumption – both by 2020 ("20 - 20 by 2020"). In its climate and energy package the EU has partially separated these overall targets into individual targets for each of the member states. In the area of renewable energy, the EU Directive 2009/28/EG (hereafter referred to as RED) has set a target for Germany of 18 percent. The specific measures and targets to be adopted in each individual area (electricity, heating/cooling, transport) in order to achieve the overall target is – with the exception of the transport sector – left to the discretion of the German Government. However, every Member State must outline their sectoral targets and objectives, as well as the proposed measures to achieve these targets, in a national action plan for renewable energy according to a template provided by the European Commission. These action plans, with a submission deadline of 30th June 2010, not only provide the European Commission with a tool to evaluate the implementation measures prescribed by the Member States but also represent a "roadmap" for every Member State that is of great interest to stakeholders (Howes 2010).

The time frame of the action plans is limited to the national targets up to 2020. Nevertheless, a course must also be set within this time frame for the restructuring measures necessary to achieve a low carbon economy and society by 2050. According to the EU's agreed negotiating position for the climate summit in Copenhagen, the industrialised countries must reduce their greenhouse gas emissions by 80 to 95 percent by the middle of the century. The majority of experts assume that this will only be possible if the supply of electricity is completely or almost completely decarbonised (Kirchner, Matthes 2009; SRU 2010, ECF 2010). This restructuring process will also require an increasing level of cooperation among the EU Member States. Therefore, this study examines firstly, to what extent the German Action Plan affects the long-term composition of the electricity sector and secondly, to what extent the plan makes full use of the potential for European cooperation up to 2020 and beyond. The analysis of the Action Plan is supplemented by proposals for exemplary measures that could enable both of these aspects to be (better) accommodated.

The subject of this study is the "National Action Plan for Renewable Energies" from 4 August 2010. In addition, reference is also be made to the German Federal Government's "Energy Concept" from 28 September 2010. Most of the Energy Concept's ideas are not reflected in the Action Plan because the Concept was still under preparation when the Action Plan was adopted. However its content is highly pertinent to the issues under consideration in this study.

2. Overview of the German Action Plan

2.1. Measures for the electricity sector

The centrepiece of the measures introduced for achieving the required renewable energy targets within the electricity sector is the Renewable Energy Sources Act (EEG). This law, which has been in force since 2000, guarantees facilities generating electricity from renewable energy immediate and priority connection to the electrical grid and obligates grid operators to purchase, transmit and distribute the renewably-produced electricity. In addition, the EEG sets technology specific tariffs to be paid by grid operators for the renewable electricity fed into the grid over a period of 20 years, including the year in which the facility is commissioned. These feed-in tariffs are based on the costs of generating the electricity so that any costs incurred by investors are covered. Every year the tariffs are reduced by a previously determined rate (degression). The EEG also prescribes that the costs incurred for the required optimisation and strengthening of the electricity network are to be carried by the network operators. The costs borne by these operators in the expansion of the network and for the feed-in tariffs are to be spread across the electricity consumers. This instrument is, therefore, independent of the public budget. In the National Action Plan, the Federal Government announced that this law will be revised in 2012, following previous amendments in 2004 and 2009. The law is to be revised at least every four years in the future in order to adapt the level of support to the market situation and technological developments. The basis for these revisions will be the EEG progress reports.

As part of the 2009 EEG revision, the Federal Government also implemented the requirements contained within the EU's renewable energy directive that serves to ensure the sustainability of biofuels and bioliquids. In the electricity sector, the ordinance on sustainability of biomass-based electricity (Biomassestrom-Nachhaltigkeitsverordnung) was issued to comply with this requirement.

In addition to the EEG, the National Action Plan announces a series of other instruments that are meant to help achieve the targets set in the RED. These include:

- low-interest loans from the state-owned KfW (Kreditanstalt für Wiederaufbau) development bank, which are issued within the framework of the "Renewable Energy" development programme;

- the National Climate Initiative, comprising a variety of information and promotion measures for improving energy efficiency and for the development of renewable energy across the board;

- the EnWG (Energiewirtschaftsgesetz) energy market law that establishes a framework for the development of the electricity and gas networks, as well as the relevant market regulations;

- the EnLAG (Gesetz zum Ausbau von Energieleitungen) law for the development of power lines, which is designed to help accelerate power grid extension by identifying urgent requirements for individual power lines. It also establishes a pilot scheme for laying underground cables as an alternative to overhead power lines.

Alongside the financial incentives and regulations included in the EEG and the EnWG, regional planning laws obligate the federal and state governments to encourage environmentally-friendly energy provision and energy network development, particularly the development of renewable energy sources. However, planning and approval of projects is under the jurisdiction of local authorities or individual states.

All of the measures listed above are already in force. Apart from regular monitoring and further adjustment of these instruments, particularly the EEG, the Action Plan does not contain any proposals for new measures.

2.2. To what extent does the Action Plan propose measures for cooperation on a European scale or cooperation with Germany's neighbouring countries?

The Federal Government declared in the Action Plan that Germany will not only achieve its national target for 2020 without exploiting the flexible cooperation mechanisms (Art. 6-12 RED) but is also expected to exceed them. Nevertheless, it confirms Germany's interest in common projects and its willingness, in principle, to participate in them. In particular, Germany could transfer the surplus levels above and beyond the indicative targets in the years 2011-2019 to other

Member States through the flexible cooperation mechanisms. In principle, it is also possible to tap into the additional potential of common projects.

According to its own statements, the Federal Government is still investigating opportunities for carrying out common projects within Germany or for German participation in other Member States. There are plans to publish a guide on utilising the flexible cooperation mechanisms and to set up an information agency for answering enquiries on the subject. In addition, the Action Plan points out that Germany has already conducted two international workshops about the cooperation mechanisms and will continue to support further exchanges between Member States. One example is the International Energy Agency (IEA) "Concerted Action" project for the implementation of the 2009/28/EG Directive where Germany serves as the co-chair of the working group on flexible cooperation mechanisms. According to the draft European Law Alignment Act for Renewable Energy (Europarechtsanpassungsgesetz Erneuerbare Energien - scheduled for December 2010), the implementation of flexible cooperation mechanisms will be postponed until the issues raised in this process have been conclusively clarified.

Regarding electricity infrastructure upgrading (Art. 16 RED), the Federal Government indicates that the expansion of joint capacities with neighbouring countries is planned and will be included in a variety of documents (Transmission Development Plan of the ENTSO-E, EnLAG, TEN-E guidelines). In its Energy Concept, the Federal Government confirms its commitment to supporting the setting up and development of a European-wide electricity grid and proposes a series of measures to achieve this goal. Amongst other things, the Government – together with other countries on the North Sea – is pursuing the idea of an offshore grid in the North Sea.

The Energy Concept assumes that Germany will import a considerable proportion of its electricity supply from renewable sources in the long term, for example, from solar thermal power plants in North Africa. The responsible Ministries will formulate an overall strategy for the EU's Mediterranean region solar plan for this purpose and also identify, in particular, the necessary framework conditions for the implementation of the "Desertec" concept. According to the Energy Concept, the Federal Government seeks to harmonise the promotion of renewably-produced electricity with the exploitation potential of the various renewable energy technologies and at the same time to further develop this economic sector in Germany. On this basis and building on the experiences gained through the implementation of the flexible cooperation mechanisms contained in the RED, the Federal Government plans to investigate the extent to which promotion systems for renewable energy can be further coordinated and harmonised among more Member States.

2.3. To what extent are measures proposed to enable the restructuring of the electricity sector to such an extent that all electricity can be supplied using renewable energies?

Although the measures in the Action Plan naturally refer to the fulfilment of the targets for 2020, the Federal Government is also committed to continuing implementation of the existing instruments for renewable energy development – particularly the EEG – beyond 2020. In order to sustain the previously observed growth in renewable energy within the electricity sector, it is crucial that the rule for priority access contained in the EEG be "maintained over a longer period". The feed-in tariffs for the individual technologies should also be maintained – in an adapted form – until these technologies become competitive without financial support and the assistance provided by the EEG can be gradually removed. In this respect, the Federal Government clearly signals its intention to promote the development of renewable energy in the electricity sector above and beyond 2020.

It can be assumed that financial incentives and the priority access rule will not be sufficient on their own to achieve the complete restructuring of the electricity system. A decisive factor is also the expansion and restructuring of the electricity grid not only does the physical infrastructure need to be adapted but new regulations must also be introduced in the electricity market in order to account for the much more decentralised and volatile supply of electricity in the future.

The Action Plan lists a number of instruments that will at the very least prepare the way for the technical restructuring of the electricity grid. These include:

- the EEG ordinance for system services by wind energy installations (SDLWindV), which stipulates that wind turbines have to contribute to maintaining grid stability;

- the ordinance for offshore power plants in German territorial waters, which regulates the planning process for offshore wind power plants in the exclusive economic zone (EEZ);

- the National Development Plan for Electric Mobility which provides research funding for the further development of electric vehicles and funding for establishing the necessary infrastructure. The target is the registration of one million electric vehicles (including hybrid vehicles) by 2020;

- the research project "E-Energy – Smart grids made in Germany" (E-Energy – IKT-basiertes Energiesystem der Zukunft) for the promotion of pilot projects, which is designed to investigate the development of smart grid technologies in practice.

All of the measures named above have already been approved and are currently being implemented. However, the Action Plan contains hardly any mention of further additional measures planned by the Federal Government to pave the way for the restructuring of the electricity system, allowing 100 percent use of renewable energy. An exception is the Government's intention to utilise innovative technologies, e.g. solar thermal power plants or offshore wind parks, within the framework of European cooperation projects.

One reason for this reluctance to propose new measures is certainly the fact that the Federal Government had been working on its Energy Concept for the time period up to 2050 in parallel to the Action Plan – the results of which were not able to flow directly into the Action Plan itself.

In contrast to the Action Plan, the Energy Concept – approved by the federal cabinet on 28 September 2010 – contains a series of proposed measures whose goal is to restructure the electricity sector in such a way that electricity can be generated – at least predominantly – from renewable sources. According to the Energy Concept, the Federal Government aims to cover 80 percent of gross electricity production with renewable sources by 2050.

