EU Renewable Energy Policies : What can be done nationally, what should be done supranationally ?

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Introduction

A transition to a sustainable energy economy is a necessity both to mitigate climate change and to manage the EU's dependency on imported fossil fuels. The EU has recently adopted an ambitious directive on renewable energy sources with binding national targets, but is now confronted with the challenge of how to implement this directive and to realise the transition to a sustainable energy economy. This overview paper accompanies a high level seminar that focuses on conditions enabling large scale deployment of renewable energy sources. It concentrates on (possible) actions to be undertaken at the national and the European level and discusses the Directive and its options for wind energy in North-west Europe and solar energy in the Mediterranean region (South Europe and North Africa).

Renewable energy sources (RES) and EU energy policy

The EU Treaty does not yet assign an explicit horizontal EU competence in the area of energy. For almost 30 years, EU energy policy was confined to the narrow field of nuclear energy and coal based on the European Atomic Community treaty (Euratom) and the European Coal and Steel Community (ECSC)[1]. The latter ceased to exist in 2002. Periodic attempts to extend the EU's jurisdiction to affect the choice of energy supply remained largely unsuccessful, since a majority of Member States were not willing to give up real or perceived authority over the economically important issue of energy. It was also difficult since energy systems in the Member States are diverse, with some relying foremost on endogenous resources and others depending largely on imported energy.

In the Treaty on European Community "measures in the sphere of energy" is listed among the areas of activities of the Communities in article 3 (within the context of its tasks/goals as defined in article 2). Nevertheless, there have been a series of broad horizontal goals, such as promoting the rational use of energy, reducing Europe's dependency on oil import and liberalising energy markets. More recently the objective to stimulate the uptake of renewable energy was added to this. The policies were justified on the basis of internal market,

[1] De Jong, J. (2008), The 2007 Energy Package: the Start of a New Era?, in: M. Roggekamp and U. Hammer (ed.), *European Energy Law Report V*, Antwerp: Intersentia, pp. 95-108.

competitiveness, environment or other EC competences. They were politically acceptable when supported unanimously by all EU member states or at least by a qualified majority.

The informal meeting of the European Council in Hampton Court in 2005 provided a watershed for EU energy policy. After the failed referenda on the Constitutional treaty in EU founding states France and the Netherlands, the UK Presidency of the EU was in search for a topic worth discussing and able to demonstrate the value of the European integration project to the citizens. Energy in combination with climate change proved an ideal topic. An increased concern over climate change, high oil prices, fear for the depletion of fossil fuels and political tension with important energy suppliers, such as Russia, justified the issue to take centre stage in the discussions of the European Council. The process culminated in the Council's adoption of an "Energy Policy for Europe" in 2007. It covered issues related to the internal energy market, environment and security of supply. Renewable energy was one of its key elements since it would reduce the EU's dependency on (imported) fossil fuels and lower greenhouse gas emissions. A "triple 20 in 2020" was agreed: RES would make up 20% of the EU's energy mix, energy efficiency would increase by 20% and greenhouse gas emissions would be decreased with 20% compared to 1990 levels.

The package implementing the European Council's 20/20/20 targets was proposed by the Commission as the Climate and Energy package in January 2008 and politically agreed upon by the end of the year. It consists of a set of legal instruments; a binding directive for the 20% RES target, a regulatory framework for CCS, a revision of the EU's ETS cap-and-trade system, and national targets for cutting emissions in the non-ETS sectors. The RES Directive distributed the 20% target into binding national targets for the EU member states. The full package was formally adopted in April 2009. A 10% biofuels target for transport fuels was included in the RES Directive, but made conditional upon the possibility to produce these biofuels in a commercially viable and sustainable way.

