A qualitative look at the coherence between EU energy security and climate change policies

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Abstract
Energy security has become a key priority in EU policy but climate change mitigation commitments live on in parallel. The purpose of this paper is to analyse the extent to which EU climate change mitigation policies and energy security policies are coherent – a relationship that is far from clear cut since both areas are both complex and wide ranging. We use a simple policy-analytical framework for a rapid assessment, by which the main components of the two policy domains are juxtaposed in a screening matrix. The availability, accessibility and affordability policies of energy security are thus set against emissions reductions, renewable energy expansions and energy efficiency policies of climate change mitigation. Our assessment shows that the two policy fields are coherent in general but a number of policy interactions require attention since coherence is dependent on ancillary policy measures. The future outlook of how the securitisation of EU energy policy will affect climate change mitigation depends on how the future security agenda will be framed. A move to a nationally fragmented security frame will lead to greater policy conflicts than a coordinated EU security frame.

Keywords
Europe; coordination; security; energy

1. Introduction

Energy policy makers in the EU have to manage different important policy agendas simultaneously, most notably the three pillars of climate change mitigation, energy market liberalisation and security of supply, all the while respecting internal market rules and economic innovation and growth aspirations. While energy markets and climate change mitigation were key drivers in the 1990s and early 2000s, today energy security has regained the centre stage in the European energy debate. During 2013 and 2014, Russia's more aggressive foreign policy, and conflict with Ukraine (including new gas delivery disputes), furthered the securitisation move - i.e. when the issue is considered and addressed as a security issue (Léonard and Knauert 2010) - in energy policy. In response to this, the European Commission was prompted to launch an EU energy security strategy in May 2014 (EESS), suggesting a range of both short-term and long term measures (European Commission 2014e).

Although energy security is today very high on the EU policy agenda, the momentum to live up to targets for climate change mitigation has also remained more or less intact (European Commission 2013c; European Commission 2014c). The question of how these different agendas can be pursued in tandem arises. In the field of energy policy, as in many other policy areas, the calls for coordinated and coherent policies have therefore grown ever stronger. This paper discusses to what extent these policy agendas are coherent with a focus on the interactions between climate change policies and energy security policies. The purpose of this paper is to analyse the level of coherence or incoherence between EU climate change mitigation policy and EU energy security policy.

In this paper, we examine this pattern systematically at the level of EU policy. First, we identify the major policy subareas of relevance and organize them in a simple classification scheme. Second, we discuss and score the overall interactions across all major energy security and climate policy areas. We look at both directions – i.e. how climate policies affect energy security policy objectives and vice versa. We identify possible intervening factors and possible ancillary policies that can influence the interactions between the two areas. Third, based on the results of the assessment, we discuss at a more general level how a further securitisation of energy policy may influence the EU's climate change policy capacity.

1.1. Approach to assessing interactions

Policy coherence has traditionally been addressed in the domain of external policies, including foreign policy, ”hard” security policy and development aid policy (den Hertog and Stross, 2011) but is increasingly of interest also in other domains, such as energy and the environment. Despite a growing interest in policy coherence and how it can be achieved, there are few concrete approaches and methodologies for how to analyze it. To examine the extent to which the two policy fields are coherent, we use a simple policy-analytical framework by which the two policy fields are juxtaposed in a screening matrix (Nilsson et al., 2012). Pair-wise comparison of policy interactions are made, building as far as possible on arguments, evidence or predictions of policy outcomes on various end points that are available in the literature.

Coherence is assessed on a scale from -2 (indicating a strongly negative interaction) to +2 (indicating a strongly positive interaction). When the assessments points to a neutral or weak interaction (positive or negative) the score +/-0 is given. The scores are aggregated to headline categories through calculating the mean value and rounding to the closest score. The theoretical basis is derived from work on institutional regime interactions and policy evaluation (Oberthür and Gehring 2006; Dunn 2011). Although the approach invites “deep-dives” into specific interaction, this paper does not go into a deeper analysis of each interaction, but takes the form of a screening exercise, where comprehensive inventories of climate change policy and energy security policy at the EU level are placed in an evaluation matrix.

2. Identification of key EU policies

2.1. EU energy security issues and policies

The meaning of energy security changes over time. Traditionally, it has been strongly linked to fossil fuel access and import dependency (Kruyt et al, 2009) and the concern that fossil energy resources are located in politically unstable regions and countries such as the Middle East, Venezuela, Nigeria, posing risks that “above-ground problems” will interrupt supply. With the development of international energy markets, supply shortages and dependencies manifest in prices, which makes the price question also part of the energy security equation (IEA 2007; Sovacool et al. 2011).

Import dependency is considered to imply not only economic but also political risks for the EU. Within this, the EU's relationship with Russia and the oil states – has gained increasing attention. The EU enlargement widened the diversity of views and positions in the EU, and has posed new challenges on the decision-making apparatus (Paillard 2010). The 2014 political crisis in Ukraine has had a strong impact on the energy security agenda in Europe. Russia has on several occasions threatened to stop supplying Ukraine with natural gas for commercial reasons, posing significant risks to gas supply in Europe. In this context, liquefied natural gas (LNG) is regaining momentum in Europe, because it can provide more flexibility, supply diversity and liquidity to the gas market (European Commission 2008). Developing LNG, which currently accounts for 15% of European gas consumption, is considered as a priority in the EESS (European Commission 2014c, p. 5).

The new EESS interprets energy security as a stable and abundant supply of energy, which in the long-term, needs to be provided in the context of a competitive, low-carbon economy which reduces the use of imported fossil fuels (European Commission 2014e). Using this kind of starting point does not however clearly delineate energy security from the impacts of energy production. Following UNDP (2000) and APERC (2007), we focus on three categories of energy security concerns: availability, accessibility, and affordability.[1] Below we delineate key policy areas within the EU portfolio that directly link to the three categories. This is not an exhaustive list, but the nine areas give a reasonable coverage of the main energy security dimensions of priority in the EU.

2.1.1. Availability

Availability refers primarily to the physical aspects of security, such as scarcity of primary fuels, e.g. the physical resources (primarily fossil), but also political and institutional constraints ("above ground problems"). Import dependency and diversification of supply are among the most common measurements of availability (Chester 2010; Martchamadol and Kumar 2013). In the EU, availability is pursued through its neighbourhood policy, whose main purpose is to create a ring of countries around the EU with which the EU has close, peaceful and co-operative relations (European Commission 2004) Here, energy components are frequently included in regional cooperation initiatives such as the Black Sea Synergy, the Eastern Partnership, the Union for the Mediterranean and the Central Asia Strategy. Availability is also pursued through facilitation of domestic energy production developments, both for fossil sources and new sources of energy. Here, the EU has long established common rules on prospection, exploration and production of hydrocarbons, through the Directive 94/22/EC. Concerning the recent interest in unconventional gas, the Commission has adopted on 22 January 2014 Recommendation 2014/70/EU on principles for hydrocarbons exploration or production using hydraulic fracturing.

2.1.2. Accessibility

Accessibility refers primarily to reliable infrastructure, e.g. the system's ability to meet consumer demand at all times as well as its resilience against disturbances and shocks. It covers also exposure to supply shocks. Factors such as the import mix, quality of infrastructure, vulnerability of supply, and the supply routes and distances, and coupled in socio-economic and political risks are considered important. This can be influenced by investments in back up power, strategic reserves and transmission network capacity. EU policies to enhance accessibility include its strategic reserves policy, where the EU has the objective to maintain minimum stocks (Directive 2009/119/EC). To secure gas and electricity

[1] We exclude "acceptability" in the APERC framework, as it is conceptually very different and deals with security threats generated by the energy system in contrast to securing the functionality of the system (see Johansson 2013).

supply, there is Directive 2004/67/EC, and Directive 2005/89/EC and Regulation 994/2010, respectively.

EU also pursues accessibility by promoting specific bilateral or multilateral infrastructures and transport routes such as gas pipelines and diversifying into LNG supply. LNG development in the European Union follows Directive 2009/73/EC concerning common rules for the internal market in natural gas and Regulation 715/2009/EC on conditions for access to the natural gas transmission networks. Of particular interest on the accessibility issue is the EU relationship to Russia. The EU lead in developing gas transmission "blueprints" such as the Southern Gas Corridor, results from a will to reduce gas dependence of Central and Eastern European countries on Russia by diversifying suppliers and transit routes.

Power transmission infrastructure is a third leg in the accessibility agenda. The EESS identified specific projects as critical for EU's energy security in the short and medium terms because of their role in enhancing diversification of supply options (European Commission 2014e) The cost of planned interconnector projects amount to 104 billion for electricity as (European Commission 2011a). However, most plans struggle to be realized due to difficulties in financing and the development of market rules (Buijs et al. 2011).

2.1.3. Affordability

Affordability refers to economic aspects of security, such as production costs and predictable market prices. Another factor is market volatility (APERC 2007). The EU's key strategy here is to develop the internal energy market, which is supposed to lead to larger and more efficient markets overall – benefiting both producers and consumers (European Commission 2014e). EU policies have focused on strengthening the internal market by providing common rules for the internal market of natural gas and electricity (Directive 2009/73/EC, Directive 2009/72/EC, Directive 2003/55/EC, Regulation 715/2009, Regulation 714/2009, Directive 2008/92/EC and Regulation 1227/2011/EU). However, the Third Energy Package has not yet been fully implemented in several Member States.

In addition to internal market development, there is increasing interest in demand response approaches, notably through enhancing short term elasticity of demand and adapting consumption more quickly in the face of price spikes, which helps maintaining equilibrium between electricity supply and demand in real time and increases the energy system's flexibility and reliability (Bergaentzlé, Clastres, and Khalfallah 2014) (Faruqui and George 2005). Existing provisions in EU legislation (Energy Efficiency Directive 2012/27/EU, Electricity Directive 2009/72/EC and Ecodesign Directive 2009/125/EC) provide a framework that enables stakeholders to engage in demand response. A third set of measures to enhance affordability concerns long term investment in infrastructure to enhance market functionality, such as the development of smart grids, i.e. modernized grids with communication technology in order to collect information on supply and demand, which helps to optimize electricity supply, distribution and use. The European framework for the development of smart grids includes Communication COM/2011/0202 and Recommendation 2010/148/EU.

2.2. EU climate change policies

More than three quarters of total greenhouse gas (GHG) emissions in the EU-27 are energy-related (EEA 2014). Carbon dioxide is the most important energy-related GHG with 96.4%, followed by methane, with 2.1% (EEA 2014). Changing the way energy is produced and consumed is thus essential to mitigate climate change. Having a 50% chance to stay below a global temperature increase of 2° Celsius over the pre-industrial level would require the concentration of carbon dioxide in the atmosphere to stabilise below 450 ppm. Member states have collectively agreed to reduce their emissions with 20% by 2020 compared to 1990 levels or 30% in the case of a global and comprehensive agreement with comparable commitments from other developed countries. By 2050 the objective is to reduce emission by 80-95%. To achieve these targets three interlinked objectives that shall be met by 2020 have been defined and agreed upon; 20% reduction of GHG, 20% increase of the share of renewable energy and 20% improvement in energy efficiency (CEC, 2007). Within the process of establishing the objectives by 2030, the European Commission has proposed a 40% reduction of GHG compared with the 1990 level, and an increase in the share of renewable energy to at least 27%. Energy efficiency will continue to be a central pillar of EU climate policy, but further objectives will be defined after the review of the Energy Efficiency Directive in 2014.

2.2.1. Reducing emissions

Reducing emissions refers to the EU policies that approach the problem of climate change as pollutants of greenhouse gases that are emitted into the atmosphere. EU has adopted both market based and regulative instruments to reduce emissions. The emissions trading system, EU-ETS, is the most important policy (Directive 2009/29/EC). EU-ETS is a cap and trade system for different sectors (power and heat generation, energy intensive industry and aviation) in which the cap is determined by the policy maker but the allocation of reductions is delegated to the market.

There are other policies in place, such as Directive 2003/96/EC that harmonizes the minimum taxation on energy in member states. In addition, a number of regulations have been adopted to reduce emissions from sectors that are not participating in the emission trading scheme. These include regulations that specifically target emissions from the transport sector, such as Directive 2009/30/EC on fuel, Regulation 443/2009/EC on emission performance standards for new passenger cars and Regulation 582/2011/EU on standards for heavy duty vehicles. Furthermore, industrial emissions are regulated in Directive 2010/75/EU that sets out emission preventive measures that each member states shall ensure that operators follow.

2.2.2. Increasing the share of renewable energy

Increasing the share of renewable energy alters the energy mix and, provided that the production is sustainable, it will also reduce the climate impact from a life cycle perspective. EUs 2020 target of 20% share of renewable energy has been broken down into country specific targets of the overall share of renewable energy of final consumption, ranging from 10% to 49%. The target is mandatory and legally binding but each member state has the flexibility to decide how to achieve the target (and articulare this in national Renewable Energy Action Plans) (2009/548/EC), and a range of instruments, most prominently feed in tariffs and tradeable certificates, have been tested and modified over the last decade. All member states are required to have a 10% share of energy from renewable sources in the transport sector by 2020 (Directive 2009/28/CE on the promotion and use of energy from renewable sources).

2.2.3. Improving efficiency

Improving energy efficiency refers to attaining the same level of energy service but using less energy. Efficiency improvements are often portrayed as the most cost efficient solution to reduce emissions, with oftentimes net negative costs but market failures, such as split incentives and lack of information, act as barriers (CEC, 2011). The 2011 Energy Efficiency Plan (COM/2011/0109) noted that the greatest potential for efficiency improvements was in the building sector followed by transport and industry. EU policies to increase efficiency range from the national target, found in Directive 2012/27/EU in which each member state is obliged to set a national minimum target of efficiency improvements, to minimum regulations that must be meet in buildings (Directive 2010/31/EC), fluorescent lamps (Regulation 245/2009/EC) and products (Directive 2009/125/EC on Ecodesign). EU has also obliged producers to label energy performance to encourage consumers to choose energy efficient products, for example Directive 2010/30/EU on labelling and standard product information, Regulation 1222/2009/EC on labelling of tyres and Regulation 66/2010/EC on EU Eco label.

3. Assessing interactions

With this inventory, we are able to juxtapose the principal dimensions to carry out our coherence assessment of each interaction. Below, we briefly present the assessment of each interaction. We start with a summary statement of the interaction and then summarise the principal arguments underpinning the score.

3.1. Energy security and reducing emissions

3.1.1. Availability and reducing emissions: Overall score: +/-0

Overall, the interaction between EU availability policies and emissions reductions policies is neutral.

Neighbourhood policy och reducing emissions

Ambitions to expand the emissions trading area outside the EU, as well as ancillary methods such as the Clean Development and Joint Implementation Mechanisms can potentially play a positive role in advancing EU neighbourhood policy objectives. For example, there are joint implementation projects on energy efficiency improvement in Ukraine, and CDM projects on developing small hydropower in Armenia and Algeria, as well as CDM projects for supporting the development of wind and solar energy in Morocco, Egypt and Israel. Increasing cooperation with EU neighbours creates opportunities for lower carbon energy supply, such as DESERTEC (Lilliestam and Ellenbeck 2011), but also increased gas consumption (for example through energy cooperation programs such as INOGATE) that may compete with both coal and renewable energies. The balance points towards a moderately positive interaction. +1

New sources of energy and reducing emissions

EU-ETS steers investments towards new sources of energy but also in certain jurisdictions a shift from coal to gas (given a sufficient price signal) (Fell, Hintermann, and Vollebergh 2013; Denny and O'Malley 2009). It can be argued that this could represent a security issue due to gas dependence to Russia – a concern voiced not least by central European member states. The search for new sources of energy does not however significantly affect the functioning of the ETS. Therefore, the balance points towards a weakly positive interaction. +/-0

Exploration of fossil fuels and reducing emissions
The exploration of gas and oil on European territory may at first sight appear to be in conflict with climate policy. However, it is neutral vis-à-vis ETS, as it competes with imported gas and oil (Weijermars et al. 2011; European Commission 2014e; Johnson and Boersma 2013). But in order for it not to compete with renewables, especially when considering subsidies to non-renewable energy, there must be ancillary policies to promote electricity generation from renewable energy sources (Lehmann and Gawel 2013). Thus, the interaction is on balance neutral or weakly negative, depending on the presence of RES policy instruments. +/-0

3.1.2. Accessibility and reducing emissions: Overall score: +/-0

Overall, the interaction between accessibility policies and reducing emissions displays both moderately positive and moderately negative patterns, so the overall score becomes neutral.

Strategic reserves and reducing emissions
During the last decade, there has been an increasing commercial pressure on refineries, which has partly been driven by ETS (Ademmer and Börzel 2013). As a result, refinery closures and other capacity reductions totalled around 722 Kb/d in Europe in 2012 (British Petroleum 2013), and the demand for diesel fuels has grown (International Energy Agency 2014), increasing diesel rather than crude oil import dependency. This is also due to carbon regulation on cars (eg 120 g/km target) which has induced a shift to diesel from gasoline (Cames and Helmers 2013; European Commission 2014c, pp. 82-83). The balance points towards a moderately negative interaction. -1

Gas transport and reducing emissions
Whether the political interest in gas in general is coherent with emissions reduction objectives is a matter of debate (see Weijermars et al. 2011; Dupont and Oberthür 2012). In the EU energy roadmap for 2050, gas is presented as a key short-to-medium term mitigation option. The share of gas in the energy mix (around 20%) does not differ significantly between the reference scenario and the low carbon scenario (European Commission 2011c). Taking this at face value suggests coherence in relation to emissions reductions. Both ETS (when prices are sufficient) and the promotion of gas transportation infrastructure steer towards increased natural gas use in the EU, shifting energy production away from coal. The balance points towards a moderately positive interaction. +1

Power transmission infrastructure and reducing emissions
In the short term there is no significant relationship between the network infrastructure and ETS. In the longer term, a stronger power transmission infrastructure is often considered a precondition for deeper emissions reductions across the EU (Gaventa 2013). However, while utilities are expected to contribute to the development of infrastructure (Giordano et al. 2013; Morris 2013) in the short term they are also suffering from pressures from the ETS; indeed, the ETS, especially during its second phase, has negatively affected European electricity companies (Mo, Zhu, and Fan 2012). The balance points to a neutral interaction. +/-0

3.1.3. Affordability and reducing emissions: Overall score: +1

Overall, the interaction between affordability and reducing emissions is ambiguous but mostly positive. There are costs in the short term from regulation, but emission reductions in the long term will improve affordability on the European energy market.

Internal market performance and reducing emissions

The relation between internal market promotion and ETS is ambiguous. Overall, ETS is firmly nested in the internal market logic and the development of ETS has arguably supported EU integration overall (Wettestad, Eikeland, and Nilsson 2012). However, conversely and from a consumer perspective, ETS has proven to enhance uncertainty on the energy market prices (Egenhofer et al. 2011; Ahamada and Kirat 2012). The balance points towards a neutral or weakly negative interaction. +/-0

Demand response and reducing emissions

Demand in the EU has been somewhat suppressed by the price effect of ETS (Chen et al. 2008). For example, ETS has steered load management in the industry (European Commission 2013a). Conversely, demand reductions have suppressed ETS prices and a weak market for emissions permits (Thema et al. 2013). This can be viewed as a problem or as proof that the market actually works as it should. The balance points towards a moderately positive interaction. +1

Demand side investment and reducing emissions

Emissions reductions policies can encourage environmentally beneficial investment, although not necessarily in all cases (Klingelhöfer 2009). Together with other measures, the ETS should increase the economic incentive to invest in low carbon technology, such as smart grids and other demand management investments, according to the price effect (Egenhofer et al. 2011). Conversely, investments on the demand side, such as smart grids, contribute to reducing emissions (Darby, Strömbäck, and Wilks 2013). The European Commission argues that smart grids could decrease CO_2 emissions by 9% per year (European Commission 2011d). The balance points towards a strongly positive interaction. +2

3.2. Energy security and increasing renewable energy

3.2.1. Availability and increasing renewables: Overall score: +1

Overall, policies to promote availability and increasing renewables in the EU are coherent.

Neighbourhood policy and increasing renewable energy

Increasing RES is coherent with neighbourhood policy. Desertec, mentioned above, is one example of RES action positively influencing neighbourhood policy. Also, bioenergy production potentials in Russia (Boute and Willems 2012) and Ukraine (Lyutskanov, Alieva, and Serafimova 2013) are very large but untapped, which points to a potentially positive influence of neighbourhood policy. However, current relations with neighbours are dominated by fossil energy, with gas and oil in Russia and Central Asia, and Africa. These current supplies to some degree compete with renewable (but also with coal). On balance, the interaction can be positive but depends on the time perspective and ancillary RES policy. +/-0

New sources of energy and increasing renewable energy

There is a strong synergy between the promotion of new sