TOWARD A SUSTAINABLE AND CONSISTENT EUROPEAN ENERGY AND CLIMATE POLICY

Fabien Roques[1]

Executive summary

In his opening statement in the European Parliament in July 2014, the new European Commission President Jean-Claude Juncker highlighted 10 key priorities for his mandate. One of these consists in "reform(ing) and reorganis(ing) Europe's energy policy into **a new European Energy Union"**.[2] Does this imply that this Energy Union will mark the beginning of a new approach toward European energy policy, or is it merely a reframing of the debate?

We argue in this paper that the new Energy Union will need a radically new approach to European energy and climate policy. A sound European energy and climate policy should be based on a set of well-defined objectives, and rely on well-articulated instruments to deliver in the most efficient way on these objectives. The current European energy and climate policy framework has major flaws on both fronts.

The paper does not aim to provide a comprehensive list of the issues at stake with European energy and climate policy, which would be a daunting task, and builds on previous work conducted for the for the Commissariat général à la stratégie et à la

(1) Associate Professor, University Paris Dauphine, Senior Vice President, Compass Lexecon. Contact details: Email: froques@compasslexecon.com, fabien.roques@cantab.net, Phone: +33 1 53 05 36 29.
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(2) Source: Jean-Claude Juncker's Political Guidelines for the New Commission, "A New Start for Europe: My Agenda for Jobs, Growth, Fairness and Democratic Change", 15 July 2014, available at: http://ec.europa.eu/priorities/docs/pg_en.pdf#page=6.

prospective (CGSP) in 2013.[1] Instead, **we focus on some key areas with the objective to make a series of concrete proposals for reform**. This paper takes a practitioners' perfective, recognizing that a "first best" economic approach is often not practical, and therefore putting forward policy recommendations which recognize the policy and institutional constraints that characterize European policy making.

We start by discussing issues with the European Commission (EC) energy and climate policy objectives, and then suggest some potential reforms to the regulatory framework to deliver on these objectives. We successively cover in session 2 and 3 the policy levers for decarbonization and for security of supply, before discussing the necessary changes to the power market framework. We conclude by discussing how the financing and governance challenges associated with these two key policy priorities can be handled.

1. The objectives of EU energy and climate policy

European energy and climate policy has often been described as searching to strike a balance between a "trilemma" of objectives: environment and climate policy, security of supply, and the creation of integrated and competitive electricity and gas markets. There has always been a working assumption that the different policy objectives reinforce each other. **However, in hindsight, the different pillars of Europe's energy policy do not seem as synergetic as often believed.** For instance, the relationship between liberalized power markets and security of supply is more complex than anticipated, as underinvestment and boom bust cycles seem to threaten security of electricity supply in a number of member states. In addition, Europe's green agenda has not been reconciled with Europe's objective to create competitive and integrated markets: the impact on energy costs and on Europe' competitiveness of the 2020 targets is becoming apparent today as many member states revisit their support policies for renewables, in order to contain costs for consumers.

RECOMMENDATION

In the context of the discussions on the policy and market framework to deliver on the 2030 targets, the EC should recognize the inherent conflicts between different policy objectives and define clear priorities. In particular the impact assessment should evaluate: the impact in terms of energy

(1) This paper follows on a first report written for the Commissariat général à la stratégie et à la prospective (CGSP) in 2013 which focused more specifically on the current issues in European electricity markets. See "European electricity markets in crisis: diagnostic and way forward", Fabien Roques, November 2013, contribution to CGSP report available at:
www.strategie.gouv.fr/sites/strategie.gouv.fr/files/archives/CGSP_Report_European_Electricity_System_030220141.pdf.

costs and industrial competitiveness of the different environmental targets; and the impact in terms of security of supply of deploying significant amounts of intermittent renewables.

The second major issue in the definition of Europe's energy and climate policy is that it is too much inward looking and based on contestable implicit or explicit assumptions about the future of global energy markets. Europe's strategy to lead on the fight against climate change has been based on the assumption that other countries would follow and define their own ambitious targets for emission reduction and clean technologies deployment. However, there has been very little progress on the international scene toward a global agreement to mitigate climate change since 2008. Moreover, current policies do not give any incentives to other countries to join Europe in the fight against climate change. Second, the conventional wisdom that underpinned Europe's commitment for decarbonization was that fossil fuel prices would increase steadily in the future. This assumption justified the support for low carbon technologies whose cost would reduce over time and converge with those of conventional fossil fuel technologies. This implied that the green agenda costs would remain affordable, and would in the long term yield positive benefits and save costs to European customers. However, the discovery and production of large quantities of shale hydrocarbons in the US, and the end of the "commodity super cycle" have largely changed the global energy market dynamics and call into question the affordability of Europe's climate targets.

RECOMMENDATION

The 2030 energy and environment policy framework should be stress tested against scenarios with a non-cooperative approach from Europe's commercial partners in the fight against climate change, and with lower fossil fuel prices than currently anticipated.

The policy debates in Brussels and in many countries are based on implicit or explicit assumptions about the costs of different technologies, as well as their evolution going forward. Often critical policy decisions are made on the basis of weak – or possibly even biased evidence – on the costs of different technologies. In the case of electricity generation, for instance, the comparison of the costs of different generation technologies is often based on the "levelised generation costs", and does not take into account the "external system costs" and/or the "subsidies" associated with the different technologies.

RECOMMENDATIONS

The principle of "cost reflective" prices should be instituted. All technologies should bear the cost associated with their external effect on the energy system and society at large.

A monitoring process should be put in place in all member states to track the evolution of the different types of energy system costs (including externalities) and subsidies over time.

2. Policies supporting decarbonization

The European Trading Scheme (ETS) was championed by the European Commission in the 2009 green energy legislative package as the centerpiece of European policy toward a decarbonized energy mix. But in practice **the ETS has become a** "**residual market" for carbon abatement, with most CO_2 reductions driven by targeted renewable support policies**.

RECOMMENDATIONS

The ETS needs a radical structural reform to provide a credible and bankable investment signal through a predictable minimum long term carbon price trajectory.

Whilst there are many ways in which a supply management mechanism can be put in place, a simple approach with cap and floor prices has many advantages.

Europe's support for clean technologies has been concentrated on the deployment of specific clean technologies which have received significant support in the past decade. This contrasts with the lack of funds available for research and development (R&D) in energy. Given the uncertainties on the costs and future progress of the different clean technologies, an optimal policy mix would need to be geared toward R&D and reduce spending on deployment. Instead of picking technology winners, the EU should invest in fundamental research and put in place a supportive framework for the demonstration and commercialization of innovation.

RECOMMENDATION

European countries need to scale up and coordinate better their R&D and innovation policies for clean technologies through a reform of the European Strategic Energy Technology plan.

The 20% / 27% renewables deployment targets could be replaced by a clean technologies R&D and deployment target, whereby countries could choose to support clean technologies through R&D and / or deployment.

Investment in clean technologies driven by support schemes displace thermal plants in the merit order, leading to lower power prices and revenues for thermal pants. By reducing power prices, policies supporting renewables create their own need as they prevent renewables to become competitive based on wholesale market revenues. **This "cannibalization effect" implies that there may be a structural and permanent need for subsidies for renewables if their cost reduction does not outweigh their depressive effect on power prices. Managing the pace of deployment of subsidized technologies is key both to control the costs**, and to provide investors with a long term perspective on the value of existing assets and potential new thermal plants.

RECOMMENDATIONS

Member states should define coordinated clean technologies roadmaps and a monitoring process to control the volumes of the different clean technologies added to the system.

In order to control the volumes of clean technologies, support schemes fixing a volume cap, or relying on auctions should be favored.

Policies to support renewables in Europe show a wide diversity of approaches, ranging from feed-in tariffs, premium schemes, and green certificate schemes. **The lack of coordination between the national approaches has led to suboptimal deployment of renewables, thereby increasing system costs for European consumers. Member states should improve the coordination of renewables support schemes and define solutions for cross border participation.**

RECOMMENDATIONS

Member states should improve the coordination of renewables support schemes by redesigning the existing cooperation mechanisms to remove the perceived barriers to their implementation.

The EC should also think of ways to create incentives for countries to participate in such cooperation mechanisms, e.g. by adding a financial or accounting bonus to projects involving cooperation across member states in the contribution toward the country 2020/2030 renewables targets.

Renewable support schemes in Europe are based on production as the level of subsidy received by the plant increases with production. This results in an

incentive to produce in hours where power prices are below avoidable costs, creating distortions in the merit order in the electricity market, and therefore increasing costs. The recently approved EU Guidelines on State Aid for Environmental Protection and Energy introduce a series of measures in order to promote the better integration of renewable energy into the market.

RECOMMENDATION

In order to remove distortions of power markets induced by clean technologies support schemes, Europe should eventually phase out production-based support schemes and instead concentrate support for renewables on investment, preferably through an auctioning process.

3. Policies supporting security of supply

Progress on building interconnection and other critical infrastructures supporting electricity and gas markets integration has been slow over the past two decades. However, there would be significant benefits in having more interconnected electricity and gas markets, estimated to range between €12.5 to €40bn/year in 2030 for electricity alone, or about €25 to €80bn savings per capita / year. However, this does not mean that all interconnection projects would be socially beneficial and the selection of projects receiving public support needs to be based on a cost benefit analysis.[1]

RECOMMENDATIONS

The EC should address permitting and licensing hurdles, through e.g. the creation of a one-stop-shop agency as part of ACER and/or regional transmission planning committees.

Greater engagement with local communities is needed to relieve local opposition, e.g. through benefit sharing mechanisms.

The regulation of Transmission System Operators (TSOs) should provide stronger incentives for TSOs to cooperate and to build interconnection capacity – e.g. by mandating that part of the congestion rents and cross border rents be channeled to investment in new lines.

Stronger coordination requires the implementation of regional transmission development agencies under joint ownership from TSOs. A more radical approach would consist in creating regional TSOs.

(1) Booz & Company (2013), “Benefits of an integrated European energy market”, 20 July. Prepared for: European Commission Directorate-General – Energy.

The recent Russian-Ukraine conflict and the associated dispute about Russian gas supplies have revived concerns about security of imported gas in Europe. In response, the European Commission released an EU energy security strategy on 28 May 2014. The mechanisms to enhance Europe's energy supply security are well known but relatively little progress has been made over the past decade.

RECOMMENDATIONS

In the short, term, the resilience of the EU gas system to supply disruptions requires: i) Developing more coordinated preventive planning through regional risk assessments, e.g. on a yearly basis; ii) Developing and regularly updating emergency preparedness procedures to deal with stress situations.

In the medium to long term, EU gas security can be improved by: i) Fostering the development of well-functioning and integrated gas markets; ii) Reducing energy demand though energy efficiency policies; iii) Fast-tracking the build-up of critical infrastructure; iv) Better coordination when negotiating with external energy suppliers, and strict application of EU energy and competition law, possibly coupled with the implementation of an internal regional aggregation mechanism for Eastern European countries to reduce discrimination against some of the most dependent member states; v) Diversification of gas supply sources and routes, and supporting security of supply in the EU's neighborhood (e.g. through the timely construction of the Trans Adriatic Pipeline (TAP) which will transport Caspian natural gas to Europe).