In line with the rapid political developments, the yet to be fully ratified Lisbon treaty proposes to include an energy chapter, in which the development of new and renewable forms of energy is included as objective (article 194 of the Treaty on the Functioning of the European Union). The significance of the new energy chapter should not be overestimated. It merely resembles the current situation and stops short of providing the EU with any real power on the core issues of energy policy, namely the Member State's choice between different energy sources and the general structure of its energy supply. In the absence of real EU power in energy policy, policy orientations are likely to continue to rely on competencies other than energy, notably internal market and the environment. This seems no problem for the issue of RES, since it has an environmental objective as well. However, more indirectly, the question is relevant to what extent the RES targets and their implementing designs are fully compatible with the market models of the single internal energy market. The targets furthermore directly influence the energy mix of EU Member States and the larger shares of RES have all sorts of impacts on the energy infrastructure. In fact, increased investment and coordination seems necessary in order to handle efficiently larger RES shares in the highly interconnected and sometimes heavily meshed European grid network. Hence, even though the Lisbon treaty only makes a small step towards increased EU activity in the field of energy, reaching the EU's objective in the field of RES may require a more coordinated approach.

The RES Directive

The RES Directive (2009/28/EC) replaces Directives on renewable electricity (2001/77/EC) and on biofuels (2003/30/EC). It translates the 20% RES target into national targets and establishes a mechanism enabling states to cooperate on joint or cross-border RES projects. The national targets are mandatory. Each state has to increase its share of RES by 5.5% compared to 2005 levels and has to do an additional effort on the basis of its GDP/ capita. Wealthier Member States thus have a more ambitious target than poorer Member States, which would still need more time to catch up. The Directive contains also interim targets to measure progress at intervals and sets out the requirement for Member States to submit National Action Plans on how they aim to reach their target. The first National Action Plan (NAP) has to be sent by 30 June 2010. Member States will not face direct financial penalties for failing to reach interim targets towards the 2020 target. But, the Commission may start infringement proceedings if states do not take 'appropriate measures' or fail to reach their 2020 target.

Member States will be permitted to link their national support schemes to those of other EU states, and will be allowed under certain conditions to import 'physical' RES generated electricity from third-country sources, such as solar power from North Africa. 'Virtual' imports, based on RES investments in third countries, cannot be included in meeting the national targets. A system of open trading in RES-credits between EU Member States, favoured by the electricity sector, was rejected in favour of a system whereby one Member State can sell or trade excess RES-credits, based on statistical (performance) values. These so-called 'statistical transfers', which can only take place if the selling Member State has reached its interim renewables targets, can also be applied in cases where Member States cooperate on joint projects.[2]

The "green market issue" played a major role in the negotiations of the directive. Trade in green electricity is today already happening because of the existence of two separate markets, the market of electricity and that of a "semi-public" market with Guarantees of Origin, issued (production), registered and cancelled (on behalf of the user). The Commission originally proposed a system in which intra-community trading would be possible with the option for member-states to opt-out. The final outcome of negotiations on the directive was the other way around: no trading allowed, but possibilities for opt-in, using Guarantees of Origin not for target counting, but for disclosure only. However, the possibility of Joint Projects in different countries still exist and could be useful if standardization of different projects is possible. The concerns around the "green market" was a major driver to include a review clause in the Directive. This clause met quite some hesitation and even resistance from the side of the European Parliament (EP). The EP feared a re-opening of the whole target-setting building blocks and was keen on avoiding that. A compromise with the Council was made allowing only a review of the progress in meeting the national targets and the advantages and disadvantages of trading in 2013.

Implementation of RES support policies by the EU Member States

RES support policies in Member States vary to a large extent (Adelle et al., 2009). There are measures in place to support, directly fund, prioritise and mandate the use of RES with a

[2] This section is based on information provided by Euractiv.com

variable emphasis upon electricity, transport and heat, including separate sectoral targets. The most used policy instrument to support RES-electricity is the feed-in tariff, guaranteeing producers priority access to the grids and a fixed price. It is used in Spain, Germany, Greece, Lithuania, Denmark and Cyprus. Other economic instruments used include fiscal measures (electricity or carbon taxing, tax breaks), direct subsidies, soft loans, etc. Direct regulation in the form of mandatory RES-targets for electricity generators or suppliers is used less. In the transport sector, where some countries have targets for biofuels in the automotive fuels, this approach is more common.

Little is known yet on the full cost-effectiveness of the various RES policies in the Member States. Assessing such effects is complicated since there are many interrelated drivers and impacts of various policy objectives and instruments, such as on climate, on energy efficiency and on energy market models. Power generators and other major industrial users are also basing their investment decisions on the developments in carbon markets and the ETS. RES opportunities also differ widely between Member States, depending on geography and policy objectives. As differences in marginal costs of larger shares of RES will tend to increase, more information may be coming available. The national action plans (NAPs) might also provide more insights and opportunities for Member States to learn from each other. Although the EU is still far from considering harmonised approaches for supporting RES, there may be some areas where more (regional) cooperation could be envisaged. It is also still a fundamental question what drives Member States to promote RES. If the drivers are mainly national industrial policies, it will take some time before a real common support approach is possible. If the drivers are especially looking for cost-effective (regional?) solutions in boosting the role of RES, progress in developing coordinated or even common policies might be coming much sooner. The jury is out and the debate is still open. The 2013 review might provide a good opportunity for returning to these issues.

Questions for discussion:

- **What suggestions could we give to the Commission for its review of the National Implementation Plans**
  - **Would it be advisable to develop national road maps for RES-deployment paths?**
  - **Is there a need for additional interpretative notes of the Directive?**
- **What issues could be expected to play a role in the 2013 review process?**
  - **Is it desirable to change the current system of cross-border green energy trade?**
  - **Would a stronger coordination of national policies be required?**

Two major challenges: wind and solar

One of the key issues being discussed during the negotiations on the Directive was the biofuels target and especially their sustainability requirements. As much attention to this subject has been given elsewhere, we have chosen in this paper and seminar to leave the issue on biofuels out. Next to biofuels, major emphasis was also put on the expected contributions from wind energy and from solar power. These two sources represent together some 60% of global RES EU potentials. Both sources are fluctuating resources that can provide electricity, but almost no firm power capacity on demand. This requires additional systems and mechanisms in order to maintain electric supply/demand balances. In addition, the wider deployment of these two sources at global EU levels has also some important strategic impacts, especially at regional levels, within and outside the EU. This is related to the

physical characteristics of these two sources, as their major effective potentials vary between the North-West and the South of Europe. Broadly speaking, large potentials for large scale deployment of wind energy exists in the EU, both on- and offshore, especially in North-West Europe. The potential for solar power is concentrated in the South of Europe, and even more in connection with Northern Africa, allowing for new concepts of wider Mediterranean cooperation.

It would not be appropriate to suggest a reopening on the advantages and disadvantages of national targets for RES and to concentrate on regional approaches in line with physical circumstances and potentials. However, we should not neglect that there are some serious political and industrial proposals on policy tables on large scale energy projects for wind in the North Sea and for Concentrated Solar Power (CSP) in Northern Africa. Both projects have different and very important wider geo-strategic impacts. It would be useful to explore these somewhat further and consider their relations from a wider policy perspective, including on energy security and foreign relations. It would also be useful to start to think about their relation with the Directive and with the possible role that the Commission could play in facilitating or even promoting these projects.

Question for discussion:

- **Do you agree that both the North Sea for wind energy and the MENA-region for solar energy are to be considered as the largest potentials for meeting the EU's ambitions for large scale RES-deployment beyond the 2020 horizon?**

Wind Energy and the North Sea

Based on a recent study of the European Environment Agency[3], economically competitive potentials for offshore and onshore wind energy amount to some 30.000 TWh in 2030, meeting some 7% of projected demand. These potentials include however assumptions with regard to social and environmental constraints and are limiting offshore potentials to the area within 10 km off the coast lines. If this latter limitation is expanded to around 50 km, or even more, offshore potentials are further increasing. This is also due to a decrease in surface roughness allowing higher wind speeds and larger full load hour potentials.[4] In its recent "Oceans-for-Opportunity" report, the European Wind Energy Association comes with a forecast for offshore wind in the EU of some 40GWe in 2020 and a target of even 150 GWe by 2030.

Compared to onshore wind, offshore wind is more complex and costly to install and maintain but also has a number of key advantages. Winds are typically stronger and more prevalent and stable at sea than on land, resulting in significantly higher production per unit installed. At sea, wind turbines can be bigger than on land because of the logistical difficulties of transporting very large turbine components from the place of manufacturing by road to installation sites on land. Finally, wind farms at sea have less potential to cause concern among neighbouring citizens and other stakeholders, unless they interfere with competing maritime activities or important marine environmental interests. Due to these and other considerations, including ones related to industrial policy, the countries around the North Sea

[3] Europe's onshore and offshore wind energy potential, EEA Technical report 6/2009

[4] On land only 5% of technical potential is realised in areas with over 3000 full load hours per annum, whereas at sea this percentage is over 40% (EEA-report).

(including Norway) are increasingly looking to their offshore areas for boosting the role of wind energy in their RES-mix.[5]

Large scale deployment of wind energy in the North Sea is facing serious, but very interesting challenges. Building these large parks, especially when distances to the coast are approaching or bypassing the 40-60 km margin and coming to some deeper waters (beyond 30 meters), allowing for a 5 MW turbine-capacity, requires new industrial and logistical concepts for both planning, building, installing and operating these installations. In addition, the issue of grid-connection is a hugely challenging one, including the system operational consequences. Such large scale deployments of this intermittent source at such levels would also mean new and innovative approaches towards accommodating this power to the grids, by combining it with larger scale buffering concepts. The availability of the Scandinavian hydro-resources gives this combination a further prospect. Figure 1 gives for instance an indication of some of the North Sea Ring ideas that has been put on the table.

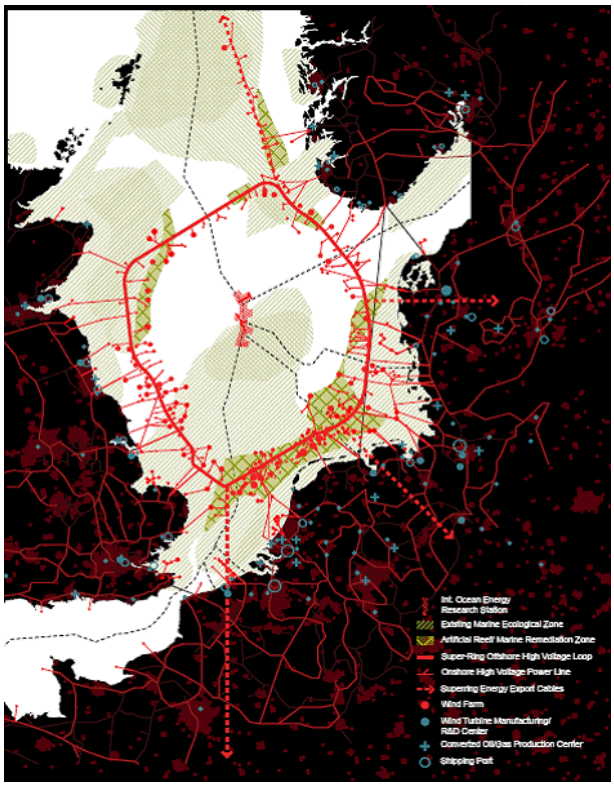

Figure 1 : North Sea Super grid for offshore wind energy.
Source: http://www.we-at-sea.org/index.php?keuze=n&nummer=55

Huge investments would be necessary for harvesting the North Sea wind energy potentials, not only with regard to the wind parks themselves, but maybe even more so in terms of the necessary electricity infrastructures. This in itself already poses important regulatory questions on socializing costs or not. A further coordination or maybe even integration of system operation between the Transmission System Operators (TSO's) involved would add to

[5] The Netherlands has a target of 6 GWe for offshore wind capacity by 2020, the UK one of delivering 33 GWe offshore wind in 2020, Germany is planning some 20-25 GWe offshore wind by 2030, Denmark and Belgium have comparable policies in place. The four countries together (NL, UK, G, DK) have ambitions to have more than 30GWe installed in 2020, of which 40% is far off-shore (>60 km). In addition, there is a 2008 study by the Norwegian government that comes to a 55 GWe offshore wind energy potential up to 1 km off coast.

the legal and regulatory issues to be solved. As the interconnections with the onshore systems have to be necessary, the whole concept of a "ring" would add further to the ongoing developments of cross border market couplings and market integration. It could lead to the need of rethinking existing business models in transmission and system operation as well. The TSO's around the North Sea will have to face these challenges, as well as the NRA's involved and their governments. The question arises to what extent the European Commission would have to play a role, as its responsibility in the internal market designs would require. At present a clear institutional set-up is not in place for discussing these issues and exploring clear road maps that would be needed for the market parties involved in order to decide on their business strategies. Nevertheless, some discussions are ongoing, for instance in the context of the Pentalateral Forum (that excludes the UK however), or under the leadership of EU coordinator for North Sea and Baltic Sea energy interconnections, mr. Adamowitsch.

The EU could further this project in the context of its Action Plan for Offshore Wind Energy[6] It could facilitate the necessary regional cooperation between the countries around the North Sea. This cooperation is recommended not only at the level of the governments involved, but even more so between the TSO's and the NRA's. In a more general sense the process to start policy and regulatory thinking about further integrating offshore infrastructures into the wider Community grids should be considered as a vital further step for EU action.

Questions for discussion:

- **Is there at present a need for more concrete EU-actions to explore and assess technological and regulatory challenges to enable the development of off-shore wind energy in Northern Europe?**
- **Is the challenge to stimulate the development of off-shore wind energy rather a political or a technical one?**
- **Would this require?**
  - **Actions mainly by TSO's, governments and regulators from the bordering countries (including Norway)?**
  - **Action by the Commission to facilitate and coordinate this regional initiative and to use its financial and other mechanisms to overcome still existing financial and technological barriers?**

CSP in Northern Africa

Solar power has immense potential. 'Solar photovoltaic' cells use sunlight to generate electricity, while 'solar thermal' collectors harness the sun's energy to produce heat. Germany for instance has been very successful in developing solar energy through its lucrative policy regarding feed-in tariffs. Obviously, the southern and more sunny parts of the EU have larger and better solar potentials than northern ones. Spain for instance has made quite some progress, but larger potentials and opportunities are available in Northern Africa, in the Sahara in particular. The concept of Concentrated Solar Power (CSP) has been developed for large scale deployment of solar power technology. It is particularly suitable for open surfaces such as in deserts. CSP is a concept using mirrors to concentrate sunlight reflection to produce steam to generate electricity. It has gained recently quite some popularity because –in contrast to solar-pv– it can store energy and operate almost at a 24-hour schedule. The concept is

[6] Reference COM(2008) 768.

already being applied in the US, in France and even more so in Spain, where some 30 large projects are currently under construction, with a combined capacity of some 4300 MWe.

The Northern Africa/Middle East dimension of the CSP-approach is even more fascinating and challenging. It is argued that solar radiation would be 50% higher in the MENA-region[7] (30% more compared to southern Europe) and that by covering only about 0,3 % of all MENA-deserts, enough electricity could be generated to meet all electricity needs in the EU and the MENA-region as well (including its needs for desalinated water). It is for this reason, that CSP is seen as a major element in wider "grand designs" of creating, an electricity network encircling the Mediterranean basin connecting the grids of the various countries (the so-called MEDRING). Therefore, in the context of the EU-MED dialogue and the Barcelona-process, the CSP-issue has been put on the agenda, including targets for a Mediterranean Solar Plan of some 20 GWe in 2020.

At more operational levels, a major initiative was recently launched. The German government/club-of-Rome created the Desertec Foundation with a number of largely German institutions and companies. Desertec is pushing for concrete steps to develop this idea into concrete projects. Figure 2 gives an indication of the concept and of its very large potentials that do have wider impacts than "just" EU energy supplies. It is alleged that the concept would also provide major contributions for the energy supplies in the MENA-region. In particular, the forecast for increasing electricity consumption is remarkable, as the largely hydrocarbon-based energy system of North-Africa is increasingly being discussed in the context of a wider energy mix. The fact that the new international energy organization for RES (IRENA) will be located in Abu Dhabi could also be seen in this context. Bringing large scale solar generated electricity to EU-markets would, as with the offshore North Sea concepts, involve not only new technological avenues but also pose additional wider policy and even political questions and considerations

Figure 2 The CSP-concept and the EUMED region. source: www.desertec.org

On the level of the system as such, very large interconnection issues in infrastructures and in system operation will have to be addressed. Long haul HVDC-cables will have to be build covering thousands of kilometers. The transmission-efficiency of such long roads seems to be acceptable, as present technology already would allow for 'just' 3-4% loss per 1000km. But this is only one element, as bringing very large amounts of electricity at near zero marginal

[7] In the energy world MENA is often used as the expression for Middle East & North Africa together.

costs[8] would have huge impacts on the EU electricity market design. Buffering and balancing of CSP should be approached at very large scales, where existing technologies to store energy in molten salt basins could overcome the daily load curves. Wider system integration and operation at the various TSO-levels would also have to considered and further accommodated requiring many technical, regulatory and legal issues of system interconnection. In addition, concerns are also expressed about operational risks in a sometimes vulnerable sandy environmental setting.

Technical and economic issues is one thing, wider political considerations is another one. Some would argue that the concept is a very beneficial and challenging one for enhancing EU-MENA energy cooperation, boosting also wider intra-MENA cooperative projects along the lines of the 'peace-through-energy' philosophy. On the receiving side however, geopolitical issues could be seen at stake for the EU market, assessing the risks of sending large amounts of energy from and through MENA-countries. Some would question this relationship as it could be seen as an 'alternative' to 'Eastern' supply-dependencies. Questions are also put on the industrial and technological capabilities of building and operating CSP-plants. The other side of the coin is that the MENA-region itself could see the project as a new form of energy-colonialism, with all sorts of political emotions around it. It would be helpful therefore if at EU-level a more systematic discussion would be started to compare risks and benefits of such a policy. This could be started by an integral assessment study, on which the European Commission should take the lead. In such a study not only the various advantages and disadvantages of this concept should be analysed, but also possibilities for a Road Map and modular steps for further implementation.

Questions for discussion:

- **Is there at present a need for more concrete EU-actions to explore and assess technological and regulatory challenges to enable the development of CSP in the South?**
- **Is the challenge to stimulate the development of solar energy rather a political or a technical one?**
- **Would this require?**
  - **Actions by the Commission to initiate a full scale cost/benefit assessment of the option, followed by a wider policy debate?**
  - **Actions by the EUMED-framework to continue assessment discussions on the basis of the study from the Commission?**
  - **Action by the Desertec Consortium or other interested parties to continue their step-by-step implementing proposals?**

[8] These claims are challenged, as other experts are indicating operational costs of some 2-4 €ct/kwh, whereas present Spanish experience is even still at much higher costs (18-20€ct/kwh). Source: FEEM workshop on a Smart EU Energy Policy, Milan, 28.10.2009

References:

Adelle, C., Anderson, J. Armstrong, J., Bowyer, C., Chiavari, J., Lewis, M., Watkins, E., Withana, S., Bozsó, Karaczun, Z.M., Umpfenback, K. and K. Sutlovicova (2009), *Action taken to address climate and energy priorities in the EU Member States, and prospects for implementation of the climate action and renewable energy package. A review for the European Climate Foundation*, Institute for European Environmental Policy, June 2009.

De Jong, J. (2008), The 2007 Energy Package: the Start of a New Era?, in: M. Roggekamp and U. Hammer (ed.), *European Energy Law Report V*, Antwerp: Intersentia, pp. 95-108.

Tyndale, S. (2009), How to meet the EU's 2020 renewables target, London: Centre for European Reform Policy Brief.

Rowlands, I. H. (2009), Promotion of Renewable Electricity in the United States and the European Union: Policy Progress and Prospects, in: Schreurs, M.A., Selin, H. and S.D. VanDeveer, *Transatlantic Environment and Energy Politics*, Ashgate, pp. 146-164.

Röller, L-H., Delgado and H.W. Friederiszick (2007), *Energy: Choices for Europe*, Brussels: Bruegel Blueprint Series.

Various websites on both offshore wind and CSP, such as:
http://www.eea.europa.eu/publications/europes-onshore-and-offshore-wind-energy-potential
http://www.we-at-sea.org/docs/brochoffshorewe_en.pdf
http://www.desertec.org/