In order to achieve this goal, a variety of measures are sketched out in the Energy Concept that are designed to address the following challenges:

- the expansion of wind energy (offshore and onshore) through a KfW funding programme, potentially supplemented by loan guarantees as well as by adapting the approval process to counteract any backlogs in the issuing of approvals;

- promoting the sustainable use and generation of bioenergy through considering the expansion of the existing sustainability criteria and potentially making them more rigorous, promotion of second-generation biofuels and exploitation of the potential of waste materials;

- ensuring the cost-efficient development of electricity generation from renewable energy through further development of the EEG, examination of the bonus payment system and an investigation of the promotion of offshore wind energy plants by tender;

- ensuring strong demand-oriented generation and utilisation of renewable energies through the further development of consumption regulations in the EEG. This measure seeks to ease the burden on the grid by revising metering regulations (MessZV) to create the conditions required for the nationwide use of smart meters, and to improve the conditions for load management;

- better integration of renewable energy into the energy system by considering a market premium concept in order to encourage renewable electricity producers to trade their product on the open energy market; accelerating the development of the network at both the German and European level, including the North Sea network; increasing the acceptance of grid expansions; extending energy storage capacities; and integrating renewable energy into the load management and reserve energy markets (particularly biogas plants).

3. Analysis

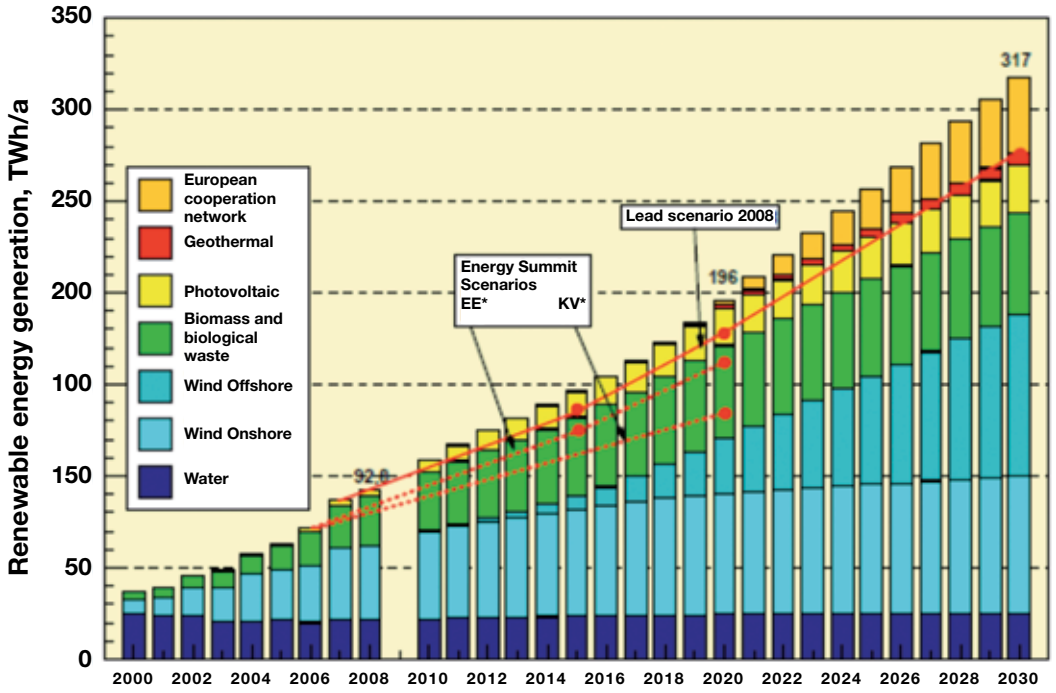
3.1. Are the proposed measures sufficient to achieve the targets set for 2020?

The Action Plan anticipates that Germany will achieve its target of 18 percent by 2020 and – provided additional efficiency measures are realised – even exceed this level by 1.6 percent. In the electricity sector, the share contributed by renewable energy would then be between 35 and 38 percent – depending on the success of the efficiency improvements. Questions have been raised, particularly regarding heating and cooling, as to whether the instruments announced up to now will be sufficient to meet the targets. However, the likelihood of achieving the renewable energy targets in the electricity sector can be classified as highly probable. The prerequisites for achieving these targets are the retention of the fundamental principles of the EEG – meaning that neither the priority access rule nor the cost-covering feed-in tariffs are abolished – and the continuation of the accompanying measures for grid expansion and planning regulation improvement.

Since the introduction of the EEG in 2000, electricity generation from renewable energy sources has more than doubled and the current trend indicates this rate may continue (see *Figure 1*). It has been possible up to now to achieve the development targets before the relevant target years. Should there be, contrary to expectation, a weakening in these developments, regular examination and revision of the laws and regulations will provide the opportunity for necessary readjustment. This ability to adjust the framework has been put into practice in the past, for example, to provide greater impetus for the installation of offshore wind plants. The target of increasing the share of electricity produced by renewable energy to at least 30 percent by 2020 and to continually increase this figure in subsequent years is stipulated in article 1, paragraph 2 of the EEG.

Several studies confirm the feasibility of the Federal Government's planned development path for renewable energy in the electricity sector (Nitsch 2009, Kirchner and Matthes 2009). Sector associations even anticipate that more rapid development is possible, with renewable energy able to cover 47 percent of the total demand

Figure 1: Development of electricity production through renewable energies according to the reference scenario published in 2009



*EE = "Renewable energy" scenario – *KV = "Coalition agreement" scenario

Source: Nitsch, Wenzel 2009, P. 38. Own translation.

for electricity by 2020 (BEE 2009). In contrast, a joint study from the research institutes Institute of Energy Economics and the Rational Use of Energy (IER), Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI) and The Centre for European Economic Research (ZEW), forecasts that the share of electricity production produced from renewable sources will reach 27 percent in 2020 (Fahl, Frondel, Löschel etc. 2010). In comparison to the reference scenario described above, the authors of the study anticipate a slightly lower rate of increase in the use of renewable energy. However, the main reason why the target will not be met in this scenario, is the assumed increase in the consumption of electricity: while the reference scenario assumes a slight decrease in gross electricity consumption in comparison to 2007, the study from the IER, RWI and ZEW forecasts an increase of 6 percent in the period between 2007 and 2020. This comparison underlines the importance of efficiency and energy saving measures for the achievement of renewable energy targets.

Bottlenecks in achieving these targets will most likely occur in grid expansion and in the construction of offshore wind power plants (see *section 3.2* of this report). Bottlenecks in the development of the electricity grid are not only to be expected in the area of high-voltage and extra high-voltage power lines, but in regional distribution networks at low and medium voltage levels due to the growing number of photovoltaic systems.

There has also been public debate, related to the Federal Government's Energy Concept, over the effects an extension to the lifespan of Germany's nuclear power plants by an average of twelve years will have on investment in renewable energy. Renewable energy sector associations and environmental groups argue that an extension in the lifespan of these nuclear plants will cement the power of the four large energy providers[1] as well as deterring public utilities and other smaller investors from investing in renewable energy, cogeneration plants and gas power plants. Another concern is that a larger share of renewably-produced electricity generation does not mix well with increasing reliance on nuclear power plants. The technical ability to start-up and shut-down nuclear plants is limited and is accompanied by high costs, thereby building inflexibility into the electrical grid which would make further utilisation of renewable energy difficult. Several cases in which short term negative prices for surplus electricity developed at the Leipzig power exchange underline the importance of these problems. However, it should be noted that the development of renewable energy will still primarily be driven by the EEG. As long as the priority access and feed-in tariffs are preserved, it can be assumed that the dynamics for expansion in this sector will also be maintained. Therefore, it is imperative that the resulting challenges of grid integration, electricity savings and energy fluctuations be tackled swiftly. It is also important in this context that the German population accept and support the EEG even if the EEG levies increase.

3.2. Is the distribution between the different sources of renewable energy for the achievement of the targets set for 2020 appropriate and sensible? Are all sources treated equally?

The central instrument for the development of electricity provision through renewable energies is the EEG, which was revised in 2009. This law is designed to support the use of all renewable energy technologies. The levels of the feed-in tariffs for the electricity fed into the grid are individually determined for every type of renewable energy according to the principle of covering production costs. In this way, all energy sources compete on a level economic playing field.

According to the Action Plan, the share of electricity production from renewable energy will be split in 2020 as follows: wind energy 48%, biomass 23%, photovoltaic 19% and hydro power 9%. The largest increase in the installation of renewable energy plants will take place in the areas of wind and solar energies. Geothermal energy will likely play a larger role by 2020, but tidal, wave and other marine energy are not likely to contribute significantly by that time.

In general, the targeted distribution of the different renewable energy technologies for the national 2020 targets appears to be both appropriate and sensible. The most problematic issue

1 In Germany, nuclear power plants are exclusively operated by the country's four largest utilities RWE, E.ON, EnBW and Vattenfall. These four companies together operate the predominant number of electricity power plants in Germany, retain holdings in many smaller utilities and – until recently – also controlled 100 percent of the electricity distribution network. However, E.ON sold its distribution network – when placed under pressure from the EU Commission - to the Dutch operator TenneT in February 2010.

is likely to be the anticipated share provided by offshore wind energy plants. As the Action Plan itself emphasises, this implies the successful installation and commissioning of the first wind parks, as well as the timely development of electricity networks and infrastructure on the coast, which from today's perspective represents a relatively optimistic scenario (see also Nitsch und Wenzel 2009). Therefore, the actions proposed by the Federal Government's Energy Concept focus on increasing support for this technology.

3.3. What other measures would be necessary to achieve the transformation to a 100% renewable energy system?

As described in section 2.3, it can be expected that the instruments named in the Action Plan for the electricity sector, particularly the EEG, will support the transformation of the electrical grid beyond 2020. In addition, the recently announced Energy Concept tackles other central fields of activity, such as the integration of renewable energies into the grid and the development of offshore wind energy, through additional measures.

In this respect, there is not necessarily a need for further measures but rather the rapid implementation of the existing measures that is required. It is also necessary to clarify how the further development of conventional power plants will be managed. The Energy Concept does not address the question of whether and to what extent, for example, new coal and gas power plants will be required in Germany in the future. In view of the fact that the opposition parties in the German Parliament have announced that they will reverse the decision to extend the lifespan of the nuclear power plants should they win the next election, the question of planning and investment confidence is currently more relevant for conventional power plants than it is for renewable energy plants.

A good level of interaction between the dynamically growing number of renewable energy plants and highly flexible conventional power plants is, however, indispensible for the transformation of electricity production. A consistent strategy for facilitating this transformation would therefore be desirable. This issue highlights the fact that as of yet there has been no consensus among politicians, industry and the public about the best path for developing environmentally-friendly and safe energy provision. One aspect of this lack in consensus is the increasing public opposition to all types of large scale projects, be it the construction of new power plants or power lines. This underlines the importance for clarification and measures for increasing acceptance.

In addition to the promotion of renewable energies, increases in energy efficiency and energy savings will play a decisive role in the achievement of long-term targets. The costs of restructuring the electrical grid and incorporating renewable sources will depend on the total amount of electricity required (SRU 2009). The introduction of electric vehicles will create additional demand for electricity in the transport sector, making it important that energy efficiency increases in other sectors so that total electricity demand is reduced or at least maintained. The Action Plan contains no information about energy efficiency but rather refers to the Energy Concept and the future "Action Plan for Energy Efficiency" due in 2011. However, it appears further action in this area is needed. The following measures, inter alia, should be taken:

- the dynamic adjustment of efficiency standards for appliances;
- effective measures for preventing rebound effects, e.g. increase in energy taxes in proportion with efficiency improvements;
- introduction of effective instruments for exploiting the energy efficiency potential, particularly in companies with high energy costs;
- improving efficiency of renewable energy production, particularly in the area of biomass energy.