There is currently much worry that the current EU power market design is sending inadequate investment signals which may endanger security of electricity supply. Many countries have taken steps to introduce a capacity mechanism, using very different approaches. The result is a patchwork of mechanisms which could undermine the further integration of European electricity markets. The drivers of capacity mechanisms across Europe are different depending on the country considered, such that it is unlikely that a common approach at the Europe level will be practical or even suitable. But there would be merits in working toward some degree of coordination in order to minimize the potential distortions associated with different capacity mechanism approaches.

RECOMMENDATIONS

The EC should produce guidelines for the regional coordination of capacity mechanisms and ensure the possibility for cross border capacity participation.

TSOs need to cooperate on a regional basis to define common certification and verification procedures for plants and demand response, and to develop operational rules to deal with situations of system stress.

4. Toward a sustainable power market framework

European electricity market design needs to be reconciled with the new policy priorities in favor of renewables deployment in order to provide better scarcity signals as well as locational incentives. The historical approach for electricity market integration is incomplete as it is primarily focused on integrating day-ahead power markets, whilst the growth of intermittent renewables requires liquid and well integrated intraday and balancing markets to balance the system in real time. In particular, specific attention should be paid on ensuring that scarcity pricing allows appropriate remuneration of flexibility in short term markets. Besides, locational signals are lacking in current European power markets and hamper an efficient and coordinated development of generation, demand response, and the network.

RECOMMENDATIONS

The EU target model needs to be revised to fast track the integration of short term balancing through the implementation of cross border liquid intraday and balancing markets in order to enable the least cost integration of renewables in the system.

This will require to reprioritize the current Framework Guidelines and Network Codes process and to give ACER a stronger mandate in order to overcome some of the current blockages.

The redefinition of price zones and/or the introduction of location specific network charges would provide better locational signals and improve the coordination of network and generation investment.

In parallel to the reforms focused on short term markets, electricity market design needs to evolve to improve fixed cost (investment) recovery and facilitate investment in capital intensive technologies. Current electricity markets were designed in the 1990s and the recent development of renewables raises two fundamental questions. Whilst electricity was considered as a homogenous commodity, the introduction of intermittent renewables leads to a differentiation of the electricity produced from different generation technologies depending on a number of attributes: whether the production can be controlled, the degree of flexibility and predictability of the production, etc. Second, the change in the cost structure toward capital intensive technologies raises questions about possible ways to transfer some of the investment risk away from investors through e.g. long term contracts in order to reduce the cost of capital. The European Target Model will therefore need to evolve as the generation mix changes toward a dominant share of low variable cost technologies.

RECOMMENDATIONS

In the long term, electricity markets based on marginal cost pricing will need to be supplemented with some other mechanisms to foster fixed cost recovery and reduce the cost of capital. This can happen gradually through the ongoing reforms introducing capacity mechanisms.

A more radical approach would be a move to "hybrid power markets" with auctions of long term capacity contracts to ensure that there is competition "for the market", whilst the spot and intraday markets would ensure competition "in the market".

5. Governance and financing challenges

Significant investments are required to decarbonize Europe's energy sector and renew ageing infrastructure. The EC estimates that out of the EUR 200 billion needed for electricity and gas networks of European importance, EUR 100 billion should be delivered by the market unaided, whereas the other EUR 100 billion will require public action to leverage the necessary investments. In an increasingly global economy, fierce competition for capital means that the energy sector in Europe will have to compete to attract funding with other investment opportunities globally in a range of other sectors.

RECOMMENDATIONS

The EC and the European Investment Bank (EIB), together with the member states financial institutions, need to scale up the amount of public money lending and equity financing available to Trans-European Network projects and Projects of Common Interest (PCI).

In addition, alternative financing arrangements (such as public-private partnerships) and investment vehicles (such as project bonds and suitable investment funds) should be developed to leverage private capital.

Investments are hampered by perceived policy and regulatory uncertainty. A key source of policy uncertainty relates to the perceived disconnect between the long term policy targets, and the concrete short term policy instruments put in place to deliver on these targets. The inability of policy makers to credibly commit on a set of long term predictable policy objectives is a key issue that undermines the European energy policy framework.

RECOMMENDATIONS

The EC and the member states should develop detailed energy policy implementation roadmaps toward the 2030 objectives, to anticipate the necessary policy changes (e.g. carbon price evolution, timing for phase out of renewables support, etc.).

The process to elaborate these policy roadmaps should be coordinated regionally and open to a wide range of industry stakeholders, through a peer review at a national, regional, and European level.

A monitoring process to assess regularly progress against the policy roadmap and the 2030 objectives should be put in place.

As European energy markets have become increasingly interconnected, there is a growing disconnect with the national mandate of gas and power network operators, as well as regulators. The third Energy package created new institutions at the European level which play an important coordination role, namely the Agency for the Coordination of Energy Regulators (ACER) and the European Network of Transmission System Operators for electricity (ENTSO-E) and for gas (ENTSO-G). But some of the slow progress on market integration and critical infrastructure projects can be attributed to the limited mandates of ACER and the ENTSOs.

RECOMMENDATIONS

ACER and the ENTSOs should be empowered to coordinate and harmonize further national regulatory practices, e.g. to unlock some of the current blockages with the gas and power network codes.

Indicative planning led by ACER and the ENTSOs should be reinforced to improve the coordination of network and generation development, e.g. by broadening the scope of ENTSO's 10 year network development plans to assess the impact of different national energy transition plans.

Coordination at the regional level is a potential promising way forward to complement European integration. Taking into account country-specific circumstances and characteristics is difficult with 28 member states, and there is scope for closer energy policy cooperation of neighboring countries sharing some similar constraints. In addition, regional approaches may prove an opportunity for bottom up involvement of all key stakeholders to find practical solutions to implement EU policies. Policy coordination at the regional level can be either informal and rely on regional forums to disseminate information, or more structured processes through e.g. a formal peer review process and some form of institutionalisation.

RECOMMENDATIONS

Regional coordination groups involving all stakeholders (regulators, TSOs and DSOs, utilities, consumer associations, policy makers, etc.) should be set up with a mandate to explore potential opportunities for cooperation at the regional level on energy policy.

The objectives of such regional coordination groups could be by increasing level of ambition: i) To share information through a peer review process on investment plans; ii) To develop cooperation mechanisms on specific policy instruments, for instance a coordinated approach for cross border participation in renewables support schemes or capacity mechanisms; iii) To coordinate or develop joint policy initiatives at the regional level, for instance discussion on security of supply or on environmental target; iv) To develop joint policy instruments, e.g. common support scheme for renewables or a common capacity mechanism.

Local communities have a growing role to play in the design and implementation of energy and climate policies. The development of decentralized generation and active demand response increases the need for coordination at the local level. System optimization has become more complex and needs to incorporate the different levels of governance through a more "bottom up" process for policy making and stakeholders. Governance changes are needed to improve the coordination and consistency of energy and environment policies at the local, regional and European levels.

RECOMMENDATION

One challenge of Europe's energy policy going forward is to ensure the consistency of the multiple levels of decision and implementation of intertwined policies. The governance and regulation of local players such as Distribution System Operators (DSOs) and municipalities should ensure that all stakeholders have incentives to optimize the system.

Introduction

In his opening statement in the European Parliament in July 2014, the new European Commission President Jean-Claude Juncker highlighted 10 key priorities for his mandate. One of these consists in “reform(ing) and reorganis(ing) Europe’s energy policy into **a new European Energy Union”**.[1]

Does this imply that this Energy Union will mark the beginning of a new approach toward European energy policy, or is it merely a reframing of the debate? **We argue in this paper that the new Energy Union will need a radically new approach to European energy and climate policy.**

The composition of the new European Commission that started his work late 2014 seems to comfort the ambition to fix some of the issues that contributed to mixed success on energy and environmental policies in the past. First, the unification of the former climate and energy directorates under a single Climate and Energy Commissioner Miguel Arias Cañete could help addressing the many conflicts and tradeoffs between energy and climate policy. Second, the creation of a Vice President position for the Energy Union, in the person of Maroš Šefčovič, demonstrates the ambition of the Commission to give a prominent role to energy policy in the coming years.

On 23rd October 2014, the European Council approved a set of 2030 targets for CO_2 emissions, renewables, and energy efficiency setting the objectives for the next fifteen years[2]. The new European Commission will be in charge of defining the supporting policies and regulatory framework to deliver on these environmental objectives, whilst maintaining security of supply and keeping costs affordable for consumers and preserving industrial competitiveness. It seems therefore timely to revisit the achievements of the previous Commission regarding the environmental targets for 2020 in the context of the wider European energy and climate policy. **Several lessons can be learnt from the past decade.**

First, a number of changes in context have led policy makers to revisit the relative priority of the different objectives characterizing the traditional trilemma of European energy policy: climate, security of supply and competition and competitiveness. The priorities evolved to put competitiveness and cost control on the top of the policy agenda, alongside security of supply as the Ukrainian crisis reminded policy makers of Europe’s growing dependence on imported gas. This change of priorities has put under the

(1) Source: Jean Claude Juncker’s Political Guidelines for the New Commission, “A New Start for Europe: My Agenda for Jobs, Growth, Fairness and Democratic Change”, 15 July 2014. Available at: http://ec.europa.eu/priorities/docs/pg_en.pdf#page=6.
(2) Source: European Council (2014), Conclusions on 2030 Climate and Energy Policy Framework, 23 and 24 October. Available at: www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145356.pdf.

spotlight some of the inherent tradeoffs between the different EU policy objectives which remain unresolved. In fact, Europe lacks a clear prioritization of the different EU energy and climate objectives.

Second, the policy tools that have been implemented in the different member states to deliver on the 2020 objectives do not only suffer from inconsistency, but have also been sometimes leading to unanticipated consequences. The EU European Trading Scheme (ETS) has largely failed to provide a robust carbon price signal to drive carbon abatement and a sound foundation for clean technologies investment. Uncontrolled growth of renewables and the use of support mechanisms based on production have contributed to destabilising power markets across Europe. Power prices have collapsed to historical low levels and large retirements of thermal plants threaten security of supply.

Unfortunately, the current European policy debate about the supportive policies to deliver on the 2030 objectives appears very much framed as a continuation of the 2020 approach and risks repeating the same mistakes. This paper argues that Europe energy and climate policy needs a major overhaul, as much in terms of objective setting as in terms of policy tools and levers to deliver on these objectives. In other words, the new Energy Union that President Juncker supports will need a radically new approach to European energy and climate policy.

This paper does not aim to provide a comprehensive list of the issues at stake with European energy and climate policy, which would be a daunting task. Instead, we focus on some key areas with the objective to make concrete proposals for reform. This paper takes a practitioners' perfective, recognizing that a "first best" economic approach is often not practical, and therefore putting forward policy recommendations which recognize the policy and institutional constraints that characterize European policy making.

The paper comprises five sections and makes a set of twelve concrete proposals for reform, both of the currently policy and regulatory framework, but also of the governance of Europe's energy policy. Section 1 discusses the objectives of EU energy and climate policy, whilst Sections 2 and 3 focus respectively on the policy tools and mechanisms for decarbonization and for security of supply. Section 4 reviews the necessary changes to the power market framework. We conclude in Section 5 by discussing how the financing and governance challenges associated with the policy priorities can be handled.

1. The objectives of EU energy and climate policy

1.1. The EU policy "Trilemma": an evolving hierarchy of objectives

European Energy policy has often been described as searching to strike a balance between a "trilemma" of objectives: environment and climate policy, security of supply, and the creation of integrated and competitive electricity and gas markets. The policy priorities of the European Commission (EC) and the member states have evolved over time, modifying the hierarchy between the different pillars of the energy policy trilemma.

