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Appraisal of the European Commission's Energy Roadmap 2050

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Abstract

What is the European energy strategy for 2050? How different is it from the 2020 energy strategy? What are the technology options? What are the policy options? The European Commission provided a first answer to these questions in its Energy Roadmap 2050. This article gives an appraisal of that answer based on the recommendations we made during the preparation of the roadmap.

Introduction

We first introduce the 2020 and 2050 energy strategies, to then introduce our appraisal.

2020 energy strategy

In 2006, the European Commission published the Green Paper "A European Strategy for Sustainable, Competitive and Secure Energy" that calls for a common European energy policy. This then led to the third energy liberalization package[1] to complete the liberalization process in Europe, and the climate and energy package[2] with the so-called "20-20-20" targets for 2020:

- 20% reduction in primary energy use compared to projected levels for 2020, to be achieved by improving energy efficiency;
- 20% reduction in greenhouse gas emission below 1990 levels;
- 20% of final energy consumption from renewable resources.

[1] The third package consists of five legislative texts: (1) a Directive (2009/72/EC) revisiting the internal market for electricity; (2) a Directive (2009/73/EC) revisiting the internal market for natural gas; (3) a Regulation (715/2009) on conditions for access to the natural gas transmission networks; (4) a Regulation (714/2009) revisiting the conditions for access to the network for cross-border exchanges in electricity; (5) a Regulation (713/2009) establishing an Agency for the Cooperation of Energy Regulators.

[2] The climate and energy package consists of four legislative texts: (1) a Directive (2009/29/EC) revising the EU ETS; (2) an "effort-sharing" Decision (406/2009/EC) setting binding national targets for emissions from sectors not covered by the EU ETS; (3) a Directive (2009/28/EC) setting binding national targets for increasing the share of renewable energy sources in the energy mix; and (4) a Directive (2009/31/EC) creating a legal framework for the safe and environmentally sound use of carbon capture and storage technologies.

In the energy sector, 2020 is however relatively short term because assets take a long time to develop (e.g. transmission lines typically take 10-15 years), and once developed they have a long lifetime (e.g. more than half of the current building stock will still be around in 2050).

2050 energy strategy

In 2009, the European Council conclusions called upon all parties to embrace the objective of the International Panel for Climate Change (IPCC) to limit climate change to 2°C in 2050 by drastically reducing greenhouse gas emissions.[3] Given the current disproportionate emission levels and expected economic growth of developing countries, there is a consensus that developed countries as a group will need to do a bigger effort. The target for developed countries is considered to be a reduction of greenhouse gas emissions of 80 to 95% below 1990 levels by 2050. This reduction will mainly need to be achieved domestically because developing countries will also need to reduce their emissions to achieve the IPCC objective so that there will be less opportunities, if any, to import emission reductions.

In 2011, the European Council asked for an elaboration of a low carbon 2050 strategy.[4] The European Commission responded shortly after by releasing three roadmaps throughout 2011. The first one was released by DG Climate and provides an indication of how the effort could be shared between the sectors that emit greenhouse gasses.[5] Several possible pathways towards the 2050 target have been considered, including those presented by various stakeholders throughout 2010.[6]

Basically, Europe would import less fossil fuels, while investment costs would increase because clean energy technologies are capital intensive. The net effect can be positive or negative, depending on the development of clean energy technologies, and the evolution of fossil fuel prices, which also depends on what will happen outside of Europe, which is all very uncertain.[7] The power sector is expected to do the biggest effort approaching nearly

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[3] October, 2009 (15265/1/09 REV 1): *"The European Council calls upon all Parties to embrace the 2°C objective and to agree to global emission reductions of at least 50%, and aggregate developed country emission reductions of at least 80-95%, as part of such global emission reductions, by 2050 compared to 1990 levels; such objectives should provide both the aspiration and the yardstick to establish mid-term goals, subject to regular scientific review. It supports an EU objective, in the context of necessary reductions according to the IPCC by developed countries as a group, to reduce emissions by 80-95% by 2050 compared to 1990 levels."*

[4] February, 2011 (EUCO 2/1/11 REV 1): *"The European Council looked forward to the elaboration of a low carbon 2050 strategy providing the framework for the longer term action in the energy and other related sectors. Reaching the EU objective, in the context of necessary reductions according to the IPCC by developed countries as a group, of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990 as agreed in October 2009 will require a revolution in energy systems, which must start now. Due consideration should be given to fixing intermediary stages towards reaching the 2050 objective. The European Council will keep developments under review on a regular basis."*

[5] A Roadmap for moving to a competitive low carbon economy in 2050: COM(2011) 112/4.

[6] For an overview, see: Meeus, L., Azevedo, I., Marcantonini, C., Glachant, J.-M., Hafner, M., 2011. EU 2050 low-carbon energy future: visions and strategies. Florence School of Regulation. RSCAS Working Papers, European University Institute.

[7] The DG Climate roadmap considers the additional investments to be about €270 billion annually during the period 2010-2050 (corresponding to 1.5% of GDP). The roadmap also states that the net

zero greenhouse gas emissions. This could be achieved by producing electricity with a combination of renewable energy technologies (e.g. wind and solar), carbon capture transport and storage technologies, and nuclear technologies, but there are strongly diverging views with respect to the relative potential of these technologies.

Important energy consuming sectors, such as transport and the residential and tertiary sectors (i.e. mainly buildings), are expected to reduce their energy use (e.g. public transport, and passive houses), and convert to renewable energy sources (e.g. biofuels, and renewable district heating) or electricity (e.g. electric vehicles, and heat pumps). Other sectors where it is considered to be relatively more difficult to reduce greenhouse gas emissions, such as the agricultural sector, could then continue to emit more.

DG Move was second to release a roadmap in 2011.[8] This roadmap lists priority policy actions to achieve the reduction of greenhouse gas emissions that the DG Climate roadmap suggests for the transport sector. The DG Energy roadmap released towards the end of 2011, i.e. the Energy Roadmap 2050, does the same for the energy sector[9]

Appraisal

With the 2050 energy roadmap, the European Commission gives a first answer to questions such as: what is the European energy strategy for 2050; how different is it from the 2020 energy strategy; what are the technology options; what are the policy options? This article gives an appraisal of that answer based on the recommendations we made during the preparation of the roadmap.[10]

The remaining of this article is structured in three sections. The first section discusses why we want the institutions of the European Union (EU) to be involved in energy policy, and how they are typically involved. The second section introduces the priority actions we recommended for the Energy Roadmap 2050 in our earlier work, and confronts them with what is in the roadmap. The third section discusses the importance of coordinating energy policy actions, and looks for coordinative action in the roadmap.

1. Involvement of EU institutions in energy policy

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effect can be positive or negative depending on the fuel price developments, which are estimated to be about €175 to 320 billion annually during the same period.

[8] Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system: COM(2011) 144 final.

[9] Energy Roadmap 2050: COM(2011) 885/2. See also: 1) Donoghue, H., 2012, "The 2050 Energy Roadmap", European Energy Journal, vol 1, issue 2; and 2) Wörsdörfer, M., 2012, “European energy strategy for 2050”, 7th edition of the EU Energy Law & Policy Conference in Brussels on 31 January and 1 February 2012, Claeys & Casteels.

[10] Meeus, L., Hafner, M., Azevedo, I., Marcantonini, C., Glachant, J.-M., 2011. Transition towards a low carbon energy system by 2050: what role for the EU? Final Report THINK Topic n° 3/12. EU FP7 funded research project (http://think.eui.eu). See also: Glachant, J.-M., Ahner, N., Meeus, L., (Eds.), 2012. EU Energy Innovation Policy Towards 2050, Claeys & Casteels Publishing.

In this section, we first introduce the economic rationale for the involvement of EU institutions in energy policy, to then distinguish between three types of EU involvement.

1.1. Economic rationale

Why is it that EU institutions can provide added value in energy policy? The answer is twofold, as we will illustrate in what follows.

First, EU institutions can provide added value by assuring commitment. The transition towards a low carbon energy system in 2050 requires massive investments, while the path is long and full of uncertainties. This implies that political commitment is needed to give the necessary confidence to investors.

Second, EU institutions can provide added value by coordinating policies. National measures often have implications for other member states, which can be both positive and/or negative. As energy markets and grids will be increasingly integrated, the EU has an important role to play in managing member state interdependencies.

However, some policies are simply better addressed at the member state level. Local policy makers can have better information and knowledge, and also tend to be more responsive to local needs. Policy experimentation at local level can also be useful when it is uncertain what should be the target or the measure to address the target. The EU institutions can then create added value by monitoring, benchmarking, and spreading good policy practices.

1.2. Typology

How can EU institutions create added value in energy policy? The answer is that we can distinguish three types of EU involvement (Figure 1).

The first type of involvement is that the EU sets binding targets for member state action, i.e. effort sharing. Examples are the "20-20-20" targets for 2020, which have been shared among member states with national targets that take into account the wealth and potential of a country. With this type of involvement, the EU creates added value by assuring commitment.

The second type of involvement is that the EU frames the choice of measures taken by member states, i.e. harmonization. Examples are the rules for cross-border energy exchanges that have been increasingly coordinated with target models to reduce transactions costs and promote exchanges. With this type of involvement, the EU creates added value by coordinating policies.

The third type of involvement is that an EU-wide instrument is created, i.e. creating a level playing field. An example is the European Union Emissions Trading Scheme (EU-ETS) that ensures that the overall target to reduce greenhouse gas emissions is reached, and that there is a single carbon price in Europe. With this type of involvement, the EU creates added value with strong commitment and coordination.

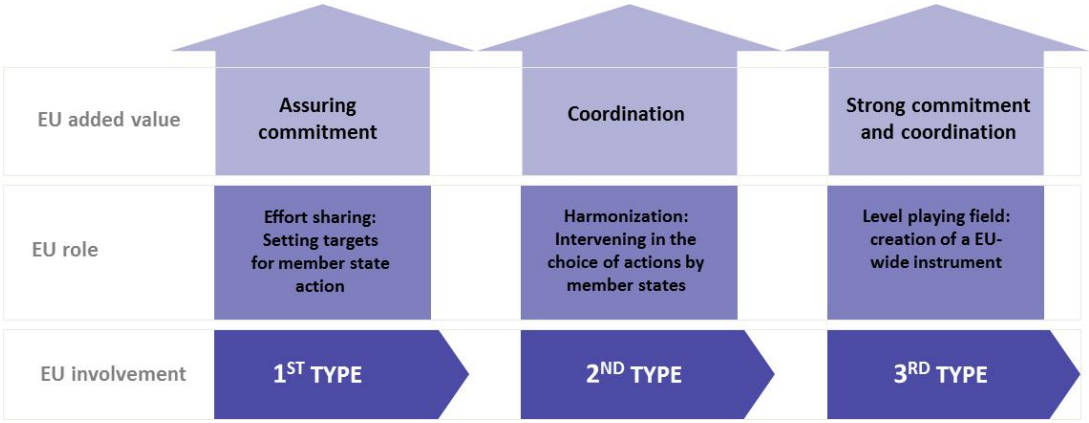

Figure 1 – Different types of EU involvement

2. Priority actions in the main energy policy areas

During the preparation of the roadmap we provided recommendations by using the typology introduced in the previous section to identify policy options, to then recommend the ten most promising options for the main energy policy areas.

2.1. Energy efficiency

In the policy area of energy efficiency, the key challenge is to achieve ambitious energy savings. Due to the way they are reported, it is however difficult to compare the importance of energy savings in visions of different stakeholders.

The Energy Roadmap 2050 also identifies this as a key challenge: "*Primary energy demand drops in a range of 16% to 20% by 2030 and 32% to 41% by 2050 as compared to peaks in 2005-2006. Achieving significant energy savings will require a stronger decoupling of economic growth and energy consumption as well as strengthened measures in all Member States and in all economic sectors.*"

We recommended two priority actions to deal with this challenge.

Priority action 1): make energy saving targets binding, which is a first type of involvement whereby the EU institutions provide added value by assuring commitment. Commitment is needed because most studies indicate that the transition costs are very sensitive to the achievement of energy saving ambitions so that not achieving them can endanger the affordability of the transition. Moreover, there is a history of indicative energy saving targets not being achieved, including the 2020 target that is expected not to be met with the existing policy; and there is an increased risk of locking-in into energy inefficient technologies and assets with a long lifetime, especially in case of buildings and transport infrastructures. This could be addressed by setting binding energy savings targets for 2020 and beyond (overall targets as well as sector specific targets).

The Energy Roadmap 2050 does not talk about making energy saving targets binding.

Priority action 2): introduce an EU instrument to evaluate the energy performance of cities, which is a third type of involvement whereby the EU institutions provide added value with strong commitment and coordination. Commitment is needed because an increasing number of cities is voluntarily committing to act via the successful Covenant of Mayors initiative, but even more cities are not. A reporting obligation with benchmarking can encourage those that are not yet mobilized to act, which is important because the transition towards more sustainable local energy systems relies on the willingness of citizens to cooperate so that it is essential to also have policies at local level. Coordination is needed because currently cities are using very different methodologies to make an inventory for their energy use and greenhouse gas emissions, and reporting practices are also very different, making it impossible to assess performance, or to replicate good practices.

The Energy Roadmap 2050 refers to the importance of cities, but without suggesting a policy action: *"The role of local organizations and cities will be much greater in the energy systems of the future."*

Note also that in 2011, the European Commission proposed an new Energy Efficiency Directive that is a step forward, even though it does not include the above priority actions.[11]

2.2. Renewable energy

In the policy area of renewable energy, the key challenge is to achieve the ambitious increase in renewable energy that is projected. There is agreement that the use of renewable energy sources needs to continue to increase, both directly (e.g. solar thermal for domestic hot water) and indirectly (e.g. electricity), but the relative importance of this increase varies widely between visions of different stakeholders (e.g. the renewable share in electricity production ranges from 30% to 100% in 2050, depending on the study).

The Energy Roadmap 2050 also identifies this as a key challenge: "*The share of renewable energy (RES) rises substantially in all scenarios, achieving at least 55% in gross final energy consumption in 2050, up 45 percentage points from today's level at around 10%. The share of RES in electricity consumption reaches 64% in a High Energy Efficiency scenario and 97% in a High Renewables Scenario that includes significant electricity storage to accommodate varying RES supply even at times of low demand."*

We recommended two priority actions to deal with this challenge.

Priority action 3): introduce market conformity requirements for national renewable energy support schemes, which is a second type of involvement whereby the EU institutions provide added value with coordination. Coordination is needed because the renewable energy support schemes that are currently mainly national will have an increasing impact on the electricity market due to the increasing investments in renewable energy, while this market is increasingly European. Market conformity requirements therefore need to be introduced

[11] Proposal for a Directive on Energy Efficiency: COM(2011) 370 final. See also: Fouquet, D., and Nysten, J., 2012, "Changing Energy Policy - The proposed energy efficiency directive and its consequences", European Energy Journal, issue 1, volume 2.

for national support schemes to expose renewable technologies to market price signals. Renewable energy technologies need to be pushed into this market as long as necessary, but at least part of their profits should depend on their participation in the wholesale and balancing markets.

The Energy Roadmap 2050 refers to this issue, but without suggesting a policy action: *"In 2030, all the decarbonisation scenarios suggest growing shares of renewables of around 30% in gross final energy consumption. The challenge for Europe is to enable market actors to drive down the costs of renewable energy through improved research, industrialization of the supply chain and more efficient policies and support schemes. This could require greater convergence in support schemes and greater responsibilities for system costs among producers, in addition to Transmission System Operators (TSO)."*

Priority action 4): institutionalize the cooperation between Mediterranean regulators and transmission companies, which is a third type of involvement whereby the EU institutions provide added value with strong commitment and coordination. Commitment is needed to tap into the massive renewable energy sources just outside EU borders in the Mediterranean area that are attractive to develop in the 2050 context. Coordination is needed to progress these typically multilateral projects. New cooperation bodies could be created, or the existing ones (i.e. the European Network of Transmission System Operators, and the Agency for Cooperation among Energy Regulators) could be extended to include the Mediterranean area.

The Energy Roadmap 2050 refers to this opportunity, but without suggesting a policy action: *"The opportunity to import electricity produced from renewable sources from neighboring regions is already complemented by strategies to use the comparative advantage of Member States e.g. such as in Greece where large scale solar projects are being developed. The EU will continue encouraging and facilitating the development of renewable and low-emission sources of energy in the Southern Mediterranean and interconnections with European distribution networks."*

Note also that in 2012, the European Commission will publish a strategy document that will look at the policy framework for renewable energy in a post-2020 perspective.

2.3. Greenhouse gas emissions

In the policy area of greenhouse gas emissions, the key challenge is to achieve a nearly zero-carbon electricity sector.

The Energy Roadmap 2050 also identifies this as a key challenge: "*the power generation system would have to undergo structural change and achieve a significant level of decarbonisation already in 2030 (57-65% in 2030 and 96-99% in 2050). This highlights the importance of starting the transition now and providing the signals necessary to minimise investments in carbon intensive assets in the next two decades."*

We recommended one priority action to deal with this challenge.

Priority action 5): strengthen the carbon price to give a strong signal for investment in low carbon technologies, which is a third type of involvement whereby EU institutions provide added value with strong commitment and coordination. Commitment could be achieved by introducing more stringent and credible long-term caps for greenhouse gas emissions. Coordination could be achieved by installing a carbon market authority with independent oversight and the power to act when the price would be considered inadequate to support the EU climate and energy policy. A strong investment signal is needed because the transition requires a long term steep decarbonization.

The Energy Roadmap 2050 talks about the importance of the EU-ETS and of having a strong carbon price signal, but without suggesting actions to strengthen it: *"The ETS is the central pillar of European climate policy. It is designed to be technology neutral, cost-effective and fully compatible with the internal energy market. It will have to play an increased role."*

Note also that in 2011, the European Commission proposed to amend the Directive on fossil fuel taxation, and the proposal includes a minimum energy taxation based on CO_2 content to tax greenhouse gas emissions to non-ETS sectors, as a complement to the EU-ETS.[12]

2.4. Energy infrastructure

In the policy area of energy infrastructure, the key challenge is to ensure electricity grid adequacy. There is agreement that transmission will need to be expanded, especially across national borders, but the importance of this expansion varies between visions of different stakeholders (the increases in interconnection capacity ranges from a 40% to more than 90%).

The Energy Roadmap 2050 also identifies this as a key challenge: "*By 2020 interconnection capacity needs to expand at least in line with current development plans. An overall increase of interconnection capacity by 40% up to 2020 will be needed, with further integration after this point. For the successful further integration after 2020, the EU needs to fully eliminate energy islands in the EU by 2015; in addition, networks have to be expanded and come over time to synchronised links between continental Europe and the Baltic region."*

We recommended two priority actions to deal with this challenge.

Priority action 6): harmonize the responsibilities of national regulators and grid companies to enable the transition towards a low carbon energy system, which is a second type of involvement whereby the EU institutions provide added value with coordination. The main challenges for transmission and distributions grids are the integration of distributed generation, demand response and storage, and large-scale renewable energy sources. Grid regulation needs to align the incentives of grid companies with the role they are expected to play in the transition, and regulators should have the mandate to do that. Coordination is needed to facilitate the required cooperation among national regulators and grid companies.

[12] Proposal for Directive on the taxation of energy products and electricity: COM(2011) 169/3.

The Energy Roadmap 2050 refers to the importance of smart grids, but without suggesting a policy action to harmonize the regulation of grids: *"To accommodate renewable production locally, the distribution grid needs to become smarter to deal with variable generation from many distributed sources such as, in particular, solar photovoltaic, but also increased demand response. With more decentralized generation, smart grids, new network users (e.g. electric vehicles) and demand response, there is a greater need for a more integrated view on transmission, distribution and storage."*

Priority action 7): facilitate the ex-ante allocation of costs and benefits of transmission investments, which is a third type of involvement whereby EU institutions provide added value with strong commitment and coordination. Commitment is needed to ensure the implementation of the projects that are in Ten Year Network Development Plan. Coordination is needed to go beyond today's ad-hoc bilateral agreements for cross-border investments that are often suboptimal from the European point of view. This facilitation could include a new mechanism and/or a portfolio approach could be used to reduce the need for compensation by approving many projects at the same time so that the cost and benefit asymmetries are less problematic as they are for individual projects.

The Energy Roadmap 2050 refers to the infrastructure package that has been proposed by the European Commission in 2011,[13] which is indeed a step towards this policy action.

2.5. Internal energy market

In the policy area of the internal energy market, the key challenge is to ensure electricity supply security. Demand for electricity will not reduce because the conversion of transport and heat to electricity is expected to dominate the savings expected to come from energy efficiency measures. Investments in the power sector will therefore need to accelerate because low carbon technologies are capital intensive, and they require more capacity for producing a certain amount of electrical energy (e.g. wind does not always blow, and sun does not always shine). These capacity investments will also need to be complemented with investments in system flexibility because matching supply and demand will become increasingly challenging with the increased penetration of renewable energy sources.

The Energy Roadmap 2050 also identifies this as a key challenge referring to it as *"Rethinking energy markets".*

We recommended two priority actions to deal with this challenge.

Priority action 8): create an internal balancing market with an EU target model and market code, which is a third type of involvement whereby EU institutions provide added value with strong commitment and coordination. Commitment is needed to share the reservation costs

[13] Proposal for a regulation on guidelines for trans-European energy infrastructure: COM(2011) 658. Proposal for a regulation establishing the Connecting Europe Facility: COM(2011) 665.

of balancing services. Coordination is needed because the reliability of the system will increasingly depend on the functioning of balancing markets and the availability of balancing services. All studies project the creation of a more integrated European electricity grid, which would reduce the need for system flexibility to balance wind and solar power. This is true, but only if there would be an internal balancing market, while today these markets are mainly organized nationally.

The Energy Roadmap 2050 refers the need for flexible resources, and is examining whether more action is needed: *"The Commission is examining the effectiveness of different market models for remuneration of capacity and flexibility and how they interact with increasingly integrated wholesale and balancing markets."*

Priority action 9): reduce the distortions coming from national security of supply measures, which is a second type of involvement whereby EU institutions provide added value with coordination. Coordination is needed to prevent that these national measures, such as capacity mechanisms, distort the internal energy market. Moreover, they should not work against the decarbonization process. Capacity mechanisms are for instance known to not always treat demand and supply resources on the same footing, while enabling demand side flexibility is essential in the transition towards a low carbon energy system.

The Energy Roadmap 2050 refers to this issue, but without suggesting a policy action to deal with the possible distortions coming from these mechanisms: *"All types of capacity (variable, baseload, flexible) must expect a reasonable return on investment. It is however important to ensure that policy developments in Member States do not create new barriers to electricity - or gas - market integration."*

2.6. Research and development of technologies

Technology development is a precondition for most of the above challenges. For instance, most stakeholder visions assume that carbon capture transport and storage technologies will become commercially available during the transition, typically between 2015 and 2030. The visions also assume that learning effects will drive down the costs of new clean energy technologies, but different indicators are used so that it is difficult to compare.

The Energy Roadmap 2050 also identifies this as a key challenge: *"Whichever pathway is considered, the scenarios show that fuel mixes could change significantly over time. Much depends on the acceleration of technological development. It is uncertain which technological options might develop, at what pace, with what consequences and trade-offs. But new technologies bring new options in the future. Technology is an essential part of the solution to the decarbonisation challenge."*

We recommended one priority action to deal with this challenge.

Priority action 10): implement and complement the Strategic Energy Technology Plan (SET-Plan), which is a third type of involvement whereby EU institutions provide added value with strong commitment and coordination. Commitment is needed to implement the SET-Plan.

The financing of the research, development and demonstration activities that are in the SET-Plan need to be shared. Coordination is needed to complement the currently industry focused and bottom up SET-Plan with a more top down approach that can prioritize projects proposed by different industries and that improves the balance between early innovation to create new options and later stage innovation to push the most promising options into the market.

The Energy Roadmap 2050 does refer to a strengthening of the SET-Plan: *"A reinforced SET Plan could lead to cost optimal European research clusters in times of tight budgets in Member States. The benefits of cooperation are significant, going beyond financial support and building on better coordination in Europe."*

3. Coordination between energy policy actions

All the above assumes that the European Commission speaks with one voice and writes with a single pen. This however does not always seem to be the case, as for instance illustrated by the fact that we now already have three roadmaps for what is to become a single 2050 energy strategy.

The currently most endangered part of the 2020 - 2050 policy architecture is the EU ETS, which has already been damaged and is exposed to severe new blows. When the 2020 package was designed, renewable energy and energy efficiency targets and policies were expected to contribute to the achievement of the greenhouse gas reduction target, but only party, so that the carbon price would show the cost of the additional efforts needed to achieve the emissions cap. We have meanwhile discovered that this price is lower than expected, and the updated forecast in the DG Climate roadmap shows that achieving the renewable energy and energy efficiency targets could even imply overshooting the greenhouse gas emission target in 2020.

Are we experiencing the death by starvation of EU carbon pricing? It would be bad news for every 2020 – 2050 path or roadmap. Some conclude that there are too many targets, and that we only need a target for greenhouse gas emission reduction. Others argue that there are good reasons to have specific targets and/or polices for energy efficiency and renewable energy, and that the problem is that the greenhouse gas emission target has been set too low so it should be increased.

The Energy Roadmap 2050 refers to the challenge of coordinating carbon pricing with other energy policy actions, such as energy efficiency and renewable energy.[14] The roadmap also

[14] Energy Roadmap 2050: *"The scenarios show that carbon pricing can coexist with instruments designed to achieve particular energy policy objectives, notably research and innovation, promotion of energy efficiency and development of renewables. More coherence and stability is however needed between EU and national policies for its price signal to function properly."*

announces that a policy framework will be developed for 2030 as an intermediate step towards 2050.[15] It is not yet clear whether this action will also help to save the EU-ETS.

Conclusions

The main difference between the 2020 and 2050 energy strategy will be that the transformation of the energy system will be more profound and accelerated. Massive investments will be required and the interdependencies between member states will increase so that EU institutions should continue to add value to national policies by assuring commitment and coordinating where needed.

The Energy Roadmap 2050 rightly emphasizes that the investment decisions that are taken today are already shaping the energy system in 2050 because of the long lead times and asset longevity. It is therefore urgent to act, and the roadmap is a preparatory step towards new policy action. The main novelty in the roadmap may be the intension to develop a 2030 policy framework as an intermediate step towards 2050.

The roadmap also reminds us that several new policy actions have already been proposed in 2011, including policies in the areas of energy efficiency (i.e. Energy Efficiency Directive Proposal), greenhouse gas emissions (i.e. Energy Taxation Directive Proposal) and energy infrastructure (i.e. Energy Infrastructure Package Proposal). Moreover, additional policy actions will be considered in the energy policy area of the internal energy market and renewable energy in 2012.

Even though this ongoing policy making does not yet have the same level of ambition as the priority actions we recommended during the preparation of the roadmap, they are a step in the right direction. Note finally that the fact that there is an energy roadmap at EU level that identifies the key challenges is already a success in itself because most member states have not even started to look into their 2050 strategic energy options.

[15] Energy Roadmap 2050:*"Member States and investors need concrete milestones. The Low carbon economy roadmap has already indicated greenhouse gas emission milestones. The next step is to define the 2030 policy framework, reasonably foreseeable and the focus of most current investors."*