3.4. Can the targets for 2020 and the aim of covering the total demand for electricity with renewable energies by 2050 be made easier and less expensive through European cooperation and if so, by using which measures?

According to a number of studies (SRU 2010, UBA 2010, Barzantny, Achner and Vomberg 2009) it would be possible for Germany to achieve complete self-sufficiency in the electricity sector through the use of domestic renewable energy. However, there is general agreement that the security of electricity provision can be increased and the costs reduced through joint European solutions (SRU 2010, UBA 2010, Nitsch and Wenzel 2009, Saint-Drenan, v. Oehsen, Gerhardt etc. 2009, Schlesinger, Lindenberger and Lutz 2010).

The development of an interconnected European electricity grid would enable Europe-wide balancing of fluctuations in electricity input from wind and photovoltaic energy, as well as reducing peak input loads. The accompanying reduction in the need for energy storage and energy reserve capacities would lower the overall costs of electricity production. Therefore, the interconnected European electricity grid offers substantial optimisation potential in comparison with only national solutions. This indicates that national solutions for self-sufficiency are not conducive for achieving the desired 2050 targets cost-effectively (SRU 2010).

However, European cooperation is not likely to make the process for achieving the German targets by 2020 significantly easier. The development of the European grid will also initially result in the creation of additional costs, though these initiatives are likely more economically efficient in the long term (SRU 2010, Schlesinger, Lindenberger and Lutz 2010). It appears measures for European cooperation will need to be initiated before 2020 to ensure the mechanisms are in place to reach the 2050 targets (Brodersen and Nabe 2009, UBA 2010).

Potential measures for European cooperation that are particularly worth mentioning are primarily those which encourage the development of the interconnected European electricity grid. Therefore, the Federal Government's Energy Concept mentions the development of common technological network standards, improved access to financial resources for grid operators, the development of border substations and the intensification of German cooperation with France and the Benelux nations in a pentalateral energy forum to avoid bottlenecks in the grid. This energy forum is intended to further develop the burgeoning cooperation between the North Sea countries and Ireland as part of the North Sea Offshore Initiative. In addition, there is also great potential for Germany to cooperate with Scandinavian and Alpine countries to utilise their pumped storage hydroelectric capacities – particularly in Norway (SRU 2010, UBA 2010, Federal Government 2010a). Even greater potential for cooperation, although far more difficult to achieve, exists in the development of a solar partnership between the EU and the states in North Africa, such as in the "Desertec" project (Nitsch and Wenzel 2009, PWC 2010). In this context, the RED includes measures that are specially designed to make common projects with third party countries easier. The debate about this project shows, however, that there is a gulf between those who advocate the use of domestic renewable energy sources through small-scale decentralised structures and those who want to import green electricity into Germany using "large-scale European technology" (Werenfels and Westphal 2010). The two approaches could of course be combined (Nitsch and Wenzel 2009, UBA 2010, Brodersen and Nabe 2009, Werenfels and Westphal 2010).

On the other hand, Germany has remained wary of initiatives for the harmonisation of Member States' national renewable energy policies. This was shown by Germany's position in the debate over the introduction of "Green Electricity Certificates" trading prior to the adoption of the RED. Nevertheless, it is anticipated for the period post-2020 that there will be an increasing focus on identifying which locations and which technologies can produce electricity in a cost effective way utilising European renewable energy sources. (Schlesinger, Lindenberger and Lutz 2010). Against this background, the Federal Government has signalled its willingness, within the context of the long-term perspectives described in the Energy Concept, to investigate the extent to which development programmes in different member states can be coordinated and harmonised.

4. Conclusion

The measures outlined in the German Action Plan for renewable energy in the electricity sector are not only oriented towards achieving the targets set for 2020. The Federal Government intends to promote renewable energy technologies until they are competitive with conventional forms of electricity generation. The prognosis for the electricity sector in 2020 shows that the share provided by renewable energy will be between 35 and 38 percent. This currently appears achievable as long as the EEG is maintained and efforts to expand the electricity network are continued.

Aside from the commitment to continue the EEG beyond 2020, the Action Plan contains relatively few measures with a long-term perspective. This is likely because the Federal Government produced a strategy paper on energy provision after the Action Plan had been published which focuses on precisely these long-term measures. This Energy Concept contains the target of providing 80 percent of the country's demand for electricity through renewable sources by the middle of the century and outlines a variety of measures that

need to be implemented to achieve this target. It tackles important topics such as the integration of renewable energy into the electricity grid and the development of offshore wind energy plants. In view of the increasing challenges faced by an electricity system consisting of predominantly decentralised and fluctuating electricity provision, the question of how to further develop conventional power plants remains unanswered – and this is the central weakness of the concept. Furthermore, significantly more ambitious measures for promoting the efficient use of electricity and for saving electricity are necessary.

The potential for European cooperation is recognised in the National Action Plan but has not yet been utilised. Measures for the utilisation of flexible cooperation mechanisms have only been investigated up to now. Measures for the establishment and development of an interconnected European electricity grid and for cooperation with neighbouring states are primarily dealt with in the Federal Government's Energy Concept but are only handled in a very general way. On the whole, the National Action Plan seeks to achieve the national targets for 2020 using essentially domestic measures, while the Energy Concept incorporates European cooperation as an important component in achieving the targets for 2050. Measures with long-term impact, such as the development of an interconnected European electricity grid, must be realised as quickly as possible if the desired effect is to be achieved by 2050.

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Evaluation of the Dutch NREAP

Max Rathmann, Thomas Winkel
and Rolf de Vos - October 2010

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1. Introduction

In January 2008 the European Commission (EC) published the Energy and Climate package. This package proposes committing the EU to a 20% reduction in its greenhouse gas emissions and to achieving a target of deriving 20% of the EU's final energy consumption from renewable sources, both by 2020. The renewables target is outlined in the EC's Directive (Directive 2009/28/EC) on the promotion of the use of energy from renewable sources. In order to achieve this overall EU renewable energy target of 20%, the directive includes individual binding targets for each Member State. The target for the Netherlands is 14% and is expected to come mainly from wind and, to a lesser extent, from biomass. These targets apply to final energy consumption. Final energy includes energy used for heating and cooling, electricity generation and transport.

The national renewable energy action plan (NREAP) is the core element of reporting obligations laid down in the Directive. Based on a specific template, EU member states are obliged to submit a national renewable energy action plan, including measures and expansion strategies geared towards achieving the binding national target. Member States had to submit a NREAP by June 30, 2010, after which the EC will evaluate the plans.

The NREAP's do not generally focus on objectives that apply beyond 2020, thereby potentially overlooking the fact that this year is only an intermediate step towards a complete transition to renewable energy. An important precondition for this transition is increasing European cooperation. Therefore this analysis focuses on two key aspects: the effects the measures proposed in the NREAP will have on the long-term structure of the energy mix and whether they utilise the full potential of European cooperation.

This evaluation is based on the officially submitted Dutch NREAP as published on the website of the European Commission DG ENER.

2. Measures proposed in the Dutch NREAP

In June 2010 a new parliament was elected, and negotiations to form a new government were concluded 14 October 2010, when Mark Rutte became Prime Minster at the head of a right-wing coalition minority government. The new government has distanced itself somewhat from the previous administration's energy policy; however, as the NREAP was drawn up during the previous government's time in office, it was highly influenced by the policies of the government of the day. The strategy of the government that was in place from 2007 to 2010, decisive for the content of the Dutch NREAP, was articulated in its policy programme, "Schoon en Zuinig" (Clean and Efficient) [1]. The programme had a relatively short-term focus, until 2020, and did not provide a long-term vision. The previous government committed the Netherlands to a target of 20% renewable energy from primary energy production by 2020, which is higher than the 14% target from the Directive in terms of final energy, even after correcting for the differences between final and primary energy.

2.1. Instruments mentioned in the NREAP which will be key to achieving the 2020 target

The following instruments are envisaged by the NREAP as key to achieving the 2020 target. The NREAP contains many more detailed policies.

- A biofuel obligation has been in place over the past few years, but the last year for which a mandatory biofuel quota is mentioned is 2010. Quotas for 2011-2014 are not mentioned in the NREAP, but are envisaged to increase slightly; this is yet to be decided by parliament.

- The key financial support instrument for electricity, biogas and cogenerated heat is the feed-in premium scheme 'SDE' (Stimulering Duurzame Energieproductie) which came into effect in 2008. The feed-in premium scheme provides a bonus payment to renewable producers on top of what they receive from selling their electricity on the market. It replaces the old feed-in premium, MEP (Milieukwaliteit Elektriciteitsproductie) which was abolished in August 2006. Currently, the premiums are paid from the government budget, but the last government had expressed the intention to change the funding for this system by via a surcharge on consumer electricity bills where the proportional cost increases the greater the consumption, and therefore making the scheme more robust. The outcome is uncertain however.

- For companies investing in renewable energy source (RES) projects, a tax relief (EIA) exists, which contributes substantially to the project's economic viability. Annual budgets are limited and regularly exhausted for some technologies and underexploited for others.

- A proposal for a Decree that gives grid priority to renewables in cases of grid congestion can be considered an important step to facilitate the integration of a larger share of renewables, and to improve their business case. The proposal has yet to be approved by the Senate.

- Two laws are designed to improve and speed-up planning permission procedures for large-scale (RCR – Rijkscoordinatieregeling, started 2008) and small-scale RES projects (Wabo – Wet algemene bepalingen omgevingsrecht, started 2010).

2.2. Measures focusing on European cooperation

The last Dutch government indicated in its programme "Schoon and Zuinig", even before the Directive on the promotion of the use of energy from renewable sources was implemented by the EC, that it would have been interested in participating in a renewables obligation in a European context. In the NREAP, however, there is no mention of this. The Dutch Government had initially indicated in its NREAP that it did not intend to use the cooperation mechanisms (neither statistical transfer, nor joint support schemes or joint projects) as the Directive allows.