In the late 1990s and early 2000s, policy efforts focused on creating the regulatory framework and common rules for the internal market in electricity, with the two key milestones being the December 1996 Directive (Directive 96/92/EC) and the June 2003 Directive (Directive 2003/54/EC). The continued drive to liberalize European electricity markets in the 2000s led to the implementation of the Third Energy package proposed by the EC in 2007 and finally adopted in July 2009. The package, among other things, dealt with unbundling of transmission networks and generation, and established National Regulatory Authorities in each member state and implemented an Agency for the Cooperation of Energy Regulators (ACER).

The focus of European energy policy in the mid-2000s turned onto the environment, as EU leaders set in March 2007 a set of targets for a low-carbon economy, which then was implemented through a set of Directives in 2009 often referred to as the "Climate and Energy Package". These targets, known as the "20-20-20" targets, set three key objectives for 2020: i) A 20% reduction in EU greenhouse gas emissions from 1990 levels; ii) Raising the share of EU energy consumption produced from renewable resources to 20%; iii) A 20% improvement in the EU's energy efficiency. As part of the 2011 discussions on a 2050 Roadmap, EU leaders committed to reducing Europe's greenhouse gas emissions by 80-95% by 2050 compared to 1990 levels.

In recent years, however, security of supply has come back to the forefront of the European energy policy agenda. The Russian-Ukrainian gas crisis of January 2009 which led to supply disruptions in several member states reminded Europeans of their dependence on imported gas and revived discussions on both a common approach toward energy supplies from external countries and a strengthened set of criteria for ensuring security of energy supplies within the internal market. More recently, the 2014 Russian-Ukraine dispute and the discussions on gas supplies have revived concerns about security of imported gas supplies in Europe. In response to the political crisis in Ukraine, the European Commission released in May 2014 a communication defining a new EU energy security strategy.[1]

Since 2008, the economic crisis has also brought a new dimension into the European energy policy trilemma: policy scrutiny about the cost of some of the climate and green policies has intensified, and concerns have grown that the uncontrolled deployment of low carbon technologies could both undermine European's economic competitiveness and raise concerns about security of supply. The Green Paper "A 2030 framework for

(1) European Commission Communication, "European Energy Security Strategy", COM(2014) 330 final, Brussels, 28.5.2014.

climate and energy policies" (COM(2013) 169, 27/03/2013) represents an inflexion point in European energy policy that clearly heralds competitiveness and affordability as one of the key issues for the years to come.

1.2. Conflicting objectives call for priorization and tradeoffs to be addressed

Despite the evolving hierarchy of the three different pillars of Europe's energy policy, there has always been a working assumption that the different policy objectives are synergetic and reinforce each other. For instance, decarbonizing the European economy would support security of supplies in the sense that the deployment of low carbon technologies reduces Europe's dependence on imported fossil fuels. In addition, the pioneering role of Europe in deploying low carbon technologies is believed to yield positive economic benefits in a future in which fossil fuel prices would increase. Similarly, the integration of competitive wholesale power markets has been seen as a way to reduce prices and improve the competitiveness of the European economy, but also to improve the resilience of Europe's energy system to potential fossil fuel price shocks or supply disruptions.

However, in hindsight, the different pillars of Europe's energy policy do not seem as synergetic as often believed. First, the relationship between liberalized power markets and security of supply is more complex than anticipated: it is now largely recognized that the so called "energy only" markets do not provide adequate investment incentives, and cannot guarantee security of supply. In response, most European countries are currently implementing some form of capacity mechanism to ensure generation adequacy in the medium to long term. In addition, the synergies between liberalized power markets and competitiveness are increasingly being questioned as customers see electricity bills increasing. This is reinforced by the impact of environmental policies, in particular support policies for renewables which are driving electricity costs up for retail users in most countries.

In fact, Europe's green agenda has not been reconciled with Europe's objective to create competitive and integrated markets. The impact on energy costs and on Europe' competitiveness of the 2020 targets is becoming apparent today as many member states revisit their support policies for renewables, in order to contain costs for consumers. The integration of intermittent renewables into electricity systems also induces network reinforcement costs and raises new challenges for transmission system operators and distribution system operators to maintain security of supply.

One key lesson of the 2020 targets is that the inherent trade-offs between Europe's climate and environmental objectives, and its other competitiveness and security of supply objectives, have not been identified properly. A sound European energy policy needs to recognize that the three historical pillars of Europe's energy policy are not always synergetic, and address areas of overlap and potential contradiction. The identification of the tradeoffs involved between the different policy objectives is an important prerequisite that should be analyzed as part of the impact assessment of the 2030 objectives discussion.

This should naturally lead to a discussion on prioritization of the different policy objectives. Are there “primary” and “secondary” objectives within the European energy policy trilemma? Whilst maintaining security of supply and the fight against climate change seem to be clear primary objectives, the drive to liberalize and integrate European power and gas markets appears today rather as secondary objective, or an overarching constraint.

In this respect, it is noteworthy that creating integrated and liberalized markets seems to have evolved from being an objective in itself to a mean to an end, namely ensuring competitive access to energy for European citizens. The changing semantic over this third pillar of European energy policy illustrates this evolution: in the 1990s the policy impetus was for the creation of “liberalized integrated energy markets”, whilst nowadays the third element of the trilemma is often described as ensuring “competitive and affordable” access to energy. For instance, the conclusions from the European Council on 26-27 June 2014 stated that “To ensure our energy future is under full control, we want to build an Energy Union aiming at affordable, secure and sustainable energy.”

This change in policy priorities and the overarching competitiveness and affordability imperative are likely to have profound implications as this implies that creating a competitive liberalized internal market is not an end objective in itself anymore, but should instead serve the two other policy objectives – namely ensuring the safe and affordable supplied of energy to European citizens, and working towards the long term decarbonization objective. In other words, whilst the main objective of the previous directives on the internal energy market were to create a common market and to foster competition, the market design and regulatory structure will need to be rethought as a mean to an end – which will most likely lead to different types of arrangements. This issue is discussed further in Section IV.

As a conclusion, we make the following policy recommendations. First, the EC should in a more systematic way recognize the inherent conflicts between different policy objectives of the EU trilemma and address the tradeoffs. In particular, the EC should clarify the way in which the overarching competitiveness and affordability imperative affects the other decarbonization and security of supply policies. For instance, the impact assessment of the 2030 “green package” should provide a thorough assessment of the economic implications in terms of wealth and employment. In this perspective, significant progress has been made in the integrated modelling of energy-climate and the economy, with could usefully inform the policy debate. Similarly, the impact in terms of security of supply of the deployment of significant capacity of intermittent renewables should be assessed, and the costs associated with the network reinforcement and flexibility procurement identified.

1.3. Recasting EU energy policy to account for changes in global energy markets

Global energy market developments over the past decade and the economic crisis have challenged European energy policy, which seems in hindsight to have been too much inward looking and based on contestable implicit or explicit assumptions about the future of global energy markets and fossil fuel prices developments.

The drive for the "green agenda" has been based on two misguided assumptions. First, Europe's strategy to lead on the fight against climate change was based on the assumption that other countries would follow and define their own targets for emission reduction and clean technologies deployment. In the run up to the Copenhagen climate conference in 2008, the working assumption was that a global deal on climate change would legitimate Europe's strategy. However, there has been almost no progress on the international scene toward a global agreement to mitigate climate change since 2008. This has fired back on Europe's ambition to decarbonize its economy, as many doubts have been raised about such unilateral commitment and the costs that it would impose on the European economy, should other countries not follow suit with comparable engagements.

The second important assumption that underpinned Europe's commitment to fight climate change was that fossil fuel prices would increase steadily in the future.[1] This assumption justified the support for low carbon technologies whose cost would reduce over time and inevitably converge with those of conventional fossil fuel technologies. This implied that the "green agenda" costs would remain affordable, and would in the long term yield positive benefits and save costs to European customers.

However, the discovery and production of large quantities of shale hydrocarbons in the US has largely changed the global energy market dynamics over the past few years. Whilst the US natural gas production had been declining until 2008, and the US was anticipated to run into a large natural gas importer, the US is now foreseen to be self-sufficient by 2020.[2] The shale gas revolution in the US has had consequences on the European economy through the global energy markets nexus. The pressure on oil indexed gas supply contracts has led to renegotiations with Europeans suppliers, which brought natural gas prices purchased though long term contracts closer to market prices.

(1) European Commission staff working document SEC(2008) 85. "Impact assessment accompanying the Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020". Available at: http://ec.europa.eu/clima/policies/package/documentation_en.htm.
(2) International Energy Agency World Energy Outlook, 2012 edition.

The surplus of US coal production that is not being used anymore by power producers in the US has been exported and contributed to the downward spiral of international steam coal prices over the past few years – which explain the revival of coal fired generation in Europe. In addition, the recent decrease in the oil price as well as a number of other commodities marks the end of the "commodity supercycle", a period of sustained high commodity prices.

Moreover, the ramifications of the recent changes in the global commodity markets stretch into the broader issue of costs and competitiveness. By halving natural gas prices in the past five years in the US, shale gas has contributed to creating a significant cost advantage for locating some industries that are energy intensive or rely on natural gas as feedstock in the production process. The indirect effect on the price of electricity in the US versus Europe is also worth noting, as Europe has become much more expensive. Electricity and gas prices in Europe come at a significant premium to the prices in developing countries but also compared to other OECD countries, to the exception of Japan.

The 2030 Green Paper from the European Commission reckoned that the EC *"must reflect a number of important changes that have taken place since the original framework was agreed in 2008/9: the consequences of the on-going economic crisis; the budgetary problems of Member States and businesses (…); developments on EU and global energy markets, including in relation to renewables, unconventional gas and oil, and nuclear; concerns of households about the affordability of energy and of businesses with respect to competitiveness; and the varying levels of commitment and ambition of international partners in reducing GHG emissions."*[1]

As a conclusion, it seems important that Europe does not repeat the same mistakes as it discusses and develops its 2030 framework to fight against climate change. In particular, the impact assessment of the 2030 renewables, CO_2 and energy efficiency targets should consider scenarios with a non-cooperative approach from Europe commercial partners and with lower fossil fuel prices than currently anticipated. In addition to the current exceptions to some sectors at risk of carbon leakage, complementary policy measures such as the introduction of border tax adjustments should also be considered.

1.4. Informing policy debates with transparent data on system costs and subsidies for different technologies

The policy debates in Brussels and in many countries are based on implicit or explicit assumptions about the costs of different technologies, as well as their evolution going

(1) European Commission Green Paper (2013), "A 2030 framework for climate and energy policies", COM(2013) 169. Available at: http://ec.europa.eu/energy/green_paper_2030_en.htm.

forward. We argue that often critical policy decisions are made on the basis of weak – or possibly even biased evidence – on the costs of different technologies.

In the case of electricity generation, for instance, the comparison of the costs of different generation technologies is often based on the pure "technology internal costs", and does not factor the "external costs" or the "subsidies" associated with the different technologies. These broad cost categories can be defined as follows:

- Internal costs. These are the costs of generating a kWh of electricity borne by the firm that owns the power plant. These would include fuel, operation and maintenance and costs related with construction, siting and interconnection of the power plant;
- External costs. External costs are the costs of generating a kWh of electricity that are borne by the rest of the society. These external costs typically include the environmental damage such as the impact on climate change, acid rain, as well as the risk of accidents along the supply chain. The external costs also include the impact of a given generating technology on the costs of the delivering electricity from the rest of the electricity system, such as the backup costs in the case of intermittent renewables (system costs);
- Government subsidies (or taxes). Another type of external cost of electricity generation comes from subsidies, for example, a fuel subsidy. This subsidy reduces the internal cost of electricity production and the government compensates this reduction through the subsidy. The subsidy represents the cost to society, since it is funded either through higher revenues from other taxes or from foregoing other government expenditure. Taxes too can be incorporated into this framework by thinking of them as negative subsidies.

