EUROPEAN ENERGY POLICY: DOGMA OR STRATEGY?

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Introduction

Between 1990 and 2007, European energy policy was mostly concerned with creating a large, integrated, and competitive energy market. Not by coincidence, this spirit of cooperation also inspired the European Union's original approach to the global negotiations on climate change, by agreeing on a joint objective ("bubble") with a heterogeneous burden sharing at the Kyoto conference, and by implementing the market-based European emission trading system (EU ETS), still the largest such scheme in the world.

Over the past decade, however, attention has shifted. At least since the 2007 council meeting which coined the threefold '20-20-20'-objectives, the energy policy of the European Union (EU) has been shaped by the belief in a "triune grail" of reducing CO_2-emissions, increasing the share of energy provided by so-called renewable energy sources, and decreasing the amount of energy consumed in the EU.

By now, these three dimensions, and the quantitative objectives set for them, seem to have acquired the status of a dogma in the European debate about energy policy. For national policymakers within the EU, the '20-20-20'-approach provided welcome legitimacy for increased political intervention into national energy markets, in particular in the electricity sector. While liberalisation and EU integration implied – and required – a reduced influence of national policymakers in the field of energy, the idealization of the '20-20-20'-dimensions have served as a justification for regulatory activity on the national level, most of which remains fully uncoordinated between the member states.

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Moreover, measures to attain the three quantified objectives have been inconsistent, not only between member states but also between the measures themselves. In particular, the comprehensive nature of the EU emission trading system (ETS) does not seem to be well appreciated, as policymakers continue to introduce complementary measures on the European or national level, especially with respect to renewable energy sources and energy efficiency. Within the sectors comprised by the EU ETS, none of such measures can have any meaningful impact on the level of emissions.

Finally, conflicts with other political objectives, such as e.g. wealth creation, distributive equality, or geopolitical interests, are not actively managed. In line with this omission, global developments, e.g. in the world's fuel markets, in technology, in geopolitics, or in the global negotiations on climate change, have little or no impact on Europe's energy policy – as if, in energy terms, Europe were an island unconnected to the outside world – or, as if, in energy terms, Europe were able to dominate the world.

The shift in attention from driving integration to micro-managing specific desired outcomes based on dogma rather than on strategy has led to a confusing European energy policy over the past years. Slowly, but steadily, Europe is faced with the consequences of such an energy policy full of contradictions, inconsistencies, and neglect of developments in the rest of the world. Energy prices keep rising for European consumers, industrial investment activity remains low, the global efforts to curb greenhouse gas emissions remain largely unaffected by Europe's example, and the geopolitical fault lines around Europe become more and more visible.

So far, the answer of European policymakers largely is: more of the same inconsistent approach, particularly on the level of the individual member states. It is more than likely that such interventions make matters rather worse at least in the long-term, as they keep adding to an already inconsistent array of European and national policy interventions.

Against this background, this paper sets out by analysing the EU's energy situation from a strategic perspective. Abstracting away from the political capital invested into issues of energy efficiency and renewable energies, it concludes that an immediate investment need only exists with respect to certain parts of the transport infrastructure within the EU, power and gas. In contrast, both electricity generation and gas import infrastructure exhibit significant overcapacity, not least because of the continuing economic problems in some parts of the EU. Moreover, import prices of fuels have plummeted. Together, this would provide the EU with a breathing space to confine activist policies to the minimum and to rethink its approach to climate and energy policy.

With a view towards such a fundamental reappraisal, this paper will argue that unfettered European competition enabled by further integration and harmonization continues to be the single largest opportunity for the EU's energy policy. In this context, it will also be argued that significant benefits would accrue to the EU from reinvigorating the EU ETS while at the same time reducing the use of technology- specific and/or national policy instruments.

Unfortunately, both the Lisbon treaty and current political practice leave significant room for national policymakers to add to the inconsistency, rather than to reduce it. As there seems to be little chance for a general overhaul of the European framework in the foreseeable future, the paper points to the potentially beneficial impact of bilateral or regional initiatives for further integration.

On the geopolitical side, the paper argues that Europe largely has to be seen as a "price-taker" – in terms of global fuel prices, global prices for CO_2, or global cost of energy technologies, and it would be well-advised to make cost efficiency the key criterion for evaluating policy choices.

Moreover, no matter which policies it chooses, Europe will continue to be highly dependent on fuel imports. In order to remain at least somewhat cost competitive in the global arena it needs to procure these fuels from sources in the immediate neighbourhood. While generally being geographically well-positioned in the proximity of Russia, the Middle East, and North Africa, all of these regions exhibit significant risk from an EU perspective. Political country risk becomes an even more pressing issue if the respective transit countries such as Turkey, Syria, the Ukraine, or Belarus are included into the picture.

As both the global developments in the climate and energy domain and the geopolitical context for the EU are highly uncertain, maintaining or even increasing flexibility carry a significant option value for Europe. This paper will discuss the most important opportunities to reap such option value, notably improving the resilience of the EU's import and transport infrastructure and keeping all technologies and all potential transport routes available for Europe.

Furthermore, the paper deduces that the number of legally binding quantitative targets for the energy sector should be kept to a minimum. Therefore, a comprehensive EU climate and energy scorecard should comprise many more dimensions than the three dimensions selected by the Council in 2007. However, only the target for greenhouse gas emissions actually needs to be legally binding.

The paper is organized as follows. Section 1 will briefly discuss the major global developments in the field of climate and energy and their impact on the EU. Section 2 then discusses four key structural challenges for the EU's energy policy. Given this background, section 3 critically reviews European energy policy from 2009 to the European Council decisions in autumn 2014. Section 4 will argue that two alleged "silver bullets" (investing into renewable energy sources and energy efficiency) are not as useful a short-cut to meeting Europe's energy challenges as public perception has it. Turning to opportunities, the paper then explores the potential upside from improving European competition and enhancing the EU ETS in section 5. Section 6 discusses the issue of market organization with a particular focus on the concern that the government should step in to replace long- term markets for hedging investment risk in electricity generation. Section 7 looks more closely at the challenge of increased import dependency and potential political action to counter it. Finally, the paper concludes with an overall appraisal of the priorities for a European energy strategy adapted to the existing challenges.

1. Global developments and the EU

Global energy markets have been characterised by several major trends since the global economic crisis in 2008:[1] continued growth in energy consumption (+1,264 million toe, or +2.4% p.a.), happening mostly in non-OECD countries; unabated growth in the consumption of coal (+564 million toe annual consumption, or +3.2% p.a.), almost entirely driven by China (+556 million toe, or +7.0% p.a.); a significant increase in U.S. gas production (+106 million toe, or +3.8% p.a.), associated with an implosion of U.S. gas prices (from 8.85 USD per million Btu to 3.71 USD per million Btu); a strong reduction of North American coal consumption (-115 million toe, or -4.2% p.a.); and the impressive increase of consumption of energy taken from non-hydro renewable energy sources (+17.6% p.a.), although still at a very low absolute level (279 million toe in 2013, or 2.1% of total primary energy consumption). Most surprisingly, the astonishing expansion of U.S. oil production (+144 million toe, or +8.1% p.a.) has led to upheaval in the global oil market, sending the oil price down to an average of some 53 USD per barrel of WTI.

During the same period, primary energy consumption in the EU has dropped by 118 million toe from 2008 to 2013 (-1.4% p.a.) mostly because of the on-going economic problems in the EU. Thus, the EU had a share of 13% in global primary energy consumption in 2013 (1,676 million toe), down from almost 16% in 2008. Energy taken from non-hydro renewable resources had a share of 6.6% of total primary energy consumption in the EU in 2013. While this represents a higher share than on a global level, fossil fuels still dominate the EU energy mix as everywhere else, with 77% of the total, with oil making up almost half of this share.[2]

Between 2008 and 2013, EU oil production has declined by almost half (-37 million toe, or -8.4% p.a.), EU gas production has gone down by roughly a third (-40 million toe, or -5.2% p.a.), and EU coal production has decreased by a bit more than 10% (-21 million toe). In addition, mostly due to the nuclear phase out in Germany, the civil use of

(1) All numbers derived from BP Statistical Review (2014).
(2) All numbers in this paragraph derived from BP Statistical Review (2014).

nuclear energy has decreased in the EU by about 10% (-14 million toe). In contrast, the use of energy from non-hydro renewable energy sources has doubled (+58 million toe), in particular in Germany, Italy, Spain, and the United Kingdom. This substantial capacity expansion was fuelled by generous promotion schemes financed by EU electricity consumers. Thus, the – rather costly – increase in indigenous renewable energy capacities compensates only half of the decline in the other indigenous energy carriers.[1] At the same time, the share of the EU in the global production of non-hydro renewable electricity has declined from 43% (2008) to 40% (2013). More significantly, the EU share in global new installations of wind power plants has decreased from 71% (2004) to 32% (2013)[2], and in photovoltaic capacity from 85% (2009) to 41% (2013)[3].