To date there is no real cooperation between the Netherlands and other European countries regarding RES support policies, and even best practice and lessons learnt abroad are seldom applied. Examples of foreign best practice which have not (yet) been applied in the Netherlands are:

- the feed-in premium SDE introduced in 2008 is financed from the government budget, although experience abroad had shown that support systems are much more stable if they are kept independent of the government budget by financing them through a surcharge on consumer electricity bills that automatically adjusts to the actual expenses for RES support. Such an improvement is currently under negotiation;

- pre-planning schemes help to reduce administrative barriers and therefore speed up RES deployment and reduce cost. Other countries successfully apply such schemes, which imply that regional and/or local government must determine a minimum land area in which RES projects are principally allowed;

- no evidence can be found in support systems of other EU countries that a switch from a feed-in premium like the SDE to a quota obligation system could help reduce cost or speed up development. Nevertheless, such a switch has recently been suggested by the responsible minister, creating policy uncertainty once again. Policy stability and continuity is, in turn, lacking in the Netherlands, and this has proven to be crucial for increased growth and cost reductions in renewables due to investor confidence and related lower risk premiums.

Cooperation is increasing in electricity markets and (offshore) grids. There is a visible trend of expansion of interconnection capacity between the Netherlands and Germany, the UK, Norway and potentially also Denmark, coordinated with other Member States within ENTSO-E, the European network of transmission system operators. Market coupling of electricity exchanges in the Benelux, France and Germany is progressing. An indication of this is that TenneT, the Dutch transmission system operator (TSO), has recently taken over one of the German TSOs, which is considered to further integrate the Dutch and German electricity markets. Together with Belgium, France, UK, Denmark, Germany, Sweden, Ireland and Luxembourg, the Netherlands has also signed a Memorandum of Understanding and a strategic work plan for the development of an offshore grid in the North Sea (the North Sea offshore grid initiative).

3. Analysis

3.1. Sufficiency of the measures for achieving the 2020 national targets

Whether the EU target of 14% will actually be met is highly uncertain.

The Dutch NREAP states that the target of 14% RES in 2020 will be met, and assumes that the Netherlands will reach 14.5%. However, the NREAP itself states that the Dutch Energy Research Centre (ECN) modeled the NREAP measures to lead to 12 to 15%. The 14.5% is therefore at the upper end of the likely range.

The share of renewable electricity (RES-E) in total final electricity consumption is expected to be 37% percent in 2020. By far the largest share of renewable electricity is expected to come from wind (60%) and biomass (31%). The sub-target for offshore wind is particularly ambitious, and would require the annual installation of about 500 MW of capacity between 2010 and 2020 (230 MW has currently been installed).

ECN's recent assessment of the government targets [2] shows, that with the measures that are already in place, a share of 7% RES could be attained and that to, meet the EU target, additional measures will need to be taken, in particular an enlargement of the budgets for production subsidies (feed-in premium) over the coming years. The allocated budgets for the years 2008-2020 are expected to be sufficient for a mere 12% RES-E of total electricity use. It is estimated that an additional €18 billion will be required to attain the envisaged RES-E share in 2020 [3]. It is unlikely that the new government will implement the NREAP as envisaged by the old government, and it is especially uncertain whether additional budgets will indeed be allocated and whether the primary support instrument (SDE) will be prolonged. The stop-and-go nature of policy instruments in the past has taught us that such political uncertainty can lead to uncertainty in the market, thereby hampering RES-E developments.

3.2. Effects on the energy mix and longer term vision

If the Netherlands increased its share of renewable electricity to the 37% envisaged in the NREAP, this would create a fundamental change to the electricity supply structures. However, the NREAP only provides limited insight into future policies and their effectiveness. For example, it is uncertain whether sufficient budgets will be made available for support policies or whether new planning procedures will actually speed up project development.

The measures described in the NREAP are likely to be insufficient to achieve the step change in policy effectiveness that is necessary to fundamentally change the electricity mix of the Netherlands. The measures, being to a large extent, similar to current policies or slight improvements on them, are leading to some growth of renewable electricity. However, in parallel, large investments in fossil fuel power plants are conducted and planned, demonstrating that a fundamental change in investment activity and therefore future power mix is not yet happening or expected by the market.

The measures currently in place have a time horizon up to 2020. An integral government-backed long-term vision or roadmap of the electricity sector in the Netherlands is lacking. Such a vision could strongly contribute to long-term certainty and more stable and predictable policies. Financial incentives are unstable and very changeable in the Netherlands. Changes of policy direction in turn lead to uncertainty in the market resulting in the postponement of investments.

Currently, the slow speed of the development of the renewable electricity sector is overshadowed by investments in fossil power generation, gas and coal fired (baseload) capacity in particular (3,500 MW and 6,000MW of new envisaged capacity respectively), leading to an overcapacity by 2020 and turning the country into an exporter of electricity [2]. If this fossil power capacity is added and the envisaged share of 37% renewables in electricity consumption is reached, increasing conflicts between baseload and the grid integration of renewables are likely. The extent of this conflict depends on investments in interconnector capacity, the development of smart grids, the flexibility of supply (production capacity) and demand and investments in storage.

The risk of future conflicts between renewable electricity and baseload capacity will have a negative impact on project development initiatives and investment decisions taken in the coming years, and on the cost of renewables due to higher risk premiums. This risk could be partly mitigated by a government showing strong commitment to renewables and guaranteeing that the business case of RES projects will not be affected by increasing amounts of baseload. The two key instruments in this respect are (a) grid priority for renewables combined with (b) changes to the feed-in premium SDE ensuring that low power prices occurring at times of high wind power production due to insufficiently flexible baseload power do not negatively affect the overall income for wind power producers (see *3.4. 2c* and *2d* below for details). However, the political risk remains that government guarantees for renewables can be changed due to increasing political pressure from conventional producers suffering from lower power prices.

Although significant steps have been made, research has been translated into concrete pilots and demonstrations of smart grids, two offshore wind parks have been developed and experience has been gained with small and large biomass plants, compared to neighboring countries such as Denmark, Germany and the UK, the Netherlands is lagging behind. Its once strong position in the areas of RES research and product development is weakening, and the chances for Dutch entrepreneurs to obtain leading market positions are declining.

3.3. Distribution between energy sources

The NREAP has a strong focus on wind and biomass co-firing in power plants. Biomass co-firing of primarily imported biomass is the cheapest renewables option and can be quickly implemented. It is not however, a domestic resource and sustainability is questionable. Wind onshore is one of the cheaper options but faces planning permission and acceptance problems. It is assumed that wind offshore can be realised quicker / in larger amounts than wind onshore due to reduced social acceptance problems, but at a substantially higher cost.

From a static efficiency viewpoint, aiming for the renewable energy technology mix that is currently cheapest up to 2020, the choices of the NREAP probably make sense. From a dynamic efficiency viewpoint, aiming for the renewable energy technology mix that is cheapest to achieve the full transition to renewables in the long term, the NREAP might pay too little attention to technologies that are currently more expensive or more difficult to implement in large quantities, but require long-term development. According to renewable energy industry associations, too little focus is placed on more small-scale and/or more decentralised technologies.

3.4. Measures required for a fundamental change to the electricity mix

In order to fundamentally change the electricity mix towards renewables, a large majority of new investments must contribute to renewables rather than fossil fuels. This can only be achieved if the business case for renewables is more attractive compared to fossil fuels. Government intervention is needed to either make the business case for fossil fuels less attractive or the one for renewables more attractive. Higher prices for greenhouse gas emissions through the EU ETS or taxes, or emission performance standards for new fossil fuel plants are the measures needed to make the polluters pay fully for the external cost that is being covered by society. These measures are not implemented to the necessary extent due to fear of loosing energy-intensive industries to international competition.

Alternatively or in parallel, the business case for renewables can be improved by providing investment or production incentives, or by obliging energy companies to deliver an increasing minimum share of renewables. In the transport and building sector obligations can also be used. The business case can also be improved by reducing risk and financing cost by creating low interest loans or government loan guarantees, or by government participation in projects similar to how it does currently with the exploration of natural gas fields.

Examining the existing policy framework for renewable electricity, two key issues must be improved in order to allow a more significant contribution of renewables to new investment in the power sector: planning permission procedures and the number of projects being enabled by the feed-in premium SDE. Ecofys recently analysed [4] how the SDE could be improved in order to increase RES growth and ensure a sound business case in the face of massively increased conventional baseload and wind production. Three shortcomings were identified (point *1* to *3* below) which could be overcome by implementing five improvements (point *a* to *e* below):

1. Available SDE budgets are limited. So far, the overall reserved budget is insufficient to achieve the 2020 targets. For individual technologies, annual budget caps exist. Both individual project developers and the RES market as a whole run the risk that their efforts in project and market development will not pay back through SDE premiums in the end:
a) abolish the annual budget caps or apply them in a more flexible way;
b) the cost of the SDE should be covered by electricity consumers instead of the government budget.

2. A high risk exists that future projects will become unprofitable due to low future power prices (if high wind production is combined with inflexible baseload):

c) abolish or reduce the electricity floor price ("basiselektriciteitsprijs" – if the power price falls below that floor price, the premium, which usually fluctuates with power prices, is not increased further);
d) apply the profile factor ("profielfactor" – which compensates for the fact that power prices are lower in hours with high wind power production).

3. RES power producers are confronted with a substantial amount of risk and complexity within the SDE. For house-owners, small-scale producers, producers independent of incumbent utilities and producers using of innovative technologies, this complexity and risk can be a too high barrier:
e) introduce a feed-in tariff within the SDE for (at least some of) these parties, or introduce the possibility for (this group of) RES producers to chose between the current SDE feed-in premium option and a feed-in tariff option.

3.5. Future prospects of European cooperation on renewable energy. Short to medium term cooperation measures that the Netherlands should implement.

Increased European cooperation can be a useful tool to reach certain policy goals, but it can not be an aim in itself. According to the subsidiarity principle, the principle used to decide whether responsibilities should be at EU or national level, policies should be a national responsibility unless a clear benefit exists by moving the responsibility to the EU level. The discussion is ongoing whether RES targets can be achieved faster or at lower cost by moving responsibilities to the EU level, or whether ensuring the functioning of the internal electricity market would require such steps.

Coordination can refer to financial support instruments, but also to grid expansion / interconnection policy and the integration or coupling of (balancing) power markets. The usefulness of further coordination and integration of grids and power markets is widely accepted and, as described above, is already being pursued. Increased bilateral, regional or European integration of national grids and (balancing) power markets will reduce cost for the system integration of fluctuating renewables and will therefore help overcome related barriers to faster growth. It would be beneficial if existing integration processes were to be speeded up further.

Views differ whether further coordination is also desirable regarding financial support instruments [5] such as the Dutch feed-in premium, SDE. Different degrees of coordination of support instruments can be distinguished:

1. A fully harmonised EU support system, (this is not currently subject to debate). Its advantage could be to exploit potentials more efficiently, particularly in Member States that so far lag behind due to insufficient support policies. A risk lies in the fact that targets and support levels would be determined by EU decision making processes: this could prohibit future ambitious targets and the harmonised system would then become an upper limit to growth. In the past it was always individual Member States which took the lead with ambitious targets and policies, which, at that time, were considered by most other Member States to be unrealistic and undesirable.

2. One EU support system with national design details, giving Member States a degree of freedom in determining technologies and/or support levels (this is not currently subject to debate). Such a system might avoid the disadvantages of the fully harmonised support system described above. A similar model would be an EU support system that Member States can participate in if they wish (opt-in). Possible motivation for Member States to opt-in could be (a) participating in optimal potential exploitation, (b) avoiding the effort of maintaining a national system, or (c) increasing confidence of (foreign) investors and banks in the support system's stability.

3. Two or more countries, jointly utilising one of the flexible mechanisms within the Directive (joint support schemes, joint projects, statistical transfer) – Member State representatives are exchanging views on this. Although the Dutch government currently has no intention of making use of them (as stated in the NREAP), the Energy Research Centre of the Netherlands has published analysis and recommendations to pursue a joint support scheme with Sweden (and Norway if the envisaged Swedish-Norwegian cooperation materialises). Joint support schemes could also be established for specific technologies such as offshore wind or biomass co-firing.

4. EU-wide harmonised design criteria for national support systems (based on best practice) – this is currently not under debate. It could help Member States by forcing them to apply best practice and avoid bad practice.

5. Coordination or information exchange regarding technology-specific support levels, approaches/formulae to determine support levels and market response to support levels. This could help to maintain cost reduction pressure on technology providers instead of stimulating competition between Member States for scarce resources based on support levels (like in the case of offshore wind), and it could also increase policy stability in Member States by allowing Member States to set support levels that match their deployment targets and budgets. This is currently not subject to debate.

6. Increased mutual policy learning to reduce barriers as a precondition for further coordination or harmonisation. Member States could join initiatives such as the feed-in cooperation or the offshore wind cooperation. The European Commission could provide a guidance paper on best practices in RES policy design. The establishment of a website with details of RES policy framework in all EU Member States, including experience on how the policy framework functions in practice, could provide an important knowledge basis for national policy makers.

The following activities for increased cooperation seem recommendable for the Netherlands in the short to medium term:

- continue/strengthen (offshore) grid and (balancing) power market integration activities;

- consider, in particular for offshore wind and biomass co-firing, the introduction of technology-specific joint support schemes or the use of other flexible mechanisms (No 3 above), or coordination of support levels and growth trajectories (point *5* above).

• Biomass co-firing:
The Netherlands imports a considerable amount of biomass for co-firing and will possibly also import this biomass in coming years from EU Member States. From an economical and environmental perspective, it is probably better to co-fire the biomass locally in the Member States where it is produced and to transfer the green power (virtually) instead of physically transporting the biomass first in order to co-fire it in the Netherlands. This can be achieved through joint projects or statistical transfer. A joint support scheme for (co-firing) biomass including the major producers and users of biomass would probably be even more beneficial as it could strongly reduce the physical trade and transport of biomass towards those Member States offering the highest support levels.

• Offshore wind:
Most North Sea Member States now have ambitious offshore wind targets. Due to scarcity of turbines, vessels, manpower etc. in the European market, national support systems are already competing to attract those scarce technologies. In order to continue growth of the domestic market and to ensure achievement of deployment targets, Member States may not reduce support levels in accordance with reduced production costs; conversely, support levels may even be increased. Such competition between national support systems to attract scarce technologies has the potential to increase the total support costs that need to be covered by the public budget or electricity consumers. For the most cost-effective deployment of offshore wind, competition should be between project developers/technology suppliers, rather than between national support systems. This justifies the introduction of joint support schemes or at least coordination of growth trajectories and support levels, which would also benefit the offshore industry due to the subsequent increased confidence in growth trajectories and policy stability.

- Increase mutual policy learning with (neighboring) Member States (point *6* above). On virtually all renewable energy policy aspects, the Netherlands can benefit from a massively increased exchange between the responsible staff in Dutch ministries, agencies and other institutions, with their counterparts in UK, Denmark, Germany, Belgium or other Member States. Often, the best practice from other Member States is neglected or bad practice is repeated.

4 Conclusion

The Dutch NREAP only provides a limited insight into future policies and their effectiveness. It is likely that the measures presented in the Dutch NREAP are not sufficient to meet the 2020 target set by the EU Renewables Directive and will not trigger a fundamental change in the Dutch energy sector towards having a very high share of annual investments in renewables , and eventually having a high share of renewables in the energy supply system. However, many measures

described in the NREAP are focused in the right direction and an unexpectedly strong implementation of these measures would be a huge step forward. Achieving the 2020 target and triggering fundamental changes in the energy sector requires predominantly more ambitious, consistent, stable and long-term national policies, but increased cooperation with neighboring countries and within the EU would also be beneficial.

Endnotes

[1] Ministry of Housing, Spatial Planning and the Environment. "Nieuwe energie voor het klimaat. Werkprogramma Schoon en Zuinig". September 2007.
www.vrom.nl/get.asp?file=docs/publicaties/7421.pdf&dn=7421&b=vrom

[2] ECN. – Referentieraming Energie en Emissies 2010-2020. April 2010.

[3] ECN/PBL. – Verkenning Schoon en Zuinig Effecten op energiebesparing, hernieuwbare energie en uitstoot van broeikasgassen. April 2009.

[4] Ecofys on behalf of Transition platform renewable electricity: "Voorrang voor duurzaam".
www.senternovem.nl/energietransitiedev/documentatie/index.asp

[5] See for a more detailed discussion including modeling results the FUTURES-e project results:
www.futures-e.org

Assessing Sweden's National Renewable Energy Action Plan

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October 2010

FACTWISE

With support from COGITO

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1. Introduction

On 23 April 2009, the European Commission (EC) issued Directive 2009/28/EC (the Directive), on the promotion of the use of energy from renewable sources.[1] The goal of this directive is to increase in the EU, by 2020, the proportion of energy sourced from renewable sources to 20%, and to increase the proportion of renewable energy in transport to 10%. In order to achieve this goal, the EC has apportioned targets to individual EU Member States, based on their current proportion of energy produced from renewable sources, and their renewable energy potential.[2] This directive is derived from the EU's targets for 2020 of reducing greenhouse emissions by 20% from 1990, reducing energy consumption by 20% from business as usual projections, and meeting 20% of its energy demand from renewable sources.[3]

The Directive outlines that Sweden's renewable energy production in 2005 was 39.8% of total energy production, and should reach a minimum of 49% by 2020. The EC has translated the EU-wide 20% target into individual targets for Member States. It did so by assessing each Member State's starting point and potential, including the existing level of energy from renewable sources and the energy mix. The EU shared the required total increase in renewable energy supply between Member States on the basis of an equal increase in each Member State's share weighted by their GDP, taking into consideration their starting points, their gross final consumption of energy, and their past efforts on renewable energy.[4]

The 10% renewable energy supply in the Directive for the transport sector target is for all EU member states, regardless of current provision of energy for transport. The Directive states that "the mandatory 10% target for transport to be achieved... should ... be defined as that share of final energy consumed in transport which is to be achieved from renewable sources as a whole, and not from biofuels alone."[5] This creates the opportunity for electricity sourced from renewable energy to contribute to the transport energy target, a possibility should there be a wider shift towards electric drive trains in vehicles. The EU has encouraged this, allowing for the supply of renewable electricity in transport to count as 150% more valuable than other forms of energy.[6]

It should be noted that all targets are expressed as percentages of total energy consumption. By using relative targets, the lawmakers are in fact not putting any curbs on the total consumption of fossil fuels. Theoretically, a Member State can chose to meet its relative target while increasing its total consumption so much that the use of fossil sources actually increases.

2. The NREAP

Under Directive 2009/28/EC, EU Member States were directed to produce a National Renewable Energy Action Plan (NREAP). The EC provided Member States with a template for developing the NREAP.[7] This template was developed to ensure comparability between the reports prepared by Member States. It includes sections on:

- national energy policy;
- projected energy demand between 2010 and 2020;
- renewable energy targets and breakdown of expected sources of supply for the electricity, heating and cooling, and transport sectors;
- specific policies relating to planning, buildings, electricity infrastructure, district heating, and biofuels;
- systems to promote the use of renewable energy;
- measures to promote the use of biofuels;
- plans to collaborate with other Member States and third parties on renewable energy; and
- expected contribution of each form of renewable energy to the total.

The template includes many detailed and specific questions. It goes beyond the demands in the directive in some cases (e.g. on the detailed reporting on

1 European Commission, *Directive 2009/28/EC - Directive on the promotion of the use of energy from renewable sources*, 2009, p. 1.
2 Ibid, p. 3.
3 European Commission, *The EU climate and energy package*, 2010, Source: http://ec.europa.eu/environment/climat/climate_action.htm
4 European Commission, *Directive 2009/28/EC - Directive on the promotion of the use of energy from renewable sources*, 2009., p. 3.
5 Ibid, p. 3.
6 European Commission, *Decision of 30 June 2009 establishing a template for National Renewable Energy Action Plans under Directive 2009/28/EC of the European Parliament and of the Council*, 2009b, p. 11. Source: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009D0548:EN:NOT
7 Ibid.

bio-energy), but fails to include other requirements of the directive (e.g. Article 15 "Guarantees of origin of electricity, heating and cooling produced from renewable energy sources").[8]

Sweden submitted its NREAP to the EU on 30 June 2010. The document covers Sweden's target through to 2020. It does not address plans for Sweden to collaborate with other countries using cooperation mechanisms to reach its target, as Sweden plans to reach its target independently through domestic actions. Collaboration with Norway on a common electricity certificate system is planned, but is not included in the calculations of the NREAP.[9]

The NREAP does not address projections beyond 2020, save Sweden's vision of having a road transportation fleet independent of fossil fuels by 2030. The NREAP states that Swedish renewable electricity production in 2005 was 81 TWh. It projects that 2010, renewable electricity production will be 87 TWh, and will reach 97 TWh in 2020. However, a feasibility study prepared by the Heinrich-Böll-Stiftung (hereafter referred to as the ERENE report) has outlined that the long-term economic potential for renewable electricity in Sweden is 240 TWh,[10] based on a report by the German Aerospace Centre (DLR).[11] The ERENE report defines economic potential as the share of an energy supply's technical potential that is economically competitive according to certain assumptions.[12] The Swedish Parliament has directed the Government to set a national planning framework target of producing 30 TWh from wind by 2020.[13] This is compared to 12.5 TWh as modelled in the NREAP.

2.1. The REPAP2020 project

The "Renewable Energy Policy Action Paving the Way for 2020" (REPAP2020) project was initiated in April 2009 with the aim to facilitate national implementation of the Renewable Energy Sources Directive. The REPAP project is supported by European renewable energy industry associations and by EUFORES (a European parliamentary network with Members from all major political groups in the European Parliament as well as in the national and regional Parliaments of the EU Member States). REAPAP2020 has produced national implementation plans that have acted as "shadow budgets" to the official NREAPs.[14]

3. Measures proposed

Under the Directive, Sweden must provide a minimum of 49% of its energy from renewable sources by 2020. The NREAP reports that the Swedish parliament has set a slightly more ambitious target – 50% of Sweden's energy should come from renewable sources by 2020. The forecasting exercise in the NREAP[15] estimates that 50.2% of Sweden's energy will come from renewable sources by 2020, up from 39.8% in 2005, in order to ensure a margin of error exists in case some of the sectors do not deliver.

The Swedish NREAP is in principle a *prognosis* of what will happen if *already existing or decided measures* will be allowed to continue. The described measures are thus already politically accepted and adapted to by industry, including the power generating industry. However, especially in the case of the financial instruments, the measures are designed in such a way that more ambitious targets can be set at a later stage.

The NREAP lists measures under three categories: *General instruments, targeted actions* and *research:*

3.1. General instruments

The Swedish Government favours financial instruments such as *carbon tax, international emissions trading* and *green electricity certificates*. Sweden intends to develop these financial instruments

8 European Commission, *Directive 2009/28/EC - Directive on the promotion of the use of energy from renewable sources*, 2009.
9 Regerinskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi,* 2010, p. 93.
10 Schreyer, M., L. Mez, and D. Jacobs, *ERENE – European Community for Renewable Energy. A Feasibility Study*, Heinrich-Böll-Stiftung, 2008, p. 32. Source: www.boell.de/downloads/ecology/ERENE-engl-i.pdf
11 German Aerospace Center (DLR), 2006. *Trans-Mediterranean Interconnection for Concentrating Solar Power*, pp. 42-60. Source: http://www.trec-uk.org.uk/reports/TRANS-CSP_Full_Report_Final.pdf.
12 Schreyer, M., L. Mez, and D. Jacobs, *ERENE – European Community for Renewable Energy. A Feasibility Study*, Heinrich-Böll-Stiftung, 2008., p. 30.
13 Swedish Energy Agency, *Energy in Sweden, Facts and figures*, 2009, p. 10. Source: http://213.115.22.116/System/ViewResource.
14 Bryntse, Göran and Mariell Mattison, *National Renewable Energy Source Industry Roadmap* – Sweden, REPAP2020, February 2010.
15 Regerinskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi*, 2010, p. 9.

progressively, but will balance that with ensuring the competitiveness of Swedish industry.[16] The intention is to supplement the financial instruments with technology development efforts, information and educational programs, and efforts to break institutional obstacles to innovation.

The total turnover of the green electricity certificate market is estimated to be in the order of SEK 4.5 billion per year.[17]

3.2. Targeted actions

The Swedish 2009 budget allocated a total of SEK 389 million per year for investments in solar PV and biogas for the period 2009-2011. A new governmental support programme for solar PV was introduced on 1 July 2009, and on 1November 2009, public support for the production, distribution and use of biogas and other renewable gaseous fuels, was introduced. The parliament approved SEK 122 million to be used for 2010. For 2011, the support is estimated at SEK 117 million. In addition to this, the 2010 Budget also allocated SEK 70 million for the subsidisation of new wind power for the years 2010-2012, as well as for promotion and planning efforts for wind power.[18]

The Swedish Energy Agency, Energimyndigheten, is responsible for the administration of public finance for the production, distribution and use of biogas and other renewable gaseous fuels, as well as for solar photovoltaic cells and the subsidisation for new wind power. Energimyndigheten received enhanced funding of SEK89 million per year to carry out its task.

The Swedish Rural Development Programme (Landsbygdsutvecklingsprogrammet) includes support for farm-based biogas production. During the period 2009-2013, SEK 200 million were earmarked for investments linked to farm-based biogas production. Support for conversion from direct electric heating in houses, apartment buildings and commercial premises within residential buildings is provided at SEK 280 million for 2010. Solar thermal energy also received SEK 24 million in support in 2010.[19]

The Delegation for Sustainable Cities (Delegationen för Hållbara Städer) can provide grants up to SEK 340 million for sustainable urban development, including support for renewable energy, for the years 2009-2010. An allocation of SEK 140 million for 2009 was announced in December 2009.[20]

There are a lso investments in renewable fuels and in the development of alternative technologies. In order to promote cars with low environmental impact, new "green cars" placed in service from 1 July 2009 are exempted from vehicle tax for a period of five years. The "green car" definition will be progressively tightened in the future. In addition, other changes in the taxation of vehicles have been introduced aimed at creating incentives for cars and trucks with lower carbon emissions.[21]

3.3. Research

Starting in 2009, the Swedish Energy Agency will have more than SEK 1 billion per year for energy research at its disposal. There will be funding to colleges and universities for energy research with SEK50 million in both 2010 and 2011 and another SEK60 million in 2012.The funding is targeted towards the following areas: large-scale renewable power generation and its integration into the grid; electric and hybrid vehicle drive trains; combined heat and power, biofuels and renewable materials; as well as research into new technologies in nuclear energy and carbon capture and storage.

In addition to the investment in energy research that was included in the research and innovation bill, an additional SEK 145 million in 2009, 380 million in 2010 and 350 million in 2011, have been allocated to energy research. This investment is intended to support the development of second-generation biofuels and the demonstration and commercialisation of other "energy technologies of major national importance and with significant export potential".[22]

It should be noted that the Swedish Energy Agency, in its background report for the NREAP, reports that there will be a large surplus of electricity, approximately 28 TWh, compared to domestic demand in 2020.[23]

16 Ibid, p. 4.
17 Ibid, p. 4.
18 Ibid, p. 5.
19 Ibid, p. 5.
20 Ibid, p. 5.
21 Ibid, p. 5.
22 Ibid, p. 4.
23 Swedish Energy Agency, *Handlingsplan för förnybar energi*, ER 2010:08 Bilaga 2, 2010.

Although the Directive does include the possibility to use cooperation with other Member States and with non-EU countries, the Swedish NREAP does not include any such initiatives. Sweden intends to meet its goals domestically.[24]

4. The Analysis

4.1. Effects on energy mix

The NREAP presents the Swedish Government's assessment of how renewable energy and energy demand on the whole will develop. It does not cover the change in sources of non-renewable energy supply. However, *Figure 1* shows that the contribution of non-renewable energy will decrease only slightly from 2005 to 2020 (from 242 TWh to 227 TWh), while all renewable energy, including electricity, heating and transportation fuels, will increase from 159 TWh to 229 TWh.

The NREAP projects that Sweden will increase its renewable energy proportion from 39.7% in 2005 to 50.2% in 2020 (*Figure 2*).

Figure 1. Swedish energy consumption in 2005 and 2020.[25]

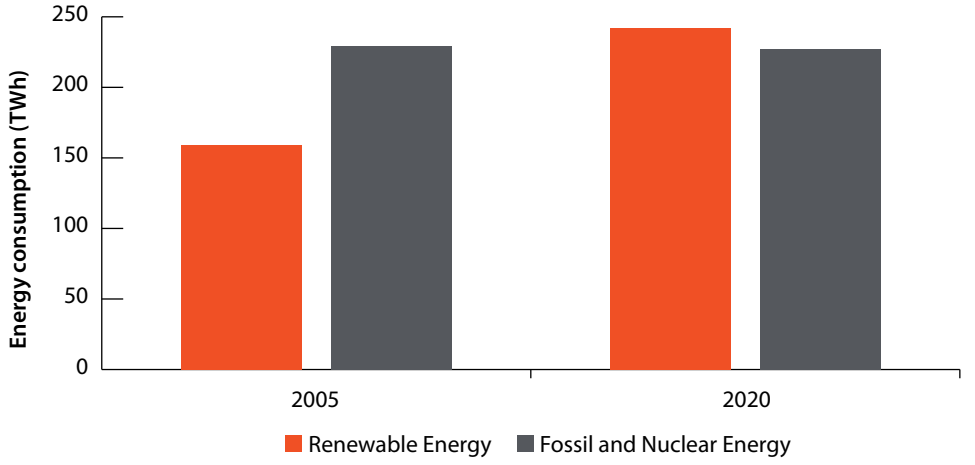
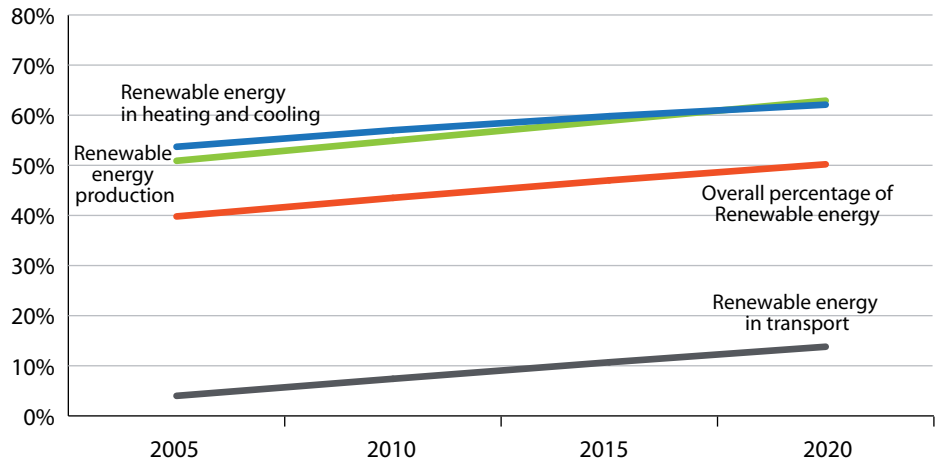


Figure 2. Proportion of energy projected to be provided by renewables.[26]



24 Regerinskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi*, 2010, pp. 93-95.
25 Adapated from Regeringskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi*, 2010, p. 7.
26 Ibid, p. 10.

For electricity, the increased proportion of renewables would result from an increase in wind power (from 0.94 TWh in 2005 to 12.5 TWh in 2020) and biomass power utilising combined heat and power (from 7.6 TWh in 2005 to 16.7 TWh in 2020). Solar power is expected to increase as well, though the contribution would only be 0.004 TWh.[27] Hydroelectricity's contribution to Sweden's electricity supply is expected to decrease; there are no plans to increase hydroelectric generation capacity (large hydro capacity would be the only source of change, with a small increase from 15,397 MW to 15,412 MW).[28] In the projection in the NREAP, hydroelectric production is expected to decrease largely because 2005, the base year for the projection, was a wet year that resulted in an unusually high level of hydropower production in Sweden.[29] As there has only been a projection to 2020, with intervening years interpolated, the results demonstrate a consistent reduction in production, which will likely not be borne out in reality.

Renewable energy in heating and cooling is expected to increase from 98.5 TWh in 2005 to 122.6 TWh in 2020. This is expected to be driven by increases in the use of solid biomass and a 114% increase in each form of heat pump (air source, ground source, and water source). The contribution of biogas decreases, likely due to it being deployed further as a transportation fuel.[30]

4.2. Transport

In transport, the change will be notable; a 250% growth in renewable energy between 2005 and 2020 is expected. All forms of renewable transportation fuels, with the exception of hydrogen, will increase. Electricity in transportation is expected to grow more slowly between 2005 and 2020, at 64%, from 1.4 TWh to 2.3 TWh. Biogas increases in the projections from 0.15 TWh to 1.1 TWh and biodiesel should grow from 0.1 TWh to 2.9 TWh. Ethanol will grow from 1.7 to 5.4 TWh, while import dependency will decrease from 81% to 63%. The reduction in import dependency is based solely on the opening of two facilities – Agroetanol in Norrköping (210,000 m^3 per year) and Nordisk Etanolproduktion in Karlshamn (130,000 m3 per year).[31]

4.3. Sufficiency of measures

As the NREAP is produced as a prognosis based on already existing or decided policy, the measures proposed are likely to be sufficient to achieve the targets of the Directive. In fact, the prognosis[32] was made by the Swedish Energy Agency even before the new efficiency programme was agreed by the Swedish Parliament in June 2009.[33] There is reason to believe that Sweden both can and will exceed the 2020 targets substantially. Increases in all forms of renewable energy could be achieved through a more ambitious energy policy, which could push Sweden's renewable energy proportion well beyond 50% by 2020. A study for REPAP2020 estimates that Sweden could provide 73% of its energy through renewable sources by 2020.[34] Sweden's renewable energy proportion already reached 42% in 2007[35] and 44.1% in 2008,[36] ahead of the projections in the NREAP, in which renewable energy was expected to provide 43.5% of Sweden's power by 2010.[37]

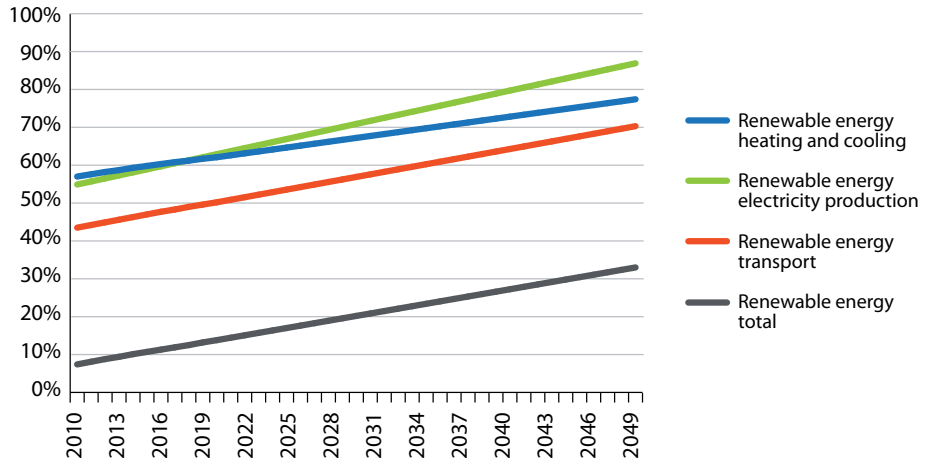
4.4. Long term impacts

Sweden's energy usage in 2005, according to *Table 1* of the NREAP, was 401 TWh (34,500 ktoe). Of that, almost 40% (159 TWh or 13,700 ktoe) came from renewable sources. In the energy efficient scenario outlined in the NREAP (the scenario under which 50% of Sweden's energy is provided by renewables 2020), it is projected that energy use will increase to 456 TWh (39,200 ktoe), of which renewables will provide 229 TWh (19,700 ktoe).

It should be noted that the NREAP's estimate of the annual increase in each respective renewable energy source is based on the Energy Agency's model calculations that have 2002 as a baseline

27 Adapted from Regeringskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi*, 2010, pp. 97-98.
28 Ibid, pp. 97-98.
29 Ibid, p. 98.
30 Ibid, p. 99.
31 Ibid, p. 100.
32 Swedish Energy Agency, *Handlingsplan för förnybar energi*, ER 2010:08, 2010.
33 Riksdagen, *Prop 2008/09:165, bet. 2008/09 NU25, rskr 2008/09:302*, 2009
34 Bryntse, Göran and Mariell Mattison, *National Renewable Energy Source Industry Roadmap – Sweden*, REPAP2020, February 2010.
35 Energimyndigheten, *Energy Indicators 2009 – Follow-up of Sweden's energy-policy objectives*, p. 39.
Source: http://www.energimyndigheten.se/Global/Energifakta/Energiindikatorer/Energiindikatorer_09_web.pdf
36 Swedish Energy Agency, *Energy in Sweden, Facts and figures 2009*, p. 70.
37 Regeringskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi*, 2010, p. 10.

Figure 3. Share of renewable energy according to Sweden's NREAP, extrapolated to 2050.



year with a projected outcome for the years 2009, 2016 and 2023. Projections for all other years (including 2020) are interpolated. In other cases, values for 2020 are projected while values for all other years are interpolated.[38]

We have used linear extrapolation to estimate renewable energy production to 2050. In this extrapolation, the economic potential as estimated in the ERENE report[39] was used as the upper limit for production of renewable energy. If, in this extrapolation, any source of renewable energy reached its economic potential before 2050, it was not allowed to increase further. No form of renewable energy reached the economic potential outlined in the ERENE report, and so all forms of renewable energy continued to grow through to 2050 (*figure 3*).

4.5. Distribution between energy sources

The Swedish Government does expect growth in renewable energy production. However, the NREAP only indicates growth in four electricity sectors: solar photovoltaic, onshore wind, offshore wind and biomass. This is based on current policies; the Swedish Government may yet implement new policies to support the development of other forms of renewable energy. Most notably, neither wave nor tidal power is expected to increase. Though the potential exists for between 2 and 2.5 TWh of wave power production within 22 km of Sweden's coast (i.e. Sweden's territorial waters)[40,41], the NREAP does not project this to be implemented by 2020. ERENE also estimates that the long-term economic potential of geothermal energy in Sweden is 1.3 TWh; the NREAP does not project that geothermal energy will come into use.

Sweden is targeting a 25 TWh increase in renewable electricity through its renewable electricity certificates, though this is not reflected in the NREAP (growth is 16 TWh between 2005 and 2020). The Swedish Government has requested the Parliament to create a framework where wind power would provide 30 TWh in 2020 (20 TWh onshore, and 10 TWh offshore).[42] However, this is also not reflected in the NREAP; wind production increases to 12.5 TWh by 2020 in the report. The Government's projections of the proportion of each form of renewable electricity between 2005 and 2020 are outlined in *Figure 4* and *Figure 5*.

The prognosis does also not include the assessment of the potential of growth in pumped storage hydroelectricity or the contribution of biogas or liquid bio-fuels to electricity. Solar thermal electricity is also excluded in the projection.[43]

38 Ibid 2010, pp. 96, 100.
39 Schreyer, M., L. Mez, and D. Jacobs, *ERENE – European Community for Renewable Energy. A Feasibility Study*, Heinrich-Böll-Stiftung, 2008., p. 30, p. 32.
40 Ibid.
41 M. Sidenmark, Ocean Harvesting – Ocean Wave Power – Renewable energy at low cost, presentation to Engineering for a Sustainable Society, Blekinge Tekniska Högskola, 3 December 2008
42 Swedish Energy Agency, *Energy in Sweden, Facts and figures 2009*, p. 10.
43 Regeringskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi*, 2010.

Figure 4. Contribution of renewable energy sources to total renewable electricity in 2005 (Adapted from the Swedish NREAP).

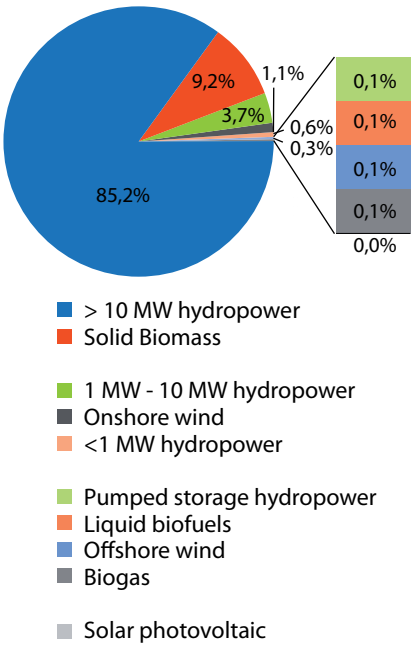
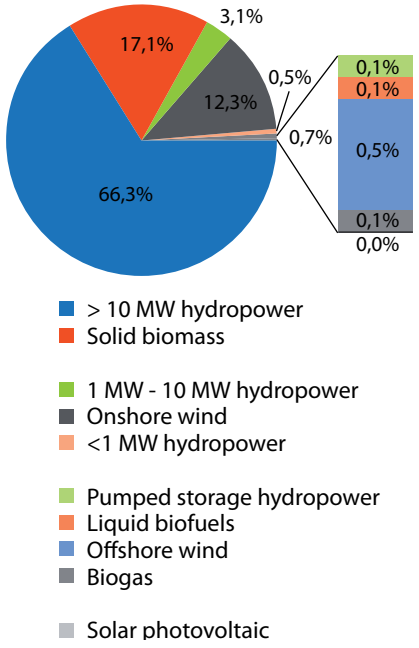


Figure 5. Projected contribution of renewable energy sources to total renewable electricity in 2020 (Adapted from the Swedish NREAP).



For heating and cooling, there is an anticipated growth in solid biomass as a fuel source. However, the proportion of renewable energy used in heating and cooling is expected to decline from 99% in 2005 to 89% in 2020, as heat pumps in particular (most notably, ground source heat pumps) gain prominence in the Swedish heating mix.