This implies that a priority of European energy policy should be to make the underlying assumptions about technology cost supporting energy policy targets explicit, and to ensure that a transparent and consistent methodology is used to assess and monitor the evolution of the cost and subsidies for different technologies. Interventions representing direct subsidies fall under state aid and are subject to European regulation on state aid, which was updated recently with the publication of the new EC Environment and Energy Aid Guidelines (EEAG).[1]

The European Commission (EC) launched a study on energy subsidies and costs in the European Union (EU) in January 2014. The objective of the EC study is to provide "a complete and consistent set of data on energy generation (electricity and heating) and

(1) European Commission (2014), "Guidelines on State aid for environmental protection and energy 2014-2020", 2014/C 200/01.

system costs and the historical and current state of externalities and subsidies in each Member State of the EU and for the EU overall."[1]

We would recommend that as a follow up from this study quantifying external costs and subsidies, a monitoring process be put in place in all member states to track and assess the evolution of the different costs over time. In addition, the creation of a level playing field will require a strict application of the European state aid guidelines policies in order to ensure that those policies are cost-effective for society and do not cause distortions of competition or a fragmentation of the Single Market.

Furthermore, we would recommend that the principle of "cost reflective" prices should be instituted as a core principle of tariff and taxes design, as well as more broadly of any policy impact assessment. In many member states, current end user prices do not reflect the addition of the different cost components, leading to subsidization, or cross subsidization of energy prices. This principle should also apply to external costs, in the sense that all technologies should bear the cost associated with their external effect on the electricity system or on society at large. This principle of cost reflectivity could be for instance enshrined in the Energy Taxation Directive.[2]

2. Policies supporting decarbonization

2.1. The need for a structural reform of the European carbon market

The European Trading Scheme (ETS) was championed by the European Commission in the 2009 green energy legislative package as the centerpiece of European policy toward a decarbonized energy mix.[3] However, carbon prices have been on a downward trend since 2009 and have been trading in the range of 5 to 7 €/tCO_2 for the past three years, which has triggered a policy debate about whether the ETS is working properly and about the need for reform.

The evidence is growing that the weak and volatile prices in the ETS are not effective in driving carbon emission abatement in the power sector. As a reference, the implied switching price between coal and gas fired generation ranges from 30 to 40€/tCO_2 with

(1) European Commission (2013), "A study on energy costs and subsidies in the European Union". See http://ec.europa.eu/dgs/energy/tenders/doc/2013/2013s_249_433934_specifications.pdf.
(2) The Energy Taxation Directive entered into force on 1st January 2004 sets minimum tax rates for energy products, including coal, natural gas and electricity. The aim is to reduce distortions of competition that currently exist between Member States as a result of divergent rates of tax on energy products; as well as to reduce distortions of competition between mineral oils and the other energy products; and increase incentives to use energy more efficiently. See:
http://ec.europa.eu/taxation_customs/taxation/excise_duties/energy_products/legislation/index_en.htm.
(3) The European carbon Trading Scheme (ETS) currently covers close to half of the European Union's emissions of carbon dioxide (CO_2).

current gas and coal prices. In a longer term perspective, current ETS prices are also held to be well below the kind of carbon prices that are needed to make investment in clean technologies competitive.[1]

The ETS design is not to blame for the drop of prices, as the drop in carbon prices over the past few years can be explained by the growing oversupply of allowances for phase 2 and 3. The supply of allowances was fixed in 2007 for Phase 3 up to 2020, and since then a series of shocks affecting the supply and demand of ETS allowances have led to the current oversupply situation. The economic crisis that started in 2008 and the weak economic recovery that followed depressed industrial activity and reduced emissions compared to the expected emissions as defined by the cap for phase 3. On the supply side, a rush to register international offset projects and use the resulting credits ahead of quality controls that went into effect in 2013 also displaced ETS allowances demand and contributed to increasing the supply surplus.

The ETS is now oversupplied well into phase 3, and this is unlikely to be materially affected by the proposed ETS reform. The back loading of some 900 mt of CO_2 allowances until the end of the decade that was approved in late 2013 has not provided much support to prices. Moreover, the structural reform proposed by the European Commission in January 2014 does not seem to be ambitious enough to reverse this trend. The "market stability reserve" (MSR) proposed for the next compliance period (2021-2028) would gradually absorb the surplus of allowances, predicted to be over 2 billion in 2020, by reducing supply each year by an estimated 200 Mt until 2028, thus diminishing the surplus to a minimum volume of 500 Mt according to the impact assessment published by the Commission.[2] This seems too little too late, and some countries including the UK and Germany are now pushing for an early implementation of the MSR.

A range of analysts agree to question not only the efficiency of the MSR to provide some significant price support, but also its fundamental design and ambition.[3] A key issue that remains to be addressed by the reform is the overlap of the ETS with national policies in support of low carbon technologies and energy efficiency which have a significant effect on the demand for ETS allowances. In concrete terms, the issue is that the ETS has become a "residual market" for carbon abatement in the power sector.[4] Policies in

(1) Assuming a 140€/MWh cost of production for wind offshore and a 210€/MWh cost of production for solar PV, the implied carbon price that would equalize their long run generation costs with a combined cycle gas turbine (about 70 €/MWh) are respectively 240 €/tCO_2 and 430 €/tCO_2.
(2) European Commission Communication. Proposal for a market stability reserve, 22/01/2014 - COM(2014) 20. Available at: http://ec.europa.eu/clima/policies/ets/reform/documentation_en.htm.
(3) "The EU ETS' market stability reserve: a marginal long-term structural reform", Tendances carbone, April 2014, No. 90, www.cdcclimat.com/IMG//pdf/tc90_eng.pdf.
(4) See "The ETS: a residual market for carbon abatement in need of a structural reform", Fabien Roques, April 2012. Available at: www.cdcclimat.com/The-ETS-a-residual-market-for-carbon-abatement-in-need-of-a-structural- reform.html.

support of renewables or nuclear have been the prime drivers of power sector investments over the past decade in Europe.

As we argued in previous papers, the ETS needs a structural reform to provide some more credibility about a long term carbon price trajectory.[1] The ETS needs to evolve toward a hybrid "cap and trade system" with a price stabilization mechanism. This requires the implementation of a supply management mechanism more ambitious than the current MSR proposal. The MSR reform aims to provide a corridor for the allowance surplus, which is only an indirect way to absorb some of the existing surplus, but will not help in managing future shocks.

A supply management mechanism to maintain prices within a predetermined "politically acceptable" price range would rely on a "strategic reserve" of allowances which would manage the amount of credits auctioned each year to maintain ETS prices within a corridor. This can be either based on an improved MSR type mechanism, or delegated to an independent authority – e.g. a European carbon bank – which would have the mandate to adjust supply so as to maintain prices within a predetermined range. Our preference goes for a simple automatic approach with an auction reserve price, which would essentially require policy makers to agree on the trajectory for the price cap and floors, as relying on a new independent authority to manage the stock of allowances would seem to be unnecessarily complex to implement and would create a new source of policy uncertainty.

2.2. Too much focus on deploying technologies, not enough support for R&D

Europe's support for clean technologies has been concentrated on the deployment of some technologies which have received significant support in the past decade. HIS CERA estimated that support costs for renewables in Europe have risen to €30 billon in 2012, and would reach €49 billion in 2020 based on current market trends. Based on current trends, annual renewables support costs would double across EU27 from €30 billion in 2012 to over €60 billion in 2035.[2]

This support for deployment of renewables contrasts with the lack of funds available for research and development (R&D) in energy. In real terms, public spending in Europe on energy remains well below the amounts spent in the 1980s, and this does contrast with the industrial policies of other countries such as the US or Japan, which focus a greater share of public spending on R&D.

(1) See "European electricity markets in crisis: diagnostic and way forward", Fabien Roques, November 2012, contribution to CGSP report. Available at: www.strategie.gouv.fr/sites/strategie.gouv.fr/files/archives/CGSP_Report_European_Electricity_System_030220141.pdf.
(2) IHS CERA European Policy Dialogue 2012, Public Launch supporting Policy Memo.

Given the uncertainties on the costs and future progress of the different clean technologies, an optimal policy mix would need to be geared toward R&D and reduce spending on deployment. In 2007, the European Commission launched a Strategic Energy Technology Plan (SET-Plan) which aimed to accomplish four things: i) An improvement of coordination among existing research capacities in the EU; ii) Higher effectiveness of implementation of energy innovation; iii)Mobilization of additional resources; and iv) More and better international cooperation on energy technology development.[1]

The SET-Plan was endorsed by the European Council during the spring meeting of 2008. However, the Council did not indicate that it would mobilize additional funding for the initiative and the financing of the SET-Plan has remained a contentious issue. The difficulties of getting additional funding since then reveal both the desire to keep the development of new technologies with potential relevance for competitiveness under tight national control, but also an unwillingness to commit fresh money in times of tight national budgets.

Going forward, we would argue that Europe needs to develop a coordinated R&D and industrial policy for clean technologies through a wide-ranging reform of the SET-Plan. This would involve scaling up spending R&D and demonstration significantly, and a better coordination of the different national efforts to R&D. Instead of picking technology winners, the European Commission should invest in fundamental research and stimulate the development of collaborations between the public and private sector to stimulate and leverage private R&D.

An integrated European innovation policy should also focus on the funding and support for the demonstration and commercialization of innovation, an area where Europe lacks a supportive framework compared to e.g. the United States.

In practice, the renewables energy supply (RES) targets could be replaced with an equivalent RES R&D and deployment target, whereby countries could choose to support R&D on RES and get credit toward meeting their RES target. In other words, a system of RES credits could be put in place to ensure that the RES obligations of member states can to some extent be met through R&D efforts. This would require a certification and measurement process for R&D which would have the added benefit to contribute to rationalize and coordinate R&D spending across member states.

(1) Communication from the Commission of 10 January 2007 entitled: “Towards a European Strategic Energy Technology Plan”, COM(2006) 847 final.

2.3. Pace the deployment of clean technologies to manage the costs of the energy transition

Investment in renewable energy sources (RES) driven by feed in tariffs or other support schemes displace thermal plants in the merit order, and therefore have a significant effect on power prices dynamics and the revenues of thermal pants. This is known as the "merit order" effect, by which low marginal cost renewables technologies displace more expensive thermal plants. This effect is well documented and a literature review of econometric studies that have modelled the impact of the wind and solar PV deployment in Germany shows a depressive effect on average power prices ranging between 2 and 8 €/MWh.[1]

By modifying the generation mix policy makers change the distribution of revenues to the existing assets, reducing both the running hours of thermal plants and the expected power prices. This can lead to significant revenue transfers across technologies as the system adjusts the generation mix to reach a new equilibrium. The distributional effects depend on whether the revenues from the new RES plants are captured by the incumbent players operating the thermal plants which see their revenues reduced, or whether these go to different players.

The key issue to have a sustainable transition toward a low carbon generation mix is therefore the pace of deployment of subsidized technologies. If the transformation is so rapid and/or unpredictable as to radically alter the revenues of some units which are still in the amortization phase, it can lead to stranded costs and possibly endanger security of supply by amplifying boom and bust cycles. A number of European countries including Germany, Spain and Italy have recently reduced generous support schemes for renewables which led to spectacular – and sometimes uncontrolled – deployment of renewables, particularly solar photovoltaics (PV). Respectively, 7 GW and 5 GW of solar PV were installed on average per year in Germany and Italy over 2010-2012. This solar PV boom was triggered by generous feed in tariffs guaranteeing a comfortable rate of return for investors – but also locking in 15 to 20 years contracts an additional support costs to be paid by electricity consumers.

The key issue to have an affordable transition toward a low carbon generation mix is to manage the pace of deployment of subsidized technologies. This is both important to control the costs associated with subsidies for these technologies, and to provide a predictable pace of deployment so that the value of existing assets and potential new investments in thermal plants do not vary in an unanticipated or unpredictable way.

(1) Source: Öko-Institut (2013), "Proposal for a Revision of the Industry Exemption rules under the German EEG Towards a model that complies with European Laws and balances energy, industry and consumers".

We therefore recommend that member states define RES deployment roadmaps which would comprise among other things an anticipated trajectory for the volumes of the different technologies to be added into the system. In order to control the volumes of clean technologies, support schemes fixing a volume cap, or relying on auctions, should be favored to ensure some predictability of the trajectory for clean technologies deployment. For instance, the reform of the German Renewable Energy Act (German: Erneuerbare-Energien-Gesetz, EEG) sets an upper limit per year for the volumes installed of onshore wind (at 2.5 GW/year), offshore wind (6.5 GW to 2020), and solar PV (2.5 GW/year).[1]

2.4. Ensure greater coordination of national renewable support policies

Policies to support renewables in Europe show a wide diversity of approaches, ranging from feed-in tariffs guaranteeing a fixed price for energy amount fed into the grid, premium schemes under which RES producers receive the electricity market price and a fixed premium for producing renewable energy, and green certificate schemes relying on a renewable generation obligations imposed on suppliers, who can either produce “green electricity” or buy the equivalent in green certificates. There is a large academic literature and practitioner’s evidence on the pro and cons of the different schemes.[2]

The lack of coordination between the national approaches has led to suboptimal deployment of renewables, with a strong build up in some regions that are not necessarily corresponding to the best endowed in terms of wind or solar resource, thereby increasing system costs for European consumers.[3]

In addition, these RES support schemes interact in a different way with electricity market dynamics. As a consequence, the lack of a coordinated approach across the different countries can lead to spreading distortions induced by RES support schemes across borders, such as negative prices. This is particularly true in regions which have implemented price-coupling, where a contagion effect for the effect of RES on electricity market price dynamics is likely to happen.

One priority of European policy should therefore be to work toward some coordination and eventually harmonization of RES support schemes. The EU Renewable Energy Directive 2009/28/EC encourages cooperation between Member States for the 2020

(1) Bundesministerium für Wirtschaft und Energie (2014): www.bmwi.de/DE/Themen/Energie/Erneuerbare-Energien/eeg-reform.html.
(2) See e.g. Hiroux, C., and Saguan, M. (2010), “Large-scale wind power in EU electricity markets: Time for revisiting supports and market designs?”, *Energy Policy*, Vol. 38(7), July, pp. 3135-3145. Ragwitz, M., and Steinhilber, S. (2013), “Effectiveness and efficiency of support schemes for electricity from renewable energy sources”, accepted for publication at WIREs Energy Environment.
(3) See e.g. Roques, F., Hiroux, C., and Saguan, M. (2010), “Optimal wind power deployment in Europe – A portfolio approach”, *Energy Policy*, Elsevier, vol. 38(7), pp. 3245-3256, July.

target, and puts in place a number of cooperation mechanisms between member states and with third countries. Four types of cooperation mechanisms provide for different levels of cooperation between countries: Statistical transfer of renewable energy (Article 6); joint projects between Member States (Article 7); joint support schemes (Article 11); and joint projects with third countries (Article 9).

Although several Member States have started to assess the use of cooperation mechanisms and have approached potential cooperating states, only Sweden and Norway have so far engaged in a cooperation mechanism (joint support scheme). Member States interests to use cooperation mechanisms have so far been strongly linked to domestic target achievement, and there seems to be little awareness of the potential benefits of a joint approach. One key issue seems to be the practical design of cooperation mechanisms, which has been left to member states.

The potential benefits of cooperation are wide ranging and might include: i) closing a potential gap with the 2020 target and/or lowering the costs of reaching the national 2020 RES targets; ii) cooperation for technology development; and iii) long-term cooperation for market integration through electricity imports/exports. A recent study commissioned by the European Commission attempted to quantify the potential benefits of improved cooperation between member states for renewables deployment.[1] The study estimates that support expenditures that come along with dedicated RES support would decrease by 10.8% in the case of a strong use of cooperation mechanisms. This corresponds at EU level to cumulative savings of € 31 billion over the 2013 to 2020 period.

Looking ahead, the European Commission should as part of the discussions on the 2030 package work on the practical design of cooperation mechanism to remove the existing of perceived barriers to their implementation.[2] Going further, the EC should also think of ways to create incentives for countries to participate in such cooperation mechanisms, e.g. by adding a bonus in the accounting of renewables generation from projects involving cooperation across members states in their contribution toward the 2020 and 2030 targets.

2.5. Move away from production based renewables support schemes

Policies supporting RES can create distortions in power markets, which have led to a debate about how RES could be better integrated into power markets. For instance, the

(1) "Cooperation between EU Member States under the RES Directive", Task 1 report. By: Corinna Klessmann, Erika de Visser, Fabian Wigand, Malte Gephart, Ecofys, and Gustav Resch, Sebastian Busch, TU Vienna. 29 January 2014. A report compiled within the European project "Cooperation between EU MS under the Renewable Energy Directive and interaction with support schemes".

(2) The design features could include for instance the type of cooperation (e.g. number of involved parties), the scope of cooperation (e.g. technology and duration of support), the flow of support (e.g. determination of support level/transfer price) and the contractual arrangements (e.g. arrangements for noncompliance).

EC has recently noted that: "frequent occurrences of negative prices in many European markets signal the need for better integration of renewables into the power grid".[1]

The key issue lies in the design of RES support schemes. RES support schemes in Europe are based on production as the level of subsidy received by the plant increases with production.[2] This results in an incentive to produce in hours where power prices are below their avoidable costs, creating distortions in the merit order in the electricity market, and therefore increasing total generation costs to meet demand.[3] In markets which allow for negative prices (e.g. Germany or UK for balancing), these distortions can create artificial (and thus inefficient) negative prices.

The potential for dispatch distortion varies depending on the RES support scheme. The range of prices which lead to inefficient dispatch is greater the greater the size of the unitary support payment. The Feed-in-Tariffs (FiT) have therefore the greatest potential to distort dispatch, followed by Feed-in-Premiums (FiP) / Green Certificates /Contracts for Difference. The potential for distortion varies depending on the cost characteristics of the plant. The lower the avoidable variable costs the smaller the range of prices which lead to inefficient dispatch.

Ignoring the distortions to productive efficiency created by support schemes may lead to incorrect allocation of risk. Thus, while the risk for investors in technologies which receive a FiT may be lower vis-a-vis a FiP, a FiT increases certain risks for other generators and consumers.[4] In addition, the transfer of risk from RES producer's to other generators and consumers is inefficient as RES producers are best placed to handle these risks.

The recently approved European Commission Guidelines on State Aid for Environmental Protection and Energy introduce a series of measures, "in order to promote the better integration of renewable energy into the market". In particular, from 1 January 2016 all

(1) DG Energy: Market Observatory for Energy (2013), "Quarterly Report on European electricity Markets", Vol. 6(2), Second Quarter of 2013,
http://ec.europa.eu/energy/sites/ener/files/documents/20130814_q2_quarterly_report_on_european_electricity_markets.pdf.

(2) Some FiT and FiP schemes may set a maximum level of production allowed to receive support in a particular period with additional production receiving the market price without any subsidy.

(3) See Eurelectric's papers on State aid and RES integration:
www.eurelectric.org/media/127341/notion_of_state_aid_eurelectrics_response_14_march_final_correction-2014-2100-0007-01-e.pdf
www.eurelectric.org/media/77389/iem_comm_eur_response-2013-300-0001-01-e.pdf
www.eurelectric.org/media/26730/resap_report_20111026_high_quality-2011-133-0001-01-e.pdf.

(4) For instance, under a FiT there may be a higher risk for conventional generators of being inefficiently displaced in the merit order and prices being distorted below their competitive level. In addition, a FiT does not provide efficient signals for maintenance decisions or for the use of storage technologies (when available) and thus leads to a higher risk that production from plants will not be available when prices are higher. This increases security of supply risk for consumers.

new support schemes must ensure (for plants with installed capacity greater than 500 kW):[1]

- Aid is granted as a premium in addition to the market price (FiP) whereby the generators sell its electricity directly in the market.
- Beneficiaries are subject to standard balancing responsibilities (unless no liquid intra-day markets exist).
- Measures are put in place to ensure that generators have no incentive to generate electricity under negative prices.

The Guidelines seem to attempt to address the issue of distortions in the merit order by restricting the use of FiTs and ensuring that RES and CHP generators do not have incentives to produce at negative prices. However, this fails to generally address the inefficiency which can result from distorting price signals that generators use to decide when to produce. A more nuanced approach is appropriate depending on the cost structure and maturity of the technology.

Going further, regulated payments based on available capacity instead of production is the only approach that will fully eliminate the potential for dispatch distortion. Remunerating RES based on installed capacity rather than production can create some other issues as it does not provide any incentive to maximize the value of production. This can for instance lead to install the cheapest technologies, which would then deliver poor operational performance. These caveats can be addressed though e.g. requirements about minimum hours of production to be eligible for the capacity payment. Some countries such as Spain are already experimenting such new approach.[2]

We therefore recommend that the EC should consider the different maturity and cost structure of the technologies in a differentiated way when applying the recent state aid guidelines. We also suggest that the distortions in power market introduced by RES support schemes could be minimized by exploring a move away from production based support toward capacity based remuneration of renewables.

(1) European Commission, IP/14/400 09/04/2014, http://europa.eu/rapid/press-release_IP-14-400_en.htm.
(2) The recent reform of the Spanish support mechanisms of RDL 9/2013 implements a capacity based annual payment for the fixed costs of RES. In addition, the RDL 9/2013 involves an operating payment equal to the difference between the market price and the generator's variable cost. If the generator where to have a variable cost below the market price the operating payment will be zero. This is the case for instance for wind generators.

3. Policies supporting security of supply

3.1. Infrastructure: fast-tracking the build-up of interconnection

Progress on building interconnection and other critical infrastructures supporting market integration has been slow over the past two decades. This comes as a stark contrast to the ambition of the European Commission to step up the rhythm of interconnection build up as a critical facilitator of an affordable transition toward a low carbon electricity system.[1]

The progress of interconnection projects has been slowed down by a range of factors: primarily local opposition, as well as political and regulatory barriers. For instance, the French-Spanish interconnection extension across the Pyrenees, or the Austrian "Steiermarkleitung" projects have faced up to a 25 years of delays. In the past couple of years, about one third of the ENTSO-E "Projects of Pan-European Significance" have experienced delays, and five have been entirely cancelled. Most often the cause of the delays resides in authorization and permitting process and local opposition, as the coordination of different parties across borders is usually complex.

There would be significant benefits in having a more interconnected market across Europe. This does not mean that building interconnections should be an objective per se – a cost benefit assessment is required to evaluate the projects which should receive public support. A number of critical interconnection projects have been identified as part of the Priority Interconnection Plan (PIP).[2] The benefits of interconnection are greatest in some areas on the periphery of Europe which remain weakly connected to the European grid – for instance the Baltics or Balkan countries. Within continental Europe, some critical transmission line reinforcements would help to alleviate local network balancing constraints, such as the North–South constraint in Germany. More interconnection capacity could also allow tapping into the hydro reserves in the Nordics and in the Alps for the storage and balancing of electricity on a wider scale than just their immediate regional surroundings. Similarly, an offshore wind grid in the North Sea would allow harnessing the good wind resources of the area whilst integrating better the Nordic market with the CWE and UK markets.

Booz & Company modeled the potential gains by 2030 of a fully integrated market which would facilitate the short and long term trading of energy, renewables, balancing services and security of supply without regard to political boundaries. They found gains from integrating the energy markets that could reach €12.5 to €40 bn/year in 2030, or about

(1) ENTSO-E 10 year Investment Plan calls indeed for two- to threefold Increase in the rate of infrastructure investment, and anticipates €104 bn of investments in power grid infrastructure over 2012-22 (TK update).
(2) Source: TEN-E: http://ec.europa.eu/energy/infrastructure/tent_e/ten_e_en.htm;
PIP: http://europa.eu/legislation_summaries/energy/internal_energy_market/l27081_en.htm.

€25 to €80 savings per capita / year.[1] In addition, the benefits of the integration due to greater interconnection can be significant in some special circumstances. For instance, power prices in the Nordics can increase significantly in a dry year when the hydro reservoirs levels are low; similarly, power prices on the continent are sensitive in France to peak load variations in case of a cold spell because of the large share of electric heating, whilst prices in Germany will vary according to renewables production. As a consequence, new interconnection can be seen as insurance mechanisms against potential disruptions or events causing sudden price increases. This is reflected in the latest ENTSO-E 10 year plan, which identifies security of supply benefits integration as the key drivers of new interconnection lines in Europe.

Going forward, Europe needs to work on a set of measures to streamline and fast track the construction of critical infrastructure. The EC should work to remove some of the permitting and licensing hurdles, through e.g. the creation of a one-stop-shop agency as part of ACER and/or regional transmission planning committees for the approval of project. This could build and expand on the Regulation EC 347/2013 (the Energy Infrastructure Regulation) from April 2013 that organizes a new framework to foster transmission grid development in Europe; In addition, best practice should be applied to relieve local opposition, e.g. by working with local communities to create support for new projects through benefit sharing mechanisms. The German NABEG law, adopted in July 2013 could serve as a useful model here and be scaled up at the EC level. The NABEG law allows certain projects to follow a Federal permitting licensing process and to bypass the normal "Länder" process to accelerate the development of critical lines.[2] Financing could also be facilitated through the expansion of the current share of European funding for projects of Common Interest (PCI) projects, as well as scaling up some of the recent EU funding mechanisms such as the new project bonds initiative from the European Investment Bank (EIB) (see Section 5 of this report).

Finally, the EC should consider how the regulation of TSOs should evolve to put in place stronger incentives for TSOs to cooperate and to build interconnection capacity, subject to lines having a positive cost – benefit. This could be done e.g. by mandating that congestion rents and cross border rents be channeled to investment in new lines; and by putting in place regional transmission development agency under joint ownership from TSOs with a clear mandate to build a coordinated transmission expansion roadmap and to implement it.

(1) Booz & Company (2013), "Benefits of an integrated European energy market", 20 July. Prepared for: European Commission Directorate-General – Energy.
(2) Bundesnetzagentur (2014): www.netzausbau.de/cln_1412/DE/Wissenswertes/Recht/Recht-node.html.

3.2. Toward a European gas security strategy

The recent Russian-Ukraine war and the associated dispute about Russian gas supplies have revived concerns about security of imported gas in Europe. In response, the European Commission released an EU energy security strategy on 28 May 2014.[1] The mechanisms to enhance Europe's energy supply security are well known and the new EC strategy builds on the existing regulation to improve security of gas supplies in the framework of the internal gas market adopted in July 2009[2] after the previous Russian-Ukraine gas crisis, as well as the September 2011 Communication on security of energy supply and international cooperation.[3]

Whilst there are divergences across member states on specific points, the UK and Polish Non papers in preparation of the April Energy Council summarize the key mechanisms to improve gas supply security in Europe.[4] In the short term, the resilience of European gas markets can be improved by:

- Fostering the development of well-functioning markets, supported by the build out of critical infrastructure to allow market integration. The implementation of the Third Energy Package should therefore be a key priority to ensure liquid and transparent energy markets.
- Developing integrated risk assessment and planning on a regional and European basis. In particular, Europe should develop coordinated preventive planning and emergency responses to potential supply disruption scenarios. This would involve regional security of supply plans based on regional risk assessments, as well as emergency response plans.

In the medium to long term, the security of gas supplies can be improved through the following measures:

- Reducing energy demand. This relies primarily on the reinforcement of energy efficiency policies. The revision of the Energy Efficiency Directive is the occasion to critically review the most efficient and cost effective approaches to support energy efficiency.
- Fast-track the build-up of critical infrastructure. The EU needs to accelerate the building of Projects of Common Interest (PCI) to improve the interconnectivity of the

(1) European Commission Communication, "European Energy Security Strategy", COM(2014) 330 final, Brussels, 28.5.2014.
(2) Regulation (EU) No. 994/2010 concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/EC.
(3) European Commission Communication, "The EU Energy Policy: Engaging with Partners beyond Our Borders", COM/2011/539.
(4) Polish Non paper, "Roadmap towards an Energy Union for Europe. Non-paper addressing the EU's energy dependency challenges", 15 April 2014. UK Non Paper, "Energy Security in the EU", 14 April 2014.

internal market with a particular focus on regions which are vulnerable to a high risk of external supplies disruptions.

- Better coordination when negotiating with external energy suppliers. Whilst the creation of an administered single buyer seems unrealistic, better coordination in the negotiation with external suppliers possibly coupled with the implementation of an internal regional aggregation mechanism for Eastern European countries could reduce discrimination against some of the most dependent member states. In addition, the implementation of EU energy and competition law provides strong tools to prevent the exercise of market power, and should be applied to all market players including suppliers from third countries.
- Diversification of energy supply sources and supply routes of energy. The development of liquefied natural gas (LNG) regasification facilities has a key role to play in diversifying European gas supplies, as well as continued support for the Southern Gas Corridor. Indigenous European energy production also has a key role to play through the development of existing as well as new energy supplies.
- Supporting security of supply in the EU's neighbourhood. The Energy Community treaty is a key mechanism to support the robustness of neighbouring eastern countries to gas supply disruptions. For instance, the Energy Community should develop liquid and transparent energy markets and implement the Second and Third Energy Packages.

3.3. Security of electricity supplies: toward a coordinated approach for capacity mechanisms

There is currently much debate about whether the lights will stay on in Europe without reform of the electricity market. Most countries have taken steps to introduce or reform a capacity mechanism, using very different approaches. The result is a patchwork of different national capacity mechanisms which could undermine the further integration of European electricity markets. As a result the European Commission has taken steps to ensure a minimum level of coordination and published on 9 April 2014 Guidelines on state aid in relation to capacity mechanisms.[1]

The drivers of capacity mechanisms across Europe are different depending on the country considered, such that it is unlikely that a common approach at the Europe level will be practical or even suitable. But there would be merits in working toward some degree of coordination in order to minimize the potential distortions associated with different capacity mechanism approaches. A number of preliminary steps can be

(1) Guidelines on State aid for environmental protection and energy 2014-2020: http://ec.europa.eu/competition/sectors/energy/eeag_en.pdf.

identified that would be necessary prerequisites before envisaging a coordination of the capacity mechanisms themselves.

A critical first step for a coordinated approach across European countries consists in defining explicit reliability standard criteria in each country and ensuring their consistency (e.g. loss of load expectation or target reserve margin). Many countries do not have an explicit security of supply standard, but rather rely on engineering principles to evaluate the necessary investments to upgrade or reinforce networks. These different security of supply criteria also imply that the issue of "capacity leakage", i.e. cross subsidization predates the implementation of capacity mechanisms, in the sense that countries which have a system dimensioned to stricter security of supply standard actually cross subsidize countries with a lower security of supply standard.

Moreover, for countries which have an explicit security of supply criteria, the indicators used are different in nature (e.g. target reserve margin versus a target probability of lost load), raising the issue of the harmonization of the criteria and approaches used to derive them. European TSOs have been working as part of ENTSO-E to spread best practice in terms of forward adequacy assessments, using probabilistic rather than deterministic assessments. The ENTSO-E Ten Year Development Plan released every other years by ENTSO-E shows some convergence, but points toward the need for further work to define a common methodological framework for resource adequacy assessment.

Another important issue is the necessary collaboration of TSOs to define common certification and verification procedures for plants and DSM that will participate in capacity mechanisms across borders. This requires at minimum, a common registry of plants and other resources, as well as common approaches to certify and verify the availability of plants in line with the definition of the capacity product.

Most importantly, TSOs will need to develop on a regional basis a common coordination framework, including operational rules, to deal with situations of system stress. At time of capacity shortage in one or two countries, there need to be clear rules and corresponding operational practices in place to ensure the physical delivery of energy according to the commercial contracts that have been signed.

All these preliminary steps require close collaboration of TSOs and regulators, and a practical way forward would be to set up regional task forces. Whilst the EU-wide process led by ENTSO-E should continue, regional approaches have proven to be a successful way to find pragmatic solutions, and TSOs have a long history of working with their neighbors.

4. Toward a sustainable power market framework

4.1. Accelerating current market reforms: toward the Target model 2.0

Despite some steady progress toward integration, European electricity markets are currently at a crossroad. The key issue is not so much the imperfect or incomplete process of liberalization and integration of electricity markets, but rather the need to reconcile this process with the new policy priorities in favor of decarbonization and competitiveness.

Europe's target model for electricity market integration has indeed become obsolete before it is even implemented, as it failed to take into account the implications of the changes in context over the past decade. Confronted with the deficiencies of the European model, different countries have embarked in the past few years into national reforms which create additional distortions through e.g. the implementation of special mechanisms to guarantee security of supply (such as capacity mechanisms).

First, the current Target model is incomplete as it is primarily focused on integrating day ahead of power markets. In a previous study, Roques (2013) detailed how the sequence of electricity markets could be completed with the missing elements in both the short term and in the long term. With the growth of intermittent renewables, the short term balancing of the system will rely critically on the implementation of liquid and integrated intraday, balancing and reserve markets.[1] In addition, the implementation of capacity mechanisms in a coordinated way seems necessary to guarantee resource adequacy and security of supply in the long term. The design of electricity markets will also need to evolve to provide better locational signals so that production or demand response are located in nodes of the network where they are most needed.

4.2. The change of technology paradigm and the implications for power market design

The theory for electricity market liberalization was developed in the early 1980s in a very different context from today. In particular, a technology rupture – the combined cycle gas turbine – contributed to anchor the belief that electricity could be produced and traded as a commodity, and that therefore commodity markets could be used as a template to liberalize the electricity industry. Whilst electricity production had been characterized for decades by increasing returns to scale, the development of combined cycle gas turbines in the 1990s offered the prospect to develop competition based on a standardized and

(1) See "European electricity markets in crisis: diagnostic and way forward", Fabien Roques, November 2012, contribution to CGSP report. Available at: www.strategie.gouv.fr/sites/strategie.gouv.fr/files/archives/CGSP_Report_European_Electricity_System_030220141.pdf

modular technology, which would reduce barriers to entry and reduce the complexity of building and operating power plants.

Whilst CCGTs were the dominant technology of the 1990s and contributed to the development of competition in liberalized European power markets, the technology paradigm has dramatically changed in the past decade. Driven by the European climate and clean technologies targets, renewables have dominated investments in power generation in the past decade. In the past four years (from 2009 to 2012), more than 60% of the capacity additions in Europe (110 GW out of 174 GW) consisted in renewables or nuclear plant.

This change in technology paradigm imposes to revisit market arrangements and raises questions about the fundamental design of power markets. First, electricity markets have been designed on the principle that electricity is a homogenous commodity produced by a set of fairly similar technologies (conventional thermal plants). The introduction of intermittent renewables is leading to a differentiation of the electricity produced from different generation technologies depending on a number of attributes: whether the production can be controlled, the degree of flexibility and predictability of the production are valuable attributes which lead to the creating of separate markets to value these different attributes. For instance, capacity markets, and flexibility products are implemented in a number of countries to value respectively dependability and operating flexibility.

Beyond this growing complexity of electricity markets associated with the different attributes of renewables production technologies, the change in the cost structure of the dominant technologies raises questions about the fundamental principle of electricity markets. According to peak load pricing theory, in power markets participants bid their short run marginal costs (SRMC), and fixed cost are recovered through: i) inframarginal rents as technologies with higher SRMC clear the market and set the power price, and ii) scarcity rents when the market is tight and prices go beyond the SRMC of the technology clearing the market.

This market paradigm worked well to induce competition between technologies with significant variable costs, but will likely need to be adapted to reflect the recent changes in the technology costs structure of the generation mix. For all low carbon technologies – renewables, nuclear and carbon capture and storage – investment costs represent a large charge of the total generation costs.

In concrete terms, the European electricity industry is moving from an “OPEX world” into a “CAPEX world”. This has important implications for the evolution of the design of competitive power markets. Whilst in theory marginal cost pricing can still work with a part of the generation mix having zero or very low SRMCs, prices will likely become very volatile as the share of renewables increases and technologies with zero SRMC clear the market increasingly frequently. The risk is therefore that prices would be at or near zero (and could even be negative) for long periods of time, and fixed costs for thermal plants would therefore have to be recouped during few hours, therefore leading to extremely high prices.

The gradual increase of the share of renewables should be supported by reforms of the target model for electricity markets in Europe, reflecting the change of the industry cost structure. This implies that a transition to a market design that complements marginal pricing with some other mechanism to support fixed cost recovery will be needed. Alternative models of competition are possible for industries with a costs structure dominated by fixed costs. The key is to apply competitive pressure where it does matter, primarily on the investment decision. In other industries which are capital intensive, this is done through e.g. the auctioning of long term contracts.[1] In this respect, experience from Latin America provides alternative models of competitive arrangements, where periodic auctions are run for long term contracts of both thermal and renewables plants, and could constitute a useful learning case for Europe.

4.3. Long term power market design challenges: toward "hybrid models"

Beyond these well understood reforms of the European target model, a discussion needs to be initiated on the medium to long term model for electricity markets in Europe. Indeed, the evolution of the generation mix toward capital intensive technologies, combined with the intermittent nature of some renewables technologies, imply that electricity markets rooted in the principle of short term marginal cost pricing will likely not be appropriate in the medium to long term. In addition, the depressive effect of RES on power prices represents a structural issue as power prices will be on average lower than in the previous equilibrium, and with growing shares of renewables, will become more volatile. This might lead to an unstable market dynamic when renewables become the marginal technology for significant periods of time, where power prices would oscillate between extremes at short notice and in an unpredictable way.

Some exploratory work needs to be launched to study alternative models for the long term (post 2025). These alternative models will likely comprise a greater role for long term contracts to facilitate investment and financing of low carbon as well as thermal technologies. Long term contracts can be tendered to maintain competition and concentrate it on the investment decision, which is the most important cost factor for capital intensive technologies. A system of auctions for long term capacity contracts could supplement a liquid spot market which role would be confined to the short term dispatch optimization.

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(1) See e.g. Finon, D., and Roques, F. (2008), "Financing Arrangements and Industrial Organisation for New Nuclear Build in Electricity Markets", Competition and Regulation in Network Industries, Intersentia, Vol. 9(3), pp. 247-282, September.

We therefore recommend that the European Commission considers the long term directions for reform of existing power markets. In particular, as the share of RES technologies with low variable costs increases, the role of marginal costs pricing as the pillar of electricity markets will have to be revised. This can happen gradually as additional remuneration sources through short term markets and capacity markets gradually provide new sources of revenues reflecting the growing importance of these products to the system. The long term destination may therefore be a market framework which would give a greater role for auctions of long term capacity contracts in order to ensure that there is competition "for the market" and a level playing field between low carbon and thermal plants, whilst the spot and intraday markets would ensure competition "in the market".[1]

5. Governance and financing challenges

5.1. Financing the energy transition: innovative instruments to scale up infrastructure investment

Significant investments are required in both the short and long term to decarbonize Europe's energy sector and renew ageing infrastructure. In the short term, the European Commission estimated that Europe's energy system would require investments of ca. EUR 1 trillion by 2020, out of which about EUR 200 billion needed for electricity and gas networks of European importance alone.[2] In the long term, Eurelectric estimated that the total investment in power generation over 2010-2050 would amount to €1.75 trillion (in 2005 money terms), whilst investment in power grids over the same time frame would amount to €1.5 trillion.[3] This corresponds to a range between 40 and 60 billion Euros per year of investment in the European power generation until 2050. The total energy costs are estimated to increase from about 10.5% of European GDP in 2010 to about 13% of European GDP in 2025.

There are concerns that financial constraints will require a significant contribution from public budgets of either member states or the European Commission to deliver on these ambitious infrastructure investment objectives. The European Commission states that *"The analysis carried out by the Commission services in preparation of the Connecting Europe Facility Regulation have shown that while the capital markets, the banking sector as well as national budgets are expected to play a major role in delivering the required infrastructures through appropriate investment and pricing mechanisms, some*

(1) For more discussion of these issues, see e.g. Finon, D., and Roques, F. (2013), "European Electricity Market Reforms: The 'Visible Hand' of Public Coordination", *Economics of Energy & Environmental Policy*, Vol. 2(2). Available at: www.ceem-dauphine.org/assets/wp/pdf/Finon_Roques_Visible_Hand1.pdf.
(2) Source: European Commission website, http://ec.europa.eu/economy_finance/financial_operations/investment/europe_2020/investment_needs_en.htm.
(3) Source: Eurelectric Power Choices Reloaded Study (2012).

investments in infrastructure will not take place or will be delayed far beyond 2020, if the EU does not take action. Therefore, there is a need for a significant contribution from the EU budget in the next Multi-Annual financial framework to ensure that EU infrastructure priorities are actually delivered"[1]. The European Commission estimates that out of the EUR 200 billion needed for electricity and gas networks of European importance, EUR 100 billion should be delivered by the market unaided, whereas the other EUR 100 billion will require public action to leverage the necessary investments.

In an increasingly global economy, fierce competition for capital means that the power sector in Europe will have to compete to attract funding with other investment opportunities globally in a range of other sectors. However, there are many claims that the current EU regulatory framework and market are not fit to attract the massive amounts of capital that are required to finance the transition to a low carbon economy. The profitability of the European power generation sector has fallen in recent years, and a growing share of European utilities' CAPEX is invested outside of Europe. European utilities are in a weak financial situation as they enter into a massive investment cycle: the total net debt position of the 10 largest European utilities nearly doubled over the past five years to reach about 280 billion Euros.[2] This implies that new sources of capital will be needed to finance Europe's ambitious energy infrastructure investment program.

A rethink of the regulatory framework is therefore needed to reduce risks for historical investors, but also to attract different sources of investors. One key new source of funding will come directly from domestic investments in renewables technologies: a large share of the solar PV investments across Europe has been financed directly by electricity consumers. However, utility scale investments will still be needed to finance the upgrade of transmission and distribution infrastructures, as well as of conventional generation. Financial players have shown a consistent interest in investing in the energy sector in Europe, and could be key players to facilitate the financing of utility scale infrastructure and generation investments going forward alongside utilities. Funds taking a long term perspective are particularly well suited, such as pension funds or sovereign wealth funds.

In order to attract large amount of equity investment into the power sector, financial players will need to be reassured about the technology and policy risks associated with investments in the European electricity sector. Funds that are ready to take on the lower ends returns on investment that have been typical of the utilities sector in Europe will also want a very secure risk profiles – which means that the key sources of risk on the regulatory, technology, and market side will have to be mitigated and/or transferred into other parties. European financial institutions have a key role to play in this respect.

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(1) Source: European Commission website, http://ec.europa.eu/economy_finance/financial_operations/investment/europe_2020/investment_needs_en.htm.
(2) Source: IHS CERA 2012 European Policy Dialogue final report.

The European Commission, the European Investment Bank (EIB) as well as the different member states financial institutions contribute already significantly toward the financing for critical energy infrastructure. The EIB lending activity for renewable energy reached for instance EUR 3.3bn in 2012. In addition to the direct lending activity of the EIB for clean technology investments, a number of joint initiatives supporting renewable energy have been put in place, including:

- The 2020 European Fund for Energy, Climate Change and Infrastructure – also known as the Marguerite Fund – which was launched jointly by the European Commission, the EIB, and other major long-term institutional investors provides finance for projects in the energy, climate change and transport sectors.
- ELENA (European Local Energy Assistance), which is managed by the EIB and funded by the Commission, provides technical assistance grants to local and regional authorities for the preparation of energy efficiency and renewable energy investment programmes in support of the EU’s climate and energy policy objectives.
- The Energy Sustainability and Security of Supply Facility (ESF) is a multiannual EUR 3bn facility for financing projects in EU candidate and neighbourhood countries, African, Caribbean and Pacific (ACP) countries, South Africa, and Asia and Latin America.
- The NER 300 initiative (New Entrants Reserve of the EU emissions trading system) is a funding programme for carbon capture and storage demonstration projects and innovative renewable energy technologies.

In addition to the direct contribution to providing debt and equity for investment in clean technologies and energy infrastructure, the European Commission and the EIB have launched a “Project Bond Initiative” to facilitate the financing of critical infrastructure, which could in the future play a significant role to attract infrastructure finance into the European energy sector. The pilot phase of the EU-EIB Project Bond Initiative was launched in 2012, and aims to revive and expand capital markets to finance large European infrastructure projects in the fields of transport, energy and information technology.[1]

The aim is to attract institutional investors to the capital market financing of projects with stable and predictable cash flow generation potential by enhancing the credit quality of project bonds issued by private companies. The intention is to support capital market financing of projects as a form of finance to complement loans, not to replace other sources of financing, such as grants, nor to intervene in stages prior to financing, such as feasibility studies, assessments or procurement, where grants are also widely used. A

(1) The pilot phase of the EU-EIB Project Bond Initiative was established by Regulation No. 670/2012, published in the Official Journal L 204/1 of 31/07/2012.

recent EIB study discusses the contribution of private capital to the financing of infrastructure investment needs and how it could be increased.[1]

Going forward, we recommend that the European Commission and the EIB, together with the member states financial institutions, work together to scale up the amount of lending and equity financing available to Trans European Network and PCI projects. In addition, whilst the traditional ways of corporate and public) capital expenditure as well bank lending will continue to play a critical role, European will need to attract new sources of capital. Therefore, recognizing the limits of public funding at times of budget constraints, a major focus should be on exploring how the current regulatory framework can provide better incentives to private capital to the financing of infrastructure investment needs. There is scope for the development of alternative financing arrangements (such as public-private partnerships) and investment vehicles (such as project bonds and suitable investment funds). In this respect, scaling up the EU-EIB Project Bond Initiative could represent avenue to reduce risks and attract a growing amount of infrastructure investment funds.

5.2. Revisiting EU energy policy governance: local and regional challenges

Before the 1990s and the liberalization of European electricity and gas markets, energy policy in the different member states was largely determined through central planning exercises at a national level involving governments and the key stakeholders. The activity of electricity and gas supply was organized as national monopolies in most European member states, which were either state owned or regulated and therefore closely associated to the national energy policy. Often this resulted in a top-down and technocratic process to define energy policies, with little democratic involvement of the local communities and citizens.

The technologies dominating electricity production and transport, and well as gas distribution reinforced this centralized approach toward energy policy. Economies of scale associated with electricity production from the dominant technologies (hydro, then oil, nuclear and coal fired generation) as well as natural monopolies for the transport and distribution of electricity and gas led to a stable regulatory environment whereby natural monopolies and governments relied on central planning to define the long term energy policy directions.

In the past two decades, several elements combined to change the way energy policy is being made in Europe. A double dynamic has led both the local level and the European levels to become increasingly more important than the national level in shaping energy

(1) Private Infrastructure Finance and Investment in Europe, Georg Inderst, Inderst Advisory, EIB Working Papers 2013 / 02.

policy in Europe. The growing importance of both, the local level as well as regional and European levels in shaping energy policy in Europe, have increased considerably the complexity of policy making. One of the biggest challenges is to ensure the consistency of these multiple levels of decision and implementation of intertwined policies. Ensuring the optimization of the system technically and economically appears today much more challenging than in the past. This raises questions about whether the current governance mixing the national level with the local and regional/European level is optimal, and how it could be improved further to adapt to this new dynamic toward regionalization and Europeanization.

At the local level, local communities have become more engaged in the past few years in shaping energy policies. Whilst the role of municipalities varies greatly across member states, the development of decentralized generation on the one hand, and the more active outreach to energy consumers on the other side to stimulate demand response and active demand management have contributed to changing the perception of energy production and distribution. There is now much more interest from consumers and citizens to engage on energy issues, and municipalities or associations of consumers are gaining a prominent role in shaping energy policy at the local level.

Going forward, the role of distribution network operators (DSOs) will be central at the local level to coordinate and optimize the production and consumption of electricity at the local level. DSOs will also have a key role in the deployment and operation of smart grids and in providing access to the data that will be essential for suppliers to provide innovative services. This raises a number of questions regarding the governance and regulation of DSOs, which should be addressed by the Commission.[1]

As regard to the European level, the Third Energy Package created new institutions at the European level which play an important – albeit insufficient – coordination role, namely ACER and ENTSO-E and ENTSO-G. In addition informal discussion forums at the EU level include the Florence and Madrid Forums. Going forward, there is a need to reinforce the mandate of these European institutions to allow better coordination across network and generation expansion, as well as to assess the impact of different national energy transition plans on integrated power and gas markets.

5.3. Toward regional approaches as a practical way forward for policy cooperation

Coordination at the regional level is a potential promising way forward for further European energy coordination. Over the past few years, a bottom-up market integration

(1) See e.g. Ruester, S., Pérez-Arriaga, I., Schwenen, S., Battle C., and Glachant, J.-M. (2013), "From Distribution Networks to Smart Distribution Systems: Rethinking the Regulation of European Electricity DSOs". Available at: http://fsr.eui.eu/Publications/POLICYbrief/Energy/2013/PB201305.aspx.

process has been at work through the creation of the Regional Initiatives (RIs) and other, independent regional integration projects.[1] These work streams have led to a number of successes in regional market integration. In particular, the implementation of market coupling on a regional basis has allowed some efficiency gains in the use of interconnections, and led to stronger price convergence between coupled markets.[2]

Going forward, regional initiatives yield some potential significant benefits compared to a more top- down European driven approach. First, taking into account country-specific circumstances and characteristics is difficult with 28 member states, and there is scope for closer energy policy cooperation of neighboring countries sharing some similar constraints – for instance countries sharing similar gas supply security issues. Second, some countries with joint interests and sharing similar policy orientations may way to move at a differentiated speed from the rest of the member states on some key issues, such as environmental policy. Third, regional approaches may prove an opportunity for bottom up involvement of all key stakeholders to find practical solutions to implement EU policies.

Several regional initiatives provide some useful lessons. These are wide ranging in their objectives and institutional setting. The Visegrad countries' V4 initiative (Poland, the Czech Republic, Slovakia and Hungary) aims for regional energy policy cooperation and market integration, and emerged from the Russia-Ukraine-EU gas crises of 2006 and 2009.[3] The Pentalateral Energy Forum (PF, which involves France, Germany, the Benelux countries, Switzerland and Austria) was created in 2005 in order to promote collaboration on cross-border exchange of electricity. The North Seas Countries Offshore Grid Initiative (NSCOGI, for ten nations bordering or close to the North Sea), as well as the Mediterranean Energy Forum are primarily driven by the joint interest in exploiting renewable resources – wind offshore in the first case and solar PV in the former case. De Jong and Egenhofer (2014) explore the potential for regional approaches, and assess lessons from existing initiatives, regional energy arrangements such as the Danube Energy Forum, the Mediterranean Energy Forum, the Pentalateral Energy Forum, the North Seas Countries' Offshore Grid Initiative and the Nordic Co- operation partnership.[4]

(1) "From Regional Markets to a Single European Market", Everis and Mercados, 2010.

(2) Market coupling in wholesale power markets uses implicit auctions in which players do not receive allocations of cross-border capacity themselves but bid for energy on their exchange. The exchanges then use the Available Transmission Capacity (ATC) to minimize the price differences between two or more areas. In so doing, market coupling optimizes the interconnection capacity and maximizes social welfare. This process increases price convergence between market areas, eliminates counter-flows. Price differentials send a price signal for investments in cross-border transmission capacities.

(3) See e.g. Kaderják, P., Selei, A., and Hum, A. (2013), "Energy Market Integration in Central Eastern Europe (CEE): Drivers, Early Lessons and the Way Forward", paper based on proceedings of a workshop, Regional Centre for Energy Policy and Research (REKK), Corvinus University, Budapest, 4 April.

(4) De Jong, J., and Egenhofer, C. (2014), Exploring a Regional Approach to EU Energy Policies. Clingendael', working paper No. 84 / April. See also De Jong, J., and Groot, K. (2013), "A Regional EU

Regional approaches could possibly play a growing role for governing EU renewables policy, which the European Commission has identified in the 2030 climate and energy framework as a new element for governance. The envisaged peer review process between countries on a regional basis and the European Commission could be a useful way forward to coordinate the pace of deployment of renewables and ensure that this deployment is optimized through e.g. regional support schemes. The Nordic countries precedent is a useful experience in this regard.

Policy coordination at the regional level can be either informal and rely on regional forums to disseminate information, or more structured processes through e.g. a formal peer review process and some form of institutionalisation. This would require some form of governance structure within the wider context of EU energy policy-making. One key objective of such governance structure should be to reconcile the work done at the regional level with the European policy directions and to ensure that these regional approaches do not lead to further fragmentation of the internal energy market.

Going forward, we recommend that Regional coordination groups involving all market stakeholders (regulators, TSOs and DSOs, utilities, consumer associations, policy makers) should be set up with a mandate to explore potential opportunities for cooperation at the regional level on energy policy. The objectives of such regional coordination groups could be by increasing level of ambition (see Leonie Meulman and colleagues (2012)[1] for a more detailed assessment of the potential for coordinated energy policy in north-western Europe):

- To share information on investment plans relevant for all fuels used in the power generation/distribution sector and for infrastructure improvements.
- To develop some cooperation mechanisms on specific policy instruments, for instance a coordinated approach for cross border participation in renewables support schemes or capacity mechanisms.
- To coordinate or develop joint policy initiatives at the regional level, for instance discussion on security of supply or on environmental targets.
- To develop joint policy instruments, e.g. a common support scheme for renewables or a common capacity mechanism.

Energy Policy?", CIEP Paper No. 2013/06, Clingendael International Energy Programme (based on workshops at the end of 2012), The Hague.

(1) Meulman, L., Boot, P., van der Linde, C., De Jong, J., and Werring, L. (2012), "Harvesting Transition? Energy Policy Cooperation or Competition around the North Sea", Clingendael International Energy Programme, The Hague, January.

5.4. From policy targets to instruments: Toward peer reviewed policy roadmaps and progress monitoring

The inability of policy makers to credibly commit on a set of long term predictable policy objectives is a key issue that undermines European energy policy. Ensuring inter-temporal consistency is always difficult for policy makers who are elected for a few years and make long term commitments. In order to demonstrate the bi partisan support for fighting climate change in the long term, the UK has for instance amended its constitution to include an emission reduction target.

In practice, governments can also rely on long term contracts which can be enforced by tribunals to create some form of long term commitments. In this respect, long term contracts in the form of FiT or Contracts for Difference (CFDs) have a role to play in reducing policy uncertainty in the long term. Whilst long term contracts can have negative effects on competition and care needs to be given to ensuring that they comply with European State Aid guidelines, they could play a growing role in reducing policy and regulatory risk relating to climate policy. As we argued in section 2, long term carbon contracts could for instance play a critical role to reduce the long term commitment to a rising carbon price and the lack of confidence in the ETS and support investment in clean technologies.[1]

Another source of policy uncertainty relates to the perceived disconnect between the long term policy targets, and the concrete short term policy instruments put in place to deliver on these targets. For instance, the European Commission 2050 roadmap sets an ambitious 2050 target to reduce CO_2 emission by 80% to 95% in Europe, which does not appear consistent with the current ETS design as the current annual emission reduction factor seems largely insufficient to deliver such emission reductions (see section 2).

In order to ensure that policy instruments in the short term are consistent with medium to long term policy objectives, and in turn reinforce the credibility of these engagements, we suggest that the Commission and the different member states should develop energy policy roadmaps. These policy roadmaps would provide a forward looking view of the required policy changes needed (e.g. carbon price evolution, timing for phase out of renewables support, etc.).

The process to elaborate these roadmaps should be largely consultative and open to a wide range of industry stakeholders, first at a national level, then at a regional level, and finally at the European level. Through a peer review process between member states at the regional and European level, inconsistencies could be picked up early and resolve

(1) See Carbon Contracts and Energy Policy: An Outline Proposal, Dieter Helm and Cameron Hepburn October 2005. Available at: www.dieterhelm.co.uk/sites/default/files/CarbonContractsOct05.pdf.

early, ensuring greater confidence and credibility of the stated energy policy objectives. Last but not least, a process to assess regularly progress against the policy roadmap should be put in place. This would rely on a set of indicators, which would be periodically reviewed.