From a geopolitical perspective, the most important aspects of these developments are the dramatic reversal of the fortunes of the U.S. – re-industrialisation, turning from an importer of energy to an exporter – and the fact that OPEC seems to be no longer able to support the price of oil at above 100 USD per barrel, in spite of significant turmoil and instability in the Middle East and North Africa.

For the EU, both these effects put up some question marks, as its high dependence on a stable oil market is currently safeguarded mostly by U.S. military power projected into the Mediterranean and the Middle East. Also, the re-industrialisation of the U.S. might threaten the remaining industrial base in Europe given their low gas and electricity prices for industrial customers. Critical exposure of the EU to global developments has therefore significantly increased over the past few years, not mentioning the recent emergence of serious conflict with Russia, the main source for oil, gas, and coal imports into Europe. Also, a unilateral emission mitigation strategy becomes relatively more expensive, since the price of the fossil alternative has dropped for everyone not (as much) engaged in mitigation.

As a result of the major global trends, global emissions of carbon dioxide have continued to increase by 3,479 million tons from 2008 to 2013 (+2.1% p.a.), the five- year-increase on a global level thus being in the same order of magnitude as the total emissions of carbon dioxide within the EU (2013: 3,913 million tons).[4] Over the same time period, emissions in the EU have been reduced by 495 million tons (-2.3% p.a.), mostly due to the decrease in energy consumption, but partially also reflecting a slight reduction in the carbon intensity of the EU's energy system. Thus, assuming the absence of any compensatory effects, the EU's reduction of emissions would have slowed down the

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(1) All numbers in this paragraph derived from BP Statistical Review (2014).

(2) Global Wind Energy Council (GWEC), Global Wind Report (2012, 2013); EU COM (2014), Eurostat – Energy Database.

(3) European Photovoltaic Industry Association (EPIA). Global Market Report (2013) and Outlook for PV (2014-2018); EU COM (2014), Eurostat – Energy Database.

(4) Recent data by the IEA and the Global Carbon Project indicate that 2014 has seen some progress in the decoupling of global economic growth and CO_2 emissions.

global increase by 0.3 percentage points (from a hypothetical growth rate of 2.4% p.a. to the actual growth rate of 2.1%). The EU's share in global emissions of carbon dioxide has consequently dropped from 14% (2008) to 11% (2013), down from a level of 18% at the time when the Kyoto-Protocol was signed. Thus, the leverage for the EU in global climate negotiations has been significantly reduced over the past one and a half decade.

Partially due to China, and partially due to the growth of decentralised PV- equipment in rural areas, the share of the EU in the global market for renewable energy capacities will continue to shrink, thus reducing the potential impact EU policies to promote further deployment of these technologies in Europe can have on their technological development on the global scale.

Going forward, most scenarios expect a continuation of the major trends listed above, however with some interesting variations. In particular, China actively tries to reduce the enormous growth rate of coal consumption by shifting the energy mix towards other energy carriers such as gas, nuclear, and renewables, thus reducing the upward pressure on global CO_2 emissions.

From a current perspective, one would identify two major – and closely related – uncertainties for the global energy market: on the one hand, the development of demand, in particular from China but also from the global economy at large; and on the other hand the political (in-)stability of the Arab world.

Apart from this, most observers do not expect a significant break-through in the global negotiations on a binding international agreement to mitigate greenhouse gas emissions. However, both of the two largest emitters, China and the U.S., find reducing their own greenhouse gas footprint a less frightening prospect than a couple of years ago, albeit for different reasons. This means that even without a binding treaty, unilateral decarbonisation efforts might significantly increase across the globe over the next couple of years.

Thus, the EU seems to have a relatively small, and declining, potential direct influence over global developments in the energy domain – politically, economically, and technologically. And the exposure of the EU to the risks in these markets will most likely increase, most importantly with respect to the security of oil and gas imports and to the development of its industrial base.

2. Europe's key challenges in the energy sector

Europe faces at least five key challenges in defining a coherent and successful energy policy: a structural cost disadvantage relative to other world regions; geopolitical issues of import dependency; defining an effective contribution to the global fight against climate change; the challenge how to optimally organise the European energy market; and Europe's governance challenge with respect to formulating energy policy.

To start with, Europe does not enjoy the benefit of large, and cheap, energy domestic sources relative to the size of her economy. The resulting cost disadvantage to other world regions, notably North America, is most prominent in natural gas, where transportation costs are substantial relative to its production cost. Indigenous natural gas can be produced competitively but with limited remaining potential (conventional). While there is some more potential for non-conventional gas production in Europe (assuming social acceptance issues can be mitigated), production cost are expected to be higher than in North America.

However, given Europe's geographic location in the proximity of many important gas producing countries, notably Norway. Russia, and the Middle East, Europe currently still enjoys a cost advantage in natural gas relative, e.g., to East Asia, as long as these sources remain accessible for Europe. Without such access, the EU's cost position would deteriorate further.

The increased use of renewable energy sources is unlikely to alter the cost disadvantage to Europe's favour. In principle, Europe has, at its periphery, some wind and solar sites which are more or less competitive to the best renewable sites globally, and which are also meteorologically sufficiently diversified in order to provide capacity without too much need for expensive storage. However, in order to benefit from these high-quality sites Europe would have to coordinate its national energy policies and to significantly expand its grid infrastructure. Both conditions seem to be very challenging. Hence, Europe will likely continue to locate its renewable investments at inefficient and meteorologically homogeneous sites, thus adding to the cost burden of the European consumer relative to other world regions.

Moreover, compared e.g. to good locations in the U.S. or in Australia due to more geography with good conditions plus a much lower population density (Europe: 116 persons per square kilometre, U.S.: 33; Australia: 3), the potential area available at globally competitive natural conditions is much more restricted in Europe.

Taking everything together, therefore, Europe certainly does not enjoy a cost advantage in the field of energy over other world regions, rather the contrary. Given these structural disadvantages, cost efficiency[1] in the provision of energy is of utmost importance.[2] In particular, any additional objective, like e.g. reducing import dependency or reducing

(1) Cost efficiency is a concept which is very different from the concepts of energy efficiency (measured by changes in the ratio of GDP over energy demand) or even absolute demand reduction. Both of these figures are results of market forces, resulting partly from the cost disadvantages. Cf. section 4.
(2) Note that this is statement on the level of the economy, not on the level of specific producer or consumer groups.

emissions of carbon dioxide, should be pursued with mechanisms that are selected with cost efficiency as the main criterion.

As a second key challenge, Europe as a heavy importer of energy is exposed to potential supply interruptions driven by political actors. Also, it leads to a permanent transfer of economic rents into exporting countries whose governments already are, or could potentially turn, hostile to the European Union.

Geopolitically, the challenge mostly concerns Russia and the Middle East, and to some extent North Africa. It is relevant for oil and gas, but not for coal. Economically, the challenge mostly concerns securing competitive gas prices. As Russia, the Middle East, and North Africa could potentially be long-term providers of substantial gas volumes at rather low cost, these issues mostly merge into one.

However, obviously, there is an inherent conflict to be solved: independence of Russia, North Africa, and the Middle East, which seems politically attractive to many in the political arena, simultaneously means depriving Europe from sources of competitive energy. And there is no realistic alternative unless at much higher cost (renewables, nuclear; significant increases in technical energy efficiency) or requiring expensive additional conversion technologies to replace oil and, in particular, gas in all of their uses (coal, renewables, nuclear). Thus, Europe cannot eat the cake and have it.

Moreover, more critical than dependence on producing countries or regions might be dependence on certain transit countries or regions, such as e.g. the Ukraine, Turkey, or Syria. Security of energy routes, thus, is at least equally important as security of supply. Direct links between producing countries and the EU eliminate any transit risk, and they should therefore sit high on European policymakers' security agenda.

In such a situation, "realpolitik" would imply active engagement with Russia and North Africa rather than the attempt to avoid using their energy. Neighbourhood stabilization is a strategic "must" for the EU.

One of the main challenges in this context certainly is posed by the unsatisfactory governance structures of most of the countries concerned – by themselves at least partly a direct result of the enormous size of the resource rents. Partnership with the main providers of our energy resources, however, is a much broader political project than just "securing energy for Europe", and it cannot be solved with the means of energy policy by itself.

A third challenge arises from the threat of global climate change which European policymakers and their electorates take very seriously. Also, they give high priority to mitigation, i.e. to the objective of reducing of greenhouse gas emissions. However, mitigation can only be effective at the global level, i.e. if mitigation efforts lead to a decrease of global greenhouse gas emissions. Due to the nature of the atmosphere there is no physically meaningful concept of “regional emissions”.

From a mitigation perspective, thus, a reduction of carbon dioxide emissions on EU territory is desirable if and only if it leads to a reduction of emissions on the global scale, either directly for lack of compensatory effects (leakage) or indirectly by promoting the global adoption of emission-mitigating policies.[1]

A unilateral mitigation policy by a single world region, ceteris paribus, encourages both a shift of production to places where CO_2-emissions have a lower (or no) price, and a reduction of the global prices of fossil fuels – with corresponding dynamic reactions both by energy consumers and suppliers. While there is significant uncertainty about the exact size of these effects, it is safe to assume that such compensation does take place, thus reducing the impact of the unilateral mitigation effort on global emissions. In fact, it cannot be excluded that these effects might actually fully compensate for the mitigation effort – which would mean that the mitigating region is incurring cost without a tangible benefit for the global effort against climate change.

The key challenge on the global scale is to devise an institutional setting which can credibly administer the monitoring and the sanctioning of emission pledges. Any such agreement would require, among other aspects, significant transfer payments between world regions, especially from the highly industrialised countries to developing countries. Europe does not seem ready to support such a transfer scheme on the scale needed to make a difference in the global negotiations. Rather, Europe puts all his hopes on continued unilateral mitigation of emissions.[2]

Remedy for some – not all – the problems from a unilateral mitigation strategy could come from so-called border-tax-adjustments, i.e. the taxing of imported goods from places with lower CO_2-prices at the EU border, and according to the CO_2-content of the product. If properly implemented, such border-tax-adjustments could, in principle, reduce the leakage issue as it would make EU citizens pay for the CO_2 content of their entire consumption, and not just for that part which is based on fossil energy consumed inside

(1) Two major leakage channels need to be taken into account: changes in the trade patterns (competitiveness channel), and changes in the global supply-demand-balance for fossil fuels (international energy price channel).
(2) A unilateral mitigation commitment by the industrialised nations has in deed helped to arrive at the Kyoto agreement in 1997. However, ever since, the EU’s pledges did not contribute much to promote a binding agreement on a global scale. There might be a variety of reasons for this failure. Maybe, with a shrinking share in the global emissions, the EU’s efforts are becoming less and less relevant from the point of view of the other negotiating parties. Or, since the pledges are well known, they are already “priced-in”; leaving the EU limited leeway for applying pressure within the negotiations. Or, those countries with emerging economies accuse the EU – not without substance – that the EU’s citizen’s carbon dioxide footprint should be measured by the carbon dioxide emissions generated by its overall consumption patterns (accounting for imports and exports), rather than by the emissions on its territory.

the EU. However, border-tax-adjustments – even if properly done – would not be able to fully absorb all the compensatory effects from leakage.[1] Moreover, they would unilaterally make European consumers worse off, and their implementation would most likely create conflicts within the world trade framework.

In summary, the case for unilateral action for mitigating the EU's CO_2 emissions – which currently is the main driver for the EU's energy policy – is much less compelling as public perception has it.

The fourth challenge relates to the way the energy market is organised, especially in the grid-bound electricity and gas sectors. In general, competitive markets have proved to be the most efficient coordination mechanism for an advanced and complex modern economy.[2] In energy, notably in electricity, many societies have been, and are, reluctant to introduce true competition.[3]

In Continental Europe, e.g., most countries still had regulated monopolies in the electricity sector until 1998. Reasons for this approach included motives of national political control over the electricity sector and the large size of individual power plant investments relative to the size of the (national) market. Also, in the phase of large growth rates in electricity demand after World War II, policymakers gave high priority to steady investment pathways in order to avoid power crunches on the national or sub-national level. The inefficiency of the sector was of little concern to policymakers, given the small share of electricity in consumers' average budgets. And large industrial consumers had no reason to complain because they were typically cross-subsidised by the household sector, especially since central control allowed for a high level of technical supply security. The enormous extent of the loss in efficiency entailed by the monopolies only became evident after liberalization started in 1998.

Today, European policymakers still have the inclination to trade-off efficiency for state-control, at least in the energy sector. And, as e.g. the German renewable levy shows, European consumers still seem rather patient in accepting the additional burden, and the redistribution of rents towards industry, imposed on them.

(1) In particular with respect to the fuel-price-channel.
(2) In essence, their specific quality results from combining competitive prices with the individual freedom of choice. Individual decision makers take prices as the basis for their decisions on investment and demand or supply; prices adjust such as to balance supply and demand at any moment in time. Because of more detailed information being processed, this way of organizing coordination between economic agents is much more efficient as a central planning approach. Moreover, external effects can be remedied by appropriate mechanisms which include the relevant additional information into the individual decision (e.g. through taxes).
(3) The often-heard justification that energy is an essential good does not seem convincing, because modern states are quite happy e.g. with a competitive market for food.

However, while monopolistic “planification” was a consistent form of market organization, today’s hybrid system of European competition and national “planification” is not. In fact, reverting back into “planification” seems to be neither desirable nor possible.

Not desirable because some fundamental changes imply that the former advantages of “national monopolies” have been greatly reduced. Firstly, European integration and liberalization have significantly increased the size of the relevant market from national at least to regional level.[1] Secondly, the set of potential technology options has multiplied. Smaller scale generation units e.g. are available at competitive cost to the energy consumer. Also, the number of agents in the energy sector has exploded, as liberalization has allowed indiscriminate market access. Preferences become more individual, business models more fragmented, and cheap ICT provides for an avalanche of relevant data. As a result, long-term energy planning will less and less be able to manage an increasingly complex energy system and its interdependencies. Thus, the relative cost of “planification” has significantly increased and competition is much better suited to efficiently coordinate the decision-making of the millions of decision-makers in the industry, especially on the demand side. And fourthly, European electricity demand is stagnant at best, and it is very unlikely to revert back to a strong growth path in the near future.

Not possible, because Europe has already opted to integrate its national energy markets. If the member states were to return to consistent “monopolistic planification” regimes, they would either have to close internal borders again (with high efficiency losses and big political damage to the European project). Else, they would have to coordinate the “planification” on a supranational, i.e. European, level, for which the EU totally lacks the appropriate institutions. The continued attempt by policymakers and regulators to “micro-manage” agents’ decisions thus cannot be organized with an appropriate geographical scope[2]. Moreover, in the current institutional setting policymakers cannot comprehensively control the market – rather, certain parts of the market are managed, adding further politically induced volatility to the remaining parts of the market; and it cannot appropriately account for the complexity and the many feedback effects.

In summary, a competitive EU internal market will prove to be the superior approach, and it is the only setting consistent with current European institutions. Europe needs to be careful not to overestimate the degree as to which policy can actively and beneficially

(1) This is particularly true for Scandinavia and the Continent. The UK is an exception because physical integration still is limited (in electricity). Similarly, Iberia needs to be looked at differently, however, physical interconnection is about to be significantly improved.
(2) Notable exceptions, for lack of interconnection, are Iberia and the British Isles. Also, due to their Western location these regions are much less exposed to the security of supply concerns troubling the rest of Continental Europe.

control the developments in the energy sector.[1] However, the challenge for Europe consists in making this approach to market organisation compatible with the political dynamics in the member states.

The fifth, and final, challenge therefore concerns the complex energy governance within the European Union. The most important opportunities for Europe – especially in the context of improving cost efficiency – generally arise from synergies between the 28 member states, and from embracing competition, both within and between the member states.[2]

Some important progress has in fact been made towards more integrated markets structures both in electricity (e.g. market coupling, or the new common grid codes) and in gas (e.g. the improvement of West-East-interconnection after the 2009 Ukraine-crisis, or the development of more liquid wholesale markets in Western Continental Europe).

However, many challenges remain. The persistent difficulties in achieving a fully liberalised EU internal energy market can partly be explained by a lack of infrastructure connecting some of the member states, leading to physical bottlenecks and thus a lack of cross-border competition.

Most importantly, however, the internal market's woes are due to a double inconsistency in the EU's approach towards organising this market, which is embodied in Article 194 of the Lisbon Treaty: The Treaty combines the quest for an integrated internal market with a political prerogative to shape the energy mix. In a market, however, technology choice would be determined endogenously by competition. Moreover, the Treaty allocates this political prerogative to the member states (rather than to the European level), thus creating room for substantial distortions to the functioning of the internal market.

On this basis, the individual member states have reclaimed significant leeway for individual interventions into the market, thus reducing the scope for unfettered and Europe-wide competition. Recent decisions by the EU Commission to apply a rather loose interpretation of the state-aid guidelines to the electricity sector underline the tendency towards renationalisation of electricity and gas markets. As a result of these 28+1 interventionist approaches to market organisation, market participants are increasingly confused about

(1) Both on the European and the national level there is a history of using long-term scenarios to derive objectives and to legitimize certain measures. By necessity, such scenarios are based on today's knowledge, and cannot encompass developments about which we will only learn in the future. The more complex the environment and the set of options, the more mistaken it is to apply central planning based on such scenarios.

(2) Potential synergies become most obvious when looking at wind and solar electricity generation, where cooperation between the member states would leverage both cost advantages from optimal siting and diversification effects from spreading the RES deployment over different meteorological conditions. Moreover, completing the large single European market still offers significant upside for further efficiency improvements by harnessing the forces of an increased intra-European competition.

the direction the EU internal market (including the EU ETS) is going to take. Such confusion certainly is not helpful for innovation and investment activities of the sector.

Unfortunately, therefore, Europe's energy challenges are rendered even more difficult by an increasingly complex and heterogeneous energy governance, failing to effectively coordinate actions by the member states. And actions by member states continue to be driven by internal member states' politics rather than the EU's common interest.

3. From 20-20-20 to 40-27-27(30) and the "Energy Union"

The 2009 climate and energy package was mainly meant to implement the so-called 20-20-20 targets set by the European council in March 2007.[1] These targets comprise the joint objectives of reducing the EU's emissions of carbon dioxide by 20% (relative to 1990), of reducing the EU's consumption of energy by 20% (relative to business-as-usual projections)[2], and of increasing the share of renewable energy in final energy consumption to 20%, all of these targets to be met by 2020.

As of today, it seems likely that the EU will reach the targets on carbon dioxide and on renewable energy sources. However, the EU will most likely fail to meet the reduction target for energy demand (in spite of a weak economy). The fact that two targets out of three will be reached is interpreted by many policymakers as a sign of success of the current approach towards energy policy. However, it is more than questionable whether the three dimensions of the 20-20-20-targets render an adequate and complete picture of the health of the European energy sector and of the EU's contribution to the global efforts against climate change. For example, the 20-20-20-targets are fully silent on dimensions relevant to the competitiveness of the European energy sector, or the impacts of energy policy on the competitiveness of European energy consumers, or to issues of security of supply.

The political rhetoric crafted around the adoption of the 20-20-20-targets has suggested that the dimensions chosen – and in particular a generous support for the built-up of renewable capacities – could offer a "magic formula" addressing the missing dimensions as well. In particular, it was suggested that the additional cost of this strategy were compensated by corresponding gains in terms of job creation and increased security supply, i.e. that the well-known trade-offs between differing policy objectives had miraculously disappeared. Theory and empirical evidence of the past five years show, however, that these trade-offs do in fact still exist.[3]

(1) The package also contained a qualitative pledge to continued progress towards a functioning internal market.
(2) Cf. Directive 2012/27/EU.
(3) Cf. Section 4 for a more detailed discussion.

Moreover, the adoption of the 20-20-20-targets as main driver for EU energy policy was justified by three key assumptions: that unilateral EU commitments on further greenhouse gas mitigation would positively support a global agreement at the Copenhagen summit in 2009; that global prices for fossil fuels would continue to increase, constituting a growing "risk of supply failure" in global energy markets;[1] and that "boosting investment, in particular in energy efficiency and renewable energy should create jobs, promoting innovation and the knowledge-based economy in the EU".[2] In hindsight, none of these assumptions – which were contested by many observers already at the time – turned out to be correct.

Firstly, the Copenhagen summit clearly displayed the irrelevance of unilateral EU commitments for the global negotiations, and the EU's insistence on the importance of binding reduction targets has not supported – to put it mildly – a more flexible exploration of potential points of agreement.

Secondly, fossil fuel prices, as described above, have not continued to increase, quite to the contrary, especially in North America, they have rather contracted.

And, thirdly, the development of overall employment and the competitiveness of the EU has been disappointing since 2008. While, unsurprisingly, there have been some positive developments in the sectors receiving subsidies or state guarantees, especially in the renewable energy value chain, these effects largely have proved to be transitory and dependent on continued subsidies, thus not self-sustaining. Moreover, while policymakers like to dwell on the gross effect in individual sectors, the relevant figure to look at is the net effect on jobs in the overall economy, including the negative effects across all sectors caused by the increase in energy prices due to the higher taxes or levies which fund the subsidies.

Therefore, it turns out that the three dimensions chosen by policymakers in the 20-20-20-targets have not served their intended purpose well. In particular, the failure of the 20-20-20-targets to slow down the global increase of CO_2-emissions, and the significant cost they have imposed on European economies, could have led European policymakers to fundamentally reconsider the "climate"-part of their "climate and energy policies".

As the EU Council in October 2014 has shown, however, there currently is only limited impetus across the EU to openly engage in such a fundamental reappraisal: basically, the Council agreed to continue on the chosen path, adopting a 40-27-27(30)-target.[3] Public debate before and after the Council's decision has mostly focussed on the order of magnitude of the three figures replacing 20-20-20, and on the degree to which these targets will be binding for the member states. The general logic, however, of the

(1) Cf. Com (2007) 1, 1.2.
(2) Cf. Com (2007) 1, 1.4.
(3) Cf. EUCO 169/14.

triple-objective has not been put into question, and there has been only little critical reflection of the actual merits and achievements of its 2007/09-strategy.

In summary, thus, EU energy policy has been, and still is, shaped by an incomplete, and partially inconsistent set of quantitative objectives for particular features of the overall energy system. Moreover, these latter objectives have been, and still are, derived from a rather shallow, and partly even erroneous, analysis of the global "boundary conditions" for European climate and energy policy.

The recent proposals by the Commission regarding a so-called "Energy Union" address some of these concerns.[1] In particular, they give stronger emphasis on grid interconnection and market integration than previous documents. Also, they explicitly discuss energy security as a second objective next to the ecological objectives captured by 20-20-20. However, cost efficiency as a third important objective does not get the attention it would deserve. Neither do the various trade-off between these objectives and potential ways to manage them. Moreover, the suggestions for the "Energy Union" are still largely based on the idea of state-administered change in the energy sector, especially through active technology choice, both with respect to investment and R&D.

4. Overconfidence in two "silver bullets"

Overall, thus, energy policy constitutes a complex challenge for European policymakers, involving in particular an uncertain global environment, conflicting political objectives, and an incomplete and inconsistent European energy governance. Shunning this complexity, ever since adopting the 20-20-20-goals two measures are being put forward which are claimed to cut across all trade-offs: the reduction of energy demand in Europe, and the expansion of the use of renewable energy sources. These two measures are often described, and they are politically treated, as if they were no-regret options because they would simultaneously serve to decrease CO_2-emissions and reduce Europe's import dependency.

However, compelling as it may sound, the logic underpinning such a sweeping and one-sided claim are hard to grasp. In fact, it ignores relevant trade-offs, especially in terms of economic cost, and feed-back effects.

To start with, consuming energy delivers a service. Thus, ceteris paribus, consuming less energy means reducing services and thus reducing wealth. E.g., roughly a third of the EU's energy consumption is devoted to transport. Obviously, the EU could theoretically refrain from using this amount of energy by stopping to move people and goods. But this would tremendously reduce our citizen's welfare. The same is true in general, and has been a shaping force for history, especially in the past 200 years: energy use is a key

(1) Cf. Com (2015) 80.

driver for wealth (and political might), i.e. in economic terms energy must strictly be considered a “good” and not a “bad”.[1] Thus, an absolute reduction in energy demand cannot be a reasonable political objective by itself.

But even a relative reduction in energy demand, often labelled as an increase in “energy efficiency”, is not an unconstrained desideratum. Rather, the concept of “energy efficiency”, i.e. the idea to receive the same amount of service (on the level of an individual piece of equipment) or wealth (on the level of the economy) with less input of energy, needs to be applied with care.

On the level of the economy, “energy efficiency” is typically measured as the rate of change in the ratio between the economic product (e.g. GDP) and primary energy consumption. Obviously, both the numerator and the denominator are the aggregate result of a plethora of individual decisions throughout the economy, including those which affect the technical efficiency of the capital stock, but also including structural effects arising from trade relationships with other countries. Therefore, setting a normative target for the relative improvement in this “macroeconomic energy efficiency” can hardly be justified in purely (environmental) economic terms. It simply is unclear whether a situation with a higher such rate is socially more desirable compared to a situation with a lower rate. Thus, “macroeconomic energy efficiency” can neither be a goal nor a mean towards a goal. In essence, it is just a statistical observation of a complex aggregate effect.

On the level of an individual piece of equipment, “energy efficiency” takes on a different meaning. Typically, it refers to relative improvements of technical input/output-ratios. Such improvements of the capital stock are, in fact, an important driver of wealth creation. In the aggregate, it is well-known from the literature on the rebound-effect that increases in “technical energy efficiency” are often associated with increases in energy demand.

Investments into improving the technical efficiency of the capital stock need to earn a return. Hence, there always is an economic limit; not every measure which improves the technical energy efficiency is economically reasonable. In essence, the decision boils down to comparing the present value of the savings in energy spent with the investment cost for the new, or improved, equipment. Thus, price expectations for energy prices play a crucial role here. And unexpected future price developments have a significant influence on the return earned on such an investment, either positive if prices turn out to be higher than previously expected or negative the other way round. Thus, investments into energy efficiency are not reasonable per se, but only if their expected return exceeds the risk-adjusted rate of return which could be earned with other types of investment.

Even without policymakers meddling, the economy will invest into such measures – up to a point. By trying to increase technical energy efficiency above the level provided by the

(1) For a very long-turn perspective on this issue cf. e.g. Morris (2010).

market itself, policymakers therefore risk directing the European economy into investments which will deliver a lower risk-adjusted return than potential alternatives, thus, making Europe poorer off in the long-run.[1] In particular, policymakers cannot claim to better understand the price dynamics in the global fuel markets than the market. Recent experience rather points to the opposite conclusion.

The only way to argue for a role for policy in improving "technical energy efficiency" above the level provided by the market, thus, is market failure. Market failure might, in deed, be claimed in certain areas of household energy demand, e.g. for lack of transparency or in the context of the owner-tenant-conflict about passing on the cost of efficiency improvements. But these are specific issues which certainly do not warrant a general political imperative for boosting technical energy efficiency but specific interventions to fix such specific market failures.

Exactly the same argument can be made for investments into renewable energy sources. In fact, such investments can be seen as one specific type of energy efficiency investments.[2] Again, the market would choose to invest into these type of efficiency improvements according to price (plus tax) expectations, and in comparison to other investment opportunities.

And what about environmental externalities? Environmental externalities of energy use should be, and mostly already are, internalised by corresponding taxes or other forms of regulation (e.g. EU ETS, emission standards etc.). If this is properly done, no additional action on energy efficiency is required. If it is not properly done, the internalisation should be corrected; measures on energy efficiency (or the endorsement of any other specific technology) are not a useful substitute for such corrections.[3]

From a carbon dioxide-perspective, both of the measures proposed (renewable energies and reduced energy demand) constitute specific mitigation technologies – among a very long list of other options to the same effect. Hence, they are inefficient within the energy

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(1) Sometimes it is argued that Europe is facing an investment shortfall which should be remedied by politically administered investment schemes. Even if this were true, it is highly unlikely that investments into "energy efficiency" or renewable energy sources would be the optimal choice for such public investment. There are other types of investment, such as e.g. roads, digital infrastructure, or research and education, which would most likely provide a much higher benefit to society because of the obvious network effects associated with them.

(2) By replacing fossil fuels, they increase the technical efficiency of the energy system measured against primary fossil energy demand – at the plant level for the case of co-firing, at the system level for the case of 100%-renewable installations.

(3) Whether or not Europe today is overinvested or underinvested in terms of technical energy efficiency crucially hinges on the question whether the full array of explicit and implicit energy taxes appropriately reflects the external cost of energy use. The answer to this question is far from obvious, but beyond the scope of this paper.

sector regulated by the EU ETS, reducing the cost of the certificates (not the amount of emissions) at too high a cost.

For example, the implicit mitigation cost of subsidised renewable energy sources in Germany lie above 40 € per ton of carbon-dioxide for wind on-shore, and far above 100 € per ton of carbon dioxide for wind off-shore or solar.[1] As the price for EU ETS certificates, which reflects the marginal cost of abatement in the EU ETS sector in Europe, is significantly lower, it is clear that the EU could achieve the same amount of emission-reduction much more cheaply than with the current policies. In particular, member states that want to unilaterally contribute to a further reduction of greenhouse gas emissions in Europe could simply buy up EU ETS certificates at the current market price.

Outside the EU ETS, the two alleged “silver bullets” might in deed contribute to reduced European CO_2 emissions. However, as usual, rebound effects need to be taken into account, and alternative measures have to be compared in terms of their cost and benefit. And in any case, they have an unclear impact on global CO_2 emissions due to potential leakage effects.

Thus, from a CO_2-perspective both energy demand and the share of renewable energy sources should be a result of choices by the actors in the economy based on reliable price (tax) signals for the cost of CO_2 rather than a politically predetermined quantity.

And what about the contribution to reducing Europe’s import dependence? Well, the perception of a critical import dependency of Europe currently mostly concerns the share of Russian natural gas in the European energy mix. An increased share of renewable energy sources increases system dependence on gas-fired power plants. Contrast this with an alternative decarbonisation path that would arise from efficiency improvements in coal and lignite power stations rather than from forced investments into renewable energy sources. Computations consistently show that such a pathway would be cheaper, and it would at the same time serve much better to increase Europe’s resilience against disruptions to its natural gas supply.

Moreover, a reduction of the EU’s gas demand would not necessarily imply a reduction of the share of Russian pipeline gas in the European gas supply. Rather, based on fundamental cost structures it is LNG supplies to Europe which are likely to be the swing supply which would find alternative destinations first. Thus, with lower gas demand, the share of imported pipeline gas would probably increase rather than decrease. Therefore, in order to have the desired impact on the security of supply, LNG import terminals (and, by the same token, underground storage facilities within the EU) becoming redundant in such a course of events would need to be kept operational by some form of public

(1) Cf. e.g. EWI (2015).

subsidies. But then it is this subsidy which increases security of supply, not the decrease in energy demand.

A final claim in the context of "no regret" is the idea of "industrial network externalities". By forcing the entire economy to adopt "energy efficiency" or "renewable energies", the argument goes, spill-over effects occur in R&D, creating additional value for the economy. Theoretically, for an open economy such as Europe which will import a significant part of the equipment aimed at increasing energy efficiency or decarbonising power generation, this argument would need additional justification. Empirically, there is limited evidence that such spill-over effects can effectively be harnessed by policymakers. The experience of the Japanese economy over the past 30 years, for example, does not provide an encouraging example for the economic value of policies actively directed at increasing energy efficiency above the level provided by companies and consumers on their own. On top, it would need an argument why such spill-over effects are more relevant in the field of technical energy efficiency or renewable energies than in any other sector of the economy.

From this perspective it becomes clear that neither "technical energy efficiency" nor "renewable energies" are the silver bullets many policymakers claim they are. As any other investment opportunity, investments into technical energy efficiency or, even more specifically, into renewable energy sources have to be weighed against their cost. The optimal level of such investment is determined by the cost of the alternatives, including environmental or other external factors.

Two important implications stand out: Firstly, "more" of such investments is not necessarily "better", but there is a choice as to which, and a limit to how much, of such investments are reasonable. And, secondly, as in every other sector of the economy, there is no reason to believe that policymakers know better about the type and the level of this optimal investment than the individual actors in the economy.

Both investment choices therefore should be seen as the result of market forces, especially market prices[1], supported by an appropriate internalisation of external (environmental) effects rather than as an end by itself.

If policymakers thus continue to single out these two particular technological options as "no regret" or "silver bullets" it might be for other reasons than those they officially state. Instead, political motives might play a dominant role, in particular, the wish to please relevant national voter groups benefitting from such policies.

Some indicators do, in fact, point in this direction, notably the unwillingness of national policymakers to adopt EU-wide measures to implement these additional targets, instead insisting on national measures which allow them to control their distributional effects.

(1) Both absolutely and relatively to other world regions.

Also, policymakers typically do not use the official state budget to fund the measures derived from the second and the third of the 20-20-20- targets but rather special levies or regulation forced onto the energy consumers or energy suppliers.

5. Distortions and the role of the EU ETS

Because of the strategic position of Europe in the global energy arena “cost efficiency” is of particular significance to European policymakers. “Cost efficiency” typically requires absence of market distortions. The most relevant distortions in the European energy sector currently arise from non-neutrality of the state with respect to choice of technology or choice of location. Main issues are distorting taxes, levies, and subsidies, especially if they differ between EU member states. Apart from very heterogeneous tax systems across the EU member states, the two most important sources for such distortions are measures aimed at implementing the specific targets for energy efficiency and renewable energies discussed in the previous section. E.g., the RES surcharges levied on electric energy in Germany reduce the attractiveness of electricity relative to other energy carriers, and with respect to investments into demand flexibility, thus contradicting the overall visions of an energy world largely based on electricity generated by (intermittent) RES.

The EU internal market, in principle, should prevent such distortions from hampering intra-European competition. However, the current version of the European treaties and their recent application by the EU Commission indicate that member states still have significant leeway to create technology- or location-specific market conditions within their boundaries. Any reduction of these distortions would support the efficiency and competitiveness of the European energy sector.[1]

The EU emission trading system (EU ETS) is the prime example for a political intervention at the level of the EU 28 which is neutral with respect to technology and location. Within the sectors covered by the EU ETS, mitigation options compete across technologies and member states, leading to a cost efficient reduction of CO_2 emissions in Europe. Hence, as long as the EU maintains a mitigation commitment, the EU ETS deserves to be considered as the lead instrument for mitigation greenhouse gas emissions in the EU.[2]

(1) For a detailed discussion of the situation in the electricity sector cf. e.g. Bettzüge (2013).

(2) CO_2 taxes could, in principle, play an equivalent role. They would have certain advantages and disadvantages relative to EU ETS. None of these are critically in favour of taxes. In terms of implementation, however, the EU ETS is already established while the introduction of European CO_2 taxes would most likely face legal and political opposition by the member states. Furthermore externally, the EU ETS could provide a prime instrument to associate partnering countries e.g. in North-Africa and to facilitate transfer payments – which necessarily need to be part of any progress towards a global carbon agreement. Internationalisation of the European effort will be much harder to achieve with taxes rather than with the EU ETS.

The EU ETS' effectiveness could be greatly increased if additional action for promoting specific mitigation technologies, such as energy efficiency or renewable energies, were abolished or at least reduced. Relying on the EU ETS instead of technology-specific support mechanisms would, in particular, improve intertemporal efficiency. Currently, (Continental) Europe is faced with substantial overcapacity in the generation sector. Thus, encouraging investments into additional (renewable) generation capacity adds to the existing overcapacity. As capital cost matter, mitigation reduction could currently be achieved at much lower cost by shifting utilisation gradually towards more carbon efficient (existing) power stations. Based on CO_2-price signals market participants can already identify the optimal pathway for these adjustments. Hence, at present, renewable energy sources are not needed to achieve the target trajectory for the EU's CO_2 emissions.

Over the next one and a half decade, or so, however, the existing conventional fleet in Europe will be reduced due to end of lifetime. Under the EU ETS, replacement investments will then take the European CO_2-cap into account. Simulations consistently show that under the assumption of a strict European CO_2-cap, renewable energy investments would be entering the market anyway based on the price signals then sent by the EU ETS. Speeding up this process by government thus increases cost – both because of accelerated obsolescence of the existing fleet, and because the renewable investments undertaken in ten or fifteen years likely come at lower cost given the global technology learning curve.

Moreover, given the advantages of the system, the EU should even consider to extend its cap-and-trade-scheme from just one (politically convenient) sector to the heat and the transport sectors, instead of simultaneously inventing a plethora of specific (mostly national) interventions to mitigate emissions in these sectors. In this context, energy taxes, levies, and regulations should be carefully revised across all EU member states as to what extent they are contributing to the goal of cost efficient mitigation of carbon emissions, and then should be streamlined accordingly. In particular, it would be important to improve the intersection between the ETS sector and the Non-EU ETS sectors.

However, many observers including the EU Commission find the EU ETS to be flawed. The alleged problem is regularly described as "the CO_2 price being too low because of excess certificates from the past".

As for the first part of the sentence, such judgment typically means "too low" for a certain mitigation technology to be competitive, e.g. renewable energy or coal-to-gas switch. Hence, the argument masks technological non-neutrality. Moreover, a cap-and-trade scheme such as the EU ETS manages volumes, not prices. Hence, the statement would mean "the cap should be stricter" – but that has nothing to do with the EU ETS as a system but with the overall strategy of Europe towards global climate negotiations. Obviously, the EU is free to agree to a stricter unilateral target for the EU ETS sectors. And it could implement this stricter target either explicitly, by reducing the cap, or implicitly, by imposing a positive minimum price path for the certificates. But such measures would add to the EU ETS rather than correct an alleged failure.

The second part of the above statement, therefore, is more interesting. It concerns the intertemporal trading of CO_2-certificates, and it actually relates to the trading system as such. Policymakers (and the general public) generally think of emissions on a year-on-year basis, having a linear mitigation pathway in mind. The EU ETS, however, works in multi-annual trading periods, and it contains the option of banking certificates from one trading period into the next. Hence, market participants count on intertemporal liquidity of the certificates. Else, they would have to settle their positions within any given year, which would most likely induce CO_2 price signals with little meaning.[1] Thus, by construction, the EU ETS cannot serve to mitigate on a year-on-year basis but it can only cap the cumulative emissions over all trading periods which are connected via banking. Hence, whenever annual emissions undershoot the pre-defined trajectory, the EU ETS effectively lowers the restriction on the emissions in the subsequent years.

From a global perspective, this is not a problem. It does not matter whether Europe mitigates in 2015 or in 2018. From the point of view of the atmosphere, it is the cumulative emissions which count. Hence, from a mitigation perspective, the EU ETS set-up is perfectly fine. However, from a political perspective it is not: policymakers want to report ever decreasing absolute emissions back to their constituencies. Such continuous decreases, however, cannot be guaranteed by a mechanism like the intertemporal EU ETS.

This poses a dilemma: On the one hand policymakers are inclined to intervene if the intertemporal effects of the system run counter their intentions. Thus, latently, the system is always exposed to the risk of political ad-hoc intervention. On the other hand, symbolic values apart, intertemporal flexibility carries economic value. Next to the liquidity issue, intertemporal trade also serves on the macroeconomic side, reducing the CO_2 price in difficult economic conditions (such as now) and increasing it when the economy is booming.

Thus, an intertemporal restriction in the EU ETS such as the proposed Market Stability Reserve mechanism (MSR) is economically reasonable only if it improved upon this dilemma, i.e. if it increased policymakers' commitment not to intervene in case of market results they do not like, and if it did so at relatively little extra cost in terms of transparency and liquidity.

It is more than unclear, whether and how the current proposal by the Commission would improve upon the non-intervention commitment. The MSR would add an additional layer

(1) Cf. the experiences with the first trading period of the EU ETS (2005-2007) which did not allow banking into the second.

of (rather complex) regulation, which needs to be interpreted by market participants, and which – by introducing new concepts like "number of allowances in circulation" – would open up an entire new array of potential micro- interventions by policymakers. In fact, the MSR seems over-engineered for the purpose.

Looked at from the perspective of intertemporal flexibility and an improved non-intervention commitment, it might be much easier just to assign a depreciation rate to certificates from any given year (within certain pre-specified limits). This could be organised in an annual, transparent process involving the Commission, the Council, the European Parliament, and the stakeholders. Alternatively, a positive minimum (or maximum) price path could be implemented to make sure that intertemporal trading does not lead to excessively low (high) prices at certain times. Note, however, that any approach fiddling with the outstanding number of certificates implies a change on the unilateral mitigation commitment.

Thus, as a system the EU ETS is performing much better than public opinion has it. Higher ambitions for Europe's mitigation pathway should therefore not be advocated by twisting the mechanism but rather by openly declaring a stricter cap, either directly or indirectly via prices.

6. Improving the resilience of Europe's energy sector

Given Europe's high share of energy imports, and because of the threats often associated with energy dependence on foreign powers, any diplomatic effort to engage with energy producing countries in Europe's neighbourhood must be complemented by an improved resilience of the European energy sector.

The role of the state, i.e. the EU and the member states, in improving resilience should not concern the direct choice of primary energy sources, as policymakers (and a certain interpretation Art. 194 of the Lisbon treaty) regularly claim. As discussed above, this choice should be left to the market based on the relevant price signals and price expectations.

Obviously, policymakers will, and must, always have an indirect influence on the energy mix by the technical regulation (licensing) they impose on the use of indigenous fuels (e.g. for nuclear, or for shale gas). The stricter these regulations on indigenous fuels, the more energy dependent the European Union will be.

Therefore, member states' approaches to licensing have an indirect effect on the security of supply of all member states, and thus should be regularly compared and discussed on the European level. In particular, coal, lignite and indigenous gas which can all be securely provided to the European market should not be excluded from the energy mix by government fiat. As discussed above, technology-specific action against coal or certain production technologies for gas (so-called “fracturing”, or, colloquially, “fracking”) would be detrimental from the point of view of both efficient carbon mitigation and security of supply.

Apart from the issue of carefully balancing conflicting objectives in the licensing of certain technologies, another prominent role for policy lies in the provision of (redundant) infrastructure; only redundant infrastructure gives sufficient flexibility to counter short-term supply interruptions which are seen as the major threat.

Whether such threats actually exist, is a matter of dispute. Producing countries have a significant interest in providing security of supply to their customers. Therefore, problems encountered in the European gas supply over the past decade typically had (and have) to do with transit countries, rather than with producing countries. Hence, projects such as North Stream or (the original plan for) South Stream providing direct connection to a producing country, thus avoiding the transit through non-EU-members have obvious advantages with respect to an enhanced security of supply.

Moreover, due to suppressed gas demand in Europe a lot of Europe’s gas import infrastructure currently sits idle. Therefore, studies consistently show that under current circumstances it would take a rather substantial and long-lasting disruption of gas supplies to Europe to create immediate serious difficulties.

Still, improving resilience (and liquidity) by expanding the (regulated) European energy infrastructure is useful and can be attained at rather limited cost. Infrastructure expansion should take two major forms: expanding the grids physically, both within countries and cross-border, on the one hand, and enhancing flexibility e.g. by the use of ICT (in particular for power) or installing LNG terminals, storage capacities, or reverse-flow capacities (for gas) on the other hand.[1]

A critical question concerns the financing of such investments. They would provide redundancy to the market in the state of a potential crisis but which are underutilised under normal market conditions. As the benefits of insuring against supply interruptions are supposed to have European rather than national or local scope, the costs should not be imposed on national or local but rather on a European level. Such European reliability surcharge would have to be borne by the European power or gas consumer; this would be a helpful step towards further integration of grid regulation. Alternatively, the EU might also finance such redundancy cost from a public budget defined at the European level, and refinanced by the member states. Such an approach would render it easier to incorporate an asymmetric “burden sharing” between the member states.

(1) For gas, a recent analysis by EWI at the University of Cologne has shown, that redundant LNG terminals in the Baltic Sea and in the South-Eastern Mediterranean Sea would be the most important addition to the EU’s infrastructure.

A further important element of a resilient European energy sector is competition. Gas markets, in particular in certain Eastern European member states, do not yet show the level of competition associated with a functioning, and secure, gas market. While increasing reverse-flow infrastructure West-East might serve as an insurance for periods of short-term interruptions, it is most likely not reasonable to increase those capacities to the size required to fully integrate the Eastern European markets with the West – the natural logic of gas flows running counter this idea.

Instead, competition law could be invoked to increase the liquidity on Eastern European gas markets. In particular, measures to open up illiquid gas markets could include restrictions on importers' long-term retail contracts as well as gas release programmes forcing them to auction off some of their imported gas volumes.[1] EU competition law could provide a sufficient basis for such interventions into the market, and it would reduce market power of incumbent importers and their supplier. The idea of a "single European gas buyer" which has been floated in the context of the "Energy Union", constitutes the extreme version of a gas release programme. Obviously, this idea runs into many political and legal objections. Moreover, it would risk to reduce European competitiveness by reducing competition between the importers. A more targeted, selective gas release programme based on existing EU competition law seems to be a much less intrusive, and fully sufficient, alternative.

In summary, the challenge in terms of security of supply of competitive energy to Europe is not a challenge of fully avoiding certain countries or energy carriers, but rather a challenge of appropriately managing our continued energy dependence. Four priorities stand out: Keeping as many options for indigenous energy production open as possible; enhancing the resilience of the European energy sector through an expanded, and partially redundant, infrastructure and improved liquidity in the EU's energy markets; reducing the dependence on unreliable transit countries – either by increasing their reliability or by circumventing them; maintaining and building on an effective partnership with major producing countries in close proximity to the EU.

7. The single largest opportunity: unfettered European competition

Apart from its geographical proximity to important sources of energy, notably in Russia, the Middle East and North Africa, the EU's biggest assets in the global energy arena are its large internal market and its already well-developed energy infrastructure. Further improving the internal market and harnessing the forces of competition across the

(1) In Germany, such measures (imposed on E.ON Ruhrgas in the wake of the E.ON-Ruhrgas merger) have significantly contributed to the development of a liquid gas wholesale market.

28 member states still is most likely the single largest opportunity for Europe in the energy sector.

A no-regret option in this context is the expansion of physical interconnections at the relevant bottlenecks. Such interconnections come at relatively low economic cost, but they reduce the overall cost of the energy system, they dynamically improve competition within Europe and they contribute to an increased resilience of the sector.

Next to expanded interconnection, European competition can be enhanced by a large range of potential measures, in particular with respect to improving cross- border cooperation within Europe. With the exception of the EU ETS discussed in the following section, the regulatory framework and the corresponding institutions still have a markedly national flavour. While the EU sets general directives, implementation of these directives and oversight remains largely in the hands of national parliaments and regulatory authorities. Thus, there still is large heterogeneity in the institutional settings for the industry, and there are few examples of cross-border institutions that go beyond the coordinating roles played by ACER, CEER, ENTSO-E, or ENTSO-G.

With continued heterogeneity across the EU, it is obvious that a more detailed prescription of common European institutional and regulatory standards would contribute to a more integrated European market, and, thus, to more effective competition on the 28 national markets. Such improvements certainly still are possible even within the existing European treaties. E.g. it has been possible to effectively couple European wholesale markets; the important next step being an improved market coupling intra-day. In this context of gradual institutional improvement, the development of common and legally binding network codes for the entire European Union represents an important step towards more harmonized institutional settings. Also, adjusting the layout of bidding zones to correctly reflect existing bottlenecks would improve upon competition. National attempts to manage deep structural bottlenecks with regulatory short-cuts, such as e.g. in Germany,[1] distort wholesale market prices, and, as a consequence, lead to inefficient energy flows in Europe.

As TSOs play a central role in the political processes defining institutions and settings, cross-border mergers of TSOs might be an important catalyst for such developments. Merging French and German TSOs could generate particular momentum.[2] Moreover,

(1) The single German bidding zone, e.g., encourages French or Swiss power markets to import German electricity when there is strong wind in-feed in the Northern part of Germany and neighbouring countries. However, due to an internal bottleneck in Germany, this electricity can physically not be transported towards the Southern German borders. Thus, (extramarginal) Southern German power plants have to be re-ramped in order to supply the electricity for the export into France or Switzerland – at marginal cost at which the French or the Swiss market would not have procured it in the first place.
(2) Cf. e.g. Fondation Jean-Jaurés, Note 251(2015).

such cross-border mergers could also contribute to improving incentives for cross-border system optimisation, in particular with respect to effective and efficient grid expansion.

However, such a gradual approach most likely is bound to hit a structural barrier, a "glass-ceiling" for European market integration. This barrier arises because Europe lacks an effective mechanism for managing cross-border redistribution, e.g. for certain grid investments or other cost components surcharged on the energy consumer, e.g. cost for redispatch or for capacity reserves, or the like. Also, a full integration of balancing markets, which by necessity have a monopsonistic structure, seems rather difficult at present. The same is true for the geographical definition of bidding zones, or entry-exit-zones, within which wholesale prices and surcharges are "pooled", or for joint promotion schemes for e.g. renewable energies on the European level. In essence, any cross-border pooling would improve upon the existing institutions but it would also entail explicit cross-border financial flows, making it politically and legally challenging.

Therefore, any such initiatives would most likely also require cross-border regulatory authorities (in some way similar e.g. to the European Central Bank), which in turn need legitimacy from corresponding treaties and parliamentary acts on the national level. Given the current state of the European Union at large, it seems unlikely that substantial progress into this direction can be achieved at the level of the EU 28 in the near future. Instead, regional or even bilateral initiatives might provide a more realistic starting point into this direction. Iberia/France, France/BeNeLux, and France/Germany appear to be the most natural candidates for such efforts – provided that national policymakers are willing to seize the initiative.

Finally, there is one important element of the current debate about the role of policymakers in the electricity market which merits a more explicit discussion: the question of adequate generation capacity in the long-term. Pressure is imposed on policymakers to give binding insurance commitments to investors in order to reduce the risk of "underinvestment", i.e. exceedingly high electricity prices or even power rationing.[1]

Two aspects of this debate need to be carefully distinguished: The question of "missing money" due to explicit or implicit price caps on the one hand, and the question of a missing long-term market for power plant investments on the other hand.

As to the first aspect, this is a fictitious debate at present. Prices are nowhere near historical peaks, even in tight market conditions, both for spot markets and for existing balancing markets (which essentially procure short term capacity buffers). Moreover, projections into the future are notoriously difficult especially for lack of good estimates of the elasticity of demand. Therefore, it is far from clear whether critical price peaks will

(1) Such guarantees are contained e.g. in the commitments given to RES-investors in Germany or to nuclear investors in the UK, and, more generally, in the logic of capacity mechanisms such as the ones recently introduced in the UK.

emerge on a regular basis if policymakers did not come up with an additional intervention into the market. Note that if penalties for deviating from the nominated schedules are sufficiently high, market participants always have an interest to fully hedge their capacity. Thus, at any point in time, prices in spot and balancing market should correctly reflect scarcity of capacity in the system. Hence, if there were a problem related to price formation, increasing the penalties for deviations from the nominated schedule might be a rather simple remedy.[1]

As to the second aspect, policymakers do not know better about potential market developments than the market. Thus, they are unable to provide an efficient substitute for a missing long-term market.[2] In particular, they do not know better about the development of demand, thus they are always likely to insure a sub- optimal level of capacity, most likely on the high side. Governmental insurance does not make this demand risk disappear, rather, it leads to a re-distribution of the risk away from the investor to someone else. Typically, as e.g. in the cases of Germany and the UK, governments do not pay for the insurance premium themselves. Instead, they pass the cost onto the electricity consumer. As a side effect, this increases the likelihood that policymakers misuse the insurance to distribute political rents (as in the case of German RES state guarantees).

Strategic reserves are discussed an alternative mechanism to provide secure capacity in tight market conditions outside the distribution of market expectations. However, in order to be non-distorting, they need to be carefully crafted. In particular, the exercise rules warrant a lot of attention. In essence, the price trigger for the reserve acts like a price cap to the market.[3] Thus, if the trigger is chosen too low, introducing a strategic reserve might actually exacerbate the problem it is intended to solve. A slippery slope into larger and larger shares of the strategic reserve might be the consequence, especially since the state lacks relevant information for deciding about the appropriate size of the reserve.

Because of these problems with state-administered capacity control, some observers suggest "decentralized capacity control". In essence, such approaches suggest an obligatory trading of long-term capacity options. Such contracts can in principle also be

(1) This remedy forms part of the suggested "Anyway measures" proposed by the German government in its recent Green Book on electricity market design.
(2) Note that redundant generation has to be distinguished from redundant infrastructure which has been discussed in the previous section. Infrastructure exhibits features of a natural monopoly, and hence is regulated. Generation is a competitive activity, and is regulated only in the last minutes before physical fulfilment (typically, on one-sided balancing markets).
(3) If the call option on the strategic reserve is exercised based on a price trigger, then the reserve is directly linked to the market. However, it does not change the argument if the exercise rules are based on purely technical rather than commercial conditions, as e.g. in the right of German TSOs to redispatch certain power plants. Still, the positive probability that the strategic reserve will be exercised in some market conditions will distort the market, reducing the room for investments into non-reserve power plant capacity.

provided by the market on voluntary basis, and they are actually already being used.[1] Making such contracts obligatory will likely increase their liquidity, but it does incur additional administrative cost, especially for those consumers who do not need to have such price insurance. Whether or not there is an effect at all, mostly depends on the penalties for deviations from schedules.[2]

And even if there is an effect on capacity provision, the net effect on social welfare is unclear because of the transaction cost, and it strongly depends on the specific form of the obligations imposed on consumers.

An additional concern needs to be mentioned. Different from most other industries, there is a tangible additional risk for a long-term investor in the electricity sector: As the investment is sunk, policymakers might be inclined to expropriate parts of it (directly or indirectly) if the asset turns out to be very valuable (i.e. prices and margins are high). Thus, there is a commitment problem between the investor and the government. The market on its own will find it difficult to provide insurance for this problem. Payments guaranteed by the government might in deed overcome the issue if retroactive changes to these commitments are explicitly ruled out by the country's legal system.[3]

While such commitment problem might in fact exist, long-term capacity guarantees administered by the government are a possible but not the only solution, let alone the most efficient one. Other ways of overcoming the commitment problem are e.g. direct co-investments by the government. Also, constitutional rules on the national level, or binding international treaties on free trade, e.g. the European treaties, can serve to lower this specific political risk – if they are properly implemented and sanctioned.

In any case, current overcapacity (on the Continent) means that, even if it existed, the commitment problem is not an urgent issue for (Continental) European policymakers. Moreover, the abundant availability of investment options with short- term or medium-term amortization periods, e.g. gas engines, open cycle gas turbines, or investments into demand flexibility, further reduce the urgency of this issue. Therefore, in summary, the introduction of additional capacity mechanisms alongside existing balancing markets should be treated with a lot of caution.[4]

(1) Cf. e.g. the recent introduction of intraday-cap products by the EEX. Also, acquiring equity in power plants can serve as long-term hedge, cf. the so-called Mankala risk sharing structure derived from direct investment of energy intensive businesses into Finnish power plants.
(2) Essentially, the penalty for using more energy than scheduled serves as a back-stop price for capacity insurance. See above.
(3) This is, e.g., the case for the EEG commitments given in Germany. It was not the case for the subsidies to RES promised to investors in Spain, which the government reneged upon during the fiscal crisis.
(4) Cf. e.g. Bettzüge (2013) for a more extensive treatment of the issue.

Conclusion

European energy policy epitomizes the challenges of a European Union which is losing clout in the global arena faster than it can make progress in integrating the formerly independent nation states. More than for other sectors, national governments and parliaments regard energy policy as a domain they have to defend against European integration and harmonization, in particular with respect to energy taxes and to the electricity sector.

Also, public debate on European energy policy tends to greatly underestimate the degree to which Europe is dependent on global developments she cannot control (any more). No matter what European policymakers decide in the short-term, the EU will import fuels from external partners for a long time to come. And no matter how much the EU reduces its CO_2 emissions, it will depend on other countries to follow her if unabated global emission growth is to be avoided. Therefore, in particular, a general, candid, and fact-based public debate on the most effective way for Europe to contribute to the global fight against climate change should urgently be led.

Under the current, rather narrow political premises and restrictions, Europe should be careful not to overstretch with respect to the unilateral mitigation target. Moreover, Europe should aim to maximise the impact from her current emissions volume-oriented approach. In particular, member state governments need to be careful with implementing additional measures on the national level without taking into account the feed-back effects on the European level. In the end, the Rest of the World will not care at all whether Europe mitigates in Poland, in Spain, or in the UK. Viewed realistically, Europe cannot afford the luxury of 28 national climate and energy policies catering for 28 different and heterogeneous audiences.

Also, developments on the global fuel markets should be an important determinant for Europe's energy and climate strategy. Reduced fuel prices, e.g., make a unilateral mitigation strategy more expensive, and should therefore inform the European emission reduction target. No such feedback mechanism has so far been considered – European objectives for CO_2 reduction are defined without any reference to global developments

Overall, therefore, the EU seems well-advised to develop an energy strategy adapted to the global developments and to its structural position. An effective strategy would most likely be characterized by dexterity and flexibility, and it would try to eschew big political bets. Rather, the substantial uncertainty surrounding the energy environment for Europe should be reflected by gradualism and portfolio thinking. Furthermore, the need for increased cost efficiency would suggest a rethinking of subsidiarity in Europe, a reduction of political and regulatory risk, and a de-bureaucratization of the sector. Thus, such efforts would require substantial further harmonization and coordination within the EU – a difficult task given the general tendency for renationalization of policies. But the prize for Europe would be substantial.

On top, such a strategic view on energy policy would also encourage the EU to consider policies in other important domains – such as education, industrial policy, or defence – that are, or will be, directly impacted by the tectonic shifts in the world's energy architecture, and to generate a consistent perspective comprising all these areas. For example, there is no honest debate about the fact that retaining industrial activity in Europe requires competitive energy prices, and about ways to square this objectives of the multitude of initiatives increasing the energy cost burden of the European consumer. "Energy efficiency" as an answer is insufficient, because if industry has to pay for it, such efforts might turn out to add to the cost rather than to reduce it.

However, instead of developing a strategy which is robust against alternative scenarios of global development, European energy policy seems to be increasingly shaped by dogma. The dogmatic approach to European energy policy becomes most visible in the simplifying rhetoric which asserts that investments into renewable energy sources and technical energy efficiency will resolve all of Europe's energy challenges quickly and without substantial trade-offs. As a consequence, those challenges and trade-offs might not get the management attention they require. Instead, micro-management of investment choices opens up significant potential for political rent seeking (and thus, political risk).

Interestingly, intervention into the energy sector is not urgent at all – contrary to public perception. With sluggish demand, ample capacity, and an effective cap on the sector's CO_2 emissions European policymakers could, theoretically, leave the electricity sector alone for a while. For other sectors, much the same analysis holds except for introducing effective CO_2 mitigation by expanding the EU ETS to cover these sectors as well.

The very low capital cost in the short-term should not be wasted on inefficient investment projects, but on such investments that can generate increasing returns to scale for Europe. Most of such opportunities lie outside of the energy sector, in particular in the infrastructures for traffic and the digital economy, as well as in research and education. Within the energy sector, substantial social payback can only be expected for grid investments, particularly cross-border. Hence, public attention should shift from intervening in competitive decisions around generation (e.g. renewable energy sources) or demand (e.g. efficiency) to fostering regulated investments.

In general, the timing of Europe's efforts to develop its energy sector is an undervalued aspect of European energy policy. Ambitious objectives for the long- term do not need to be addressed by immediate, drastic action in the short-term, except for the European grid. Capacity thus freed up in the political institutions could then be used to address some of the fundamental governance challenges, e.g. for refining Europe's understanding of the meaning of Art. 194 of the Lisbon treaty, or for debating the best way to reap "double dividend" from energy taxes and the sale of CO_2 certificates.

In summary, a European energy strategy would think from today into a necessarily open future – rather than back-casting the present from closed "visions" of what the future will look like.[1] Open future thinking would start with the problems (e.g. greenhouse gas mitigation) rather than with potential solutions (e.g. certain renewable energy technologies). And such openness is warranted especially today – given the speed of technological development across the globe, partly driven by the digital revolution. The energy world of the 21st century has just started to emerge, and while one might guess some general directions, one should always be prepared for surprises.

Avoiding falling into the "closed-future"-trap, then, would require a fundamental rethinking of Europe's approach to energy policy. Over the past decade, Europe (as well as many a member state) has developed an inclination to set binding quantitative targets for certain descriptive dimensions of the energy sector. With the exception of the CO_2 cap for the EU ETS this is an ill-guided approach. Not only will the array of dimensions chosen be inconsistent and incomplete. Moreover, making many such specific targets binding necessarily leads into wasteful and ultimately unsuccessful "planification" policies – i.e. to the contrary of an open future-strategy. Thus, in particular, the additional targets for renewable energies and reduced energy demand should not be implemented as binding targets but rather be treated as indicative targets for a certain scenario of the CO_2 mitigation pathway.

The complexity of Europe's energy could be better captured by an "EU climate and energy scoreboard" encompassing a broad and relevant range of indicators. Such an approach would be similar to the sets of indicators for measuring the overall state of the economy which have been suggested e.g. by the Stiglitz-Fitoussi-Sen commission in France, or by the Enquête-commission "Growth, Wealth, and Quality of Life" of the German Bundestag.

Important dimensions for such a scoreboard would likely be cost (both within Europe and relative to the rest of the world), security of supply (both in terms of import dependency and reliability), ecologic footprint of energy supply (on the European as well as the local level), as well as descriptive statistics for energy demand. Within these dimensions, several essential indicators would have to be identified, a task which goes far beyond the scope of this paper.

(1) It might, e.g., be possible to compute the optimal path of energy demand relative to GDP in Europe for one specific scenario of future developments. But to fix e.g. the computed total energy demand for a given future year, say 2030, as a quantified target for the European economy, yet alone a binding one, does not seem to make a lot of economic sense, because it does not account at all for the enormous amount of uncertainty surrounding e.g. the development of technologies, of global fuel prices, or the well-being of the European economy in general.

The most important contribution of such a scoreboard would be to visualize the complexity of the energy challenge, and to allow for an explicit discussion of the trade-offs between political actions to “improve” any single one of these indicators. By doing so, the scoreboard might then also help Europe to slowly yet steadily change its energy policy from dogma to strategy.