In transport, there will be a shift away from electricity, which currently comprises 42% of renewable transport energy (largely through railways). The shift will lead to a slight decrease in the proportion of ethanol as a renewable transport fuel, and an increase in biodiesel and biogas. It is surprising that there are no expectations for major growth in the number of electric vehicles, particularly as neighbouring Denmark is embarking on a major program of support for electric vehicles.[44]

The Swedish Commission on Oil Independence[45] estimated a realistic potential for bioenergy to be 228 TWh/year by 2050 (and 154 TWh by 2020). Heinrch Böll Stiftung estimates that the long-term economic potential for electricity from biomass in Sweden is 80 TWh.[46]

4.6. Measures needed to fundamentally change the Swedish electricity mix toward renewable energy sources

The potential for renewable energy can be measured with very different criteria. There is a *theoretical potential* that measures what could be produced in a situation where no technical, economical or other practical restraints existed. The theoretical potential for renewable energy is enormous. If all of the solar energy that reaches Sweden's surface were harnessed, it would exceed Sweden's energy consumption many times over. A study made in 2006 by the European Commission concluded that Sweden could completely satisfy its total energy consumption by installing solar cells across 0.39% of its area.[47]

44 J. Bergman, *Denmark Leads Europe's Electric-Car Race*. Time, February 14, 2010. Source: http://www.time.com/time/world/article/0,8599,1960423,00.html
45 Kommissionen mot oljeberoende, *På väg mot ett OLJEFRITT Sverige*, 2006.
46 Schreyer, M., L. Mez, and D. Jacobs, *ERENE – European Community for Renewable Energy. A Feasibility Study*, Heinrich-Böll-Stiftung, 2008, p. 32.
47 Marcel Suri *et al., Potential of solar electricity generation in the European Union member states and candidate countries*,. European Commission, DG Joint Research Centre, Institute for Environment and Sustainability, Renewable Energies Unit, 2006.

The *technical potential* covers what is technically feasible using known technologies, but ignoring cost issues. It includes restraints imposed by the current state of technology, by shortages of raw materials and by the time needed for design and construction.

There is also an *economical potential* that includes the cost factor and what society and the actors within society deem is worth investing in. The economic potential depends on the cost of alternative or competing energy sources, which for Sweden include existing large hydropower and nuclear power. It should be noted that policy will influence what is economically viable through the use of financial measures such as taxes or other incentives. For example, a study by McKinsey & Company estimates that, should Sweden implement all measures that would cost SEK 500 per tonne of reduced CO_2 or less, it could reduce emissions compared to business as usual by 5.5 million tonnes by 2020. However, if all measures that cost less that SEK 1,010 per tonne CO_2 (the current level of the Swedish carbon tax for non-industrial sources) there is a potential to save 10.2 million tonnes.[48]

Sweden uses financial measures as its main policy instrument to promote renewable energy sources. It sets its tax levels and the level of the green electricity certificate quota obligations to reach an agreed renewable energy target.

While the green electricity certificates are efficient and cost-effective measures to reach an agreed target, they provide no incentives to go beyond this target. A feed-in tariff system would provide this further incentive. The example of Denmark shows how feed-in tariffs can drive the market to undertake renewable energy development, while green electricity certificates only lead to renewable energy generation up to a certain target. In 1999, Denmark began to move towards a renewable energy certificate system. While this system has yet to be implemented fully, transitional rules implemented for new wind power reduced the feed-in tariff premium for wind power, reducing the attractiveness of wind power to private and cooperative investors.[49] Installed capacity remained virtually stagnant between 2003 and 2008 (rising from 3,116 MW to 3,163 MW), before rising 300 MW in 2009 as the Horns Rev 2 offshore wind farm came on stream.

There is a potential for Sweden to raise its ambitions by either using its existing green certificates system or a feed-in tariff system, in combination with other existing or strengthened financial measures, to substantially increase its proportion of renewable energy. How far Sweden can go depends on how highly the Swedish Government and Swedish citizens value independence from non-renewable energy sources. The gap between what is technically possible and what today is considered economically feasible is significant.

4.7. Future prospects of European cooperation on renewable energy

Today, Europe uses only a fraction of its economic renewable energy potential. No EU Member State currently meets its electricity demand with solely renewable sources. Sweden, due to the use of its hydropower resources, meets more of its energy demand from renewable sources than any other EU Member State.

While the Directive has set the target to generate 20% of the EU's overall energy consumption from renewable sources by 2020, there is a much larger potential available than what is reflected in the Directive's national targets. The Swedish NREAP is no exception.

Increasing cooperation with other Member States through the European Network of Transmission System Operators for Electricity, (ENTSO-E), could combine the use of regional renewable sources with a transnational grid for green electricity, and could be an important step towards a fully renewable European energy system.

To move in this direction, much more ambitious targets and measures than the ones described in the Swedish NREAP would be needed.

48 McKinsey & Company, 2008. "Greenhouse Gas Abatement Opportunities in Sweden," p. 15. Source: http://www.mckinsey.com/clientservice/sustainability/pdf/Svenska_Kostnadskurvan_IN_English.pdf

49 Mendonça, M., S. Lacey and F. Hvelplund, "Stability, participation and transparency in renewable energy policy: Lessons from Denmark and the United States." 2009, *Policy and Society*, 27:4, pp. 379-398.

4.8. International Cooperation

The directive says: "Two or more Member States may cooperate on all types of joint projects relating to the production of electricity, heating or cooling from renewable energy sources."[50] This means that there is an opportunity, but not an obligation, to cooperate across Member State borders. Comparing the Swedish NREAP with assessments of renewable energy production potential and energy efficiency potential, it is clear that the plan takes a quite conservative and unambitious approach to Sweden's role in the European Community.

Chapter 4.7 of the Swedish Action Plan, "Planned use of statistical transfers between Member States and planned participation in joint projects with other Member States and third countries", is very brief and the Government simply reports that nothing is done or planned in this area to date.[51] There is no guidance for private power producers to engage other Member States in renewable power exchanges.

Considering the already high level of renewable energy production in Sweden; the large potential for expansion of this sector; the substantially lower proportion of renewable energy in neighbouring countries (*Table 1*); and the abundance of existing and planned high voltage interconnections in the region, the potential for cooperation is huge.

Table 1. National overall targets for the share of energy from renewable sources in gross final consumption of energy in 2020.[52]

	Share of renewable energy 2005	Target, share of renewable energy 2020
Sweden	39,8%	49%
Latvia	32.6%	40%
Finland	28.5%	38%
Denmark	17.0%	30%
Estonia	18.0%	25%
Lithuania	15.0%	23%
Germany	5.8%	18%
Poland	7.2%	15%

There is a long history of cooperation on the energy markets of the Nordic countries. *Nordel* was founded in 1963 as a body for cooperation between the transmission system operators in Denmark, Finland, Iceland, Norway and Sweden. Its objective was to create preconditions for a further development of an effective and harmonised Nordic electricity market.

In order to increase efficiency in the electricity sector, the Nordic countries chose, starting in 1991 in Norway, to expose electricity production and trading to competition and to separate these functions from the still regulated grid monopoly. Since the 1980s, there has been a trend towards free competition both in the EU and elsewhere in the world, but the trend has developed most rapidly in the Nordic countries. The world's first international electric power exchange, Nord Pool, was launched amongst Nordic nations in 1996.[53]

The Nord Pool market is a single financial electricity market for Norway, Denmark, Sweden and Finland. As of 2008, Nord Pool is the largest power derivatives exchange, and the second largest exchange in European Union emission allowances (EUAs) and global certified emission reductions (CERs) trading. The international derivative products, the clearing house and the consulting services are provided through cooperation with NASDAQ OMX Commodities.

The number of physical interconnections between the Nordel region and neighbouring countries is increasing. In 1982, an HVDC link was installed between Finland and the Soviet Union. There are now HVDC links to Germany from both Sweden and Denmark and since 2000 an HVDC cable between Poland and Sweden. The AC interconnections between Western Denmark and Germany have been expanded continuously. Since 2000, a 450 MW Russian power plant in St. Petersburg has been connected directly to the Finnish subsystem. The increasing number of interconnections brings a growing need for coordination.

On 1 July 2009 Nordel was wound up, and all operational tasks were transferred to the newly formed *ENTSO-E*, with 42 members across 34 European countries.

50 European Commission, *Directive 2009/28/EC - Directive on the promotion of the use of energy from renewable sources*, 2009.
51 Regeringskansliet, *Sveriges Nationella Handlingsplan för främjande av förnybar energi enligt Direktiv 2009/28/EG och Kommissionens beslut av den 30.6.2009, Bilaga till regeringsbeslut 2010-06-23, I27, Dnr 2010/742/E (partly) 2009/7789/E*, 2010.
52 European Commission, *Directive 2009/28/EC - Directive on the promotion of the use of energy from renewable sources*, 2009.
53 Nordel, *Nordic Grid Code* 2007, 2007.

ENTSO-E's legal *raison d'être* is Regulation (EC) 714 / 2009 on cross-border electricity exchanges. This Regulation assigns new tasks to ENTSO-E, such as the drafting of network codes that can become binding to system users; as well as EU-wide ten-year network development plans. Thus, ENTSO-E pursues primarily three objectives:

- ensuring the secure and reliable operation of the European power transmission system;
- facilitating a secure integration of new generation sources, particularly growing amounts of renewable energy and thus contributing to the achievement of the EU's 20-20-20 goals; and
- enhancing the integration of the internal electricity market through standardised market integration and transparency frameworks that facilitate competitive and truly integrated markets.

5. Conclusion

Sweden has had greater success that most countries in its renewable energy development, particularly biomass energy. This baseline situation, in combination with current and upcoming measures and improvements, should enable Sweden to easily achieve its goal under Directive 2009/28/EC of meeting 49% of its energy demand through renewable energy. Sweden was already halfway to its target by 2008 (up to 44.1%, from 39.8% in 2005).

However, the economic potential for renewable energy in Sweden is far greater than 49% of the energy consumption. Implementing the measures that would provide 30 TWh of wind power by 2020 would increase Sweden's projected proportion of renewable energy to 54%. Increasing renewable energy production to levels that are still below Sweden's economic potential would enable Sweden to make statistical or actual transfers of renewable energy to its neighbours to enable them to meet their target, providing Sweden a boost to its economy. While Sweden remains a leader in the renewable energy field, there are many technologies, policies and measures that Sweden could adopt, including a feed-in tariff for renewable energy and/or an increase of the quota obligation in the electricity certificate system, which would increase renewable energy production significantly.

The EU Renewables Directive, for the first time, set legally binding renewable energy targets for the EU: a 20% share of renewables in final energy consumption by 2020. Each Member State was apportioned an individual target, and had to produce a National Renewable Energy Action Plan (NREAP) offering detailed information on their concrete polices for reaching these targets. These NREAPs thus offer a unique insight into the expected development of renewable energy and the energy industry as a whole in Europe over the next decade.

If we are to make the fundamental changes required to tackle climate change, we will have to think beyond the 2020 targets however. This publication provides a first, critical insight into six of these NREAPs with two questions in mind: do they take into consideration the long term goal of 100% electricity from renewables, and do they expect to make use of European cooperation methods? The analysis demonstrates the great variety that exists between Member States on renewable energy policy, both in terms of ambition and method.

The Green European Foundation, as the European platform for green political foundations, has worked with the Heinrich Böll Foundation, Grüne Bildungswerkstatt, Stichting Wetenschappelijk Bureau GroenLinks and Cogito in order to collate the analysis in this single publication. The future of European climate and energy policy is explored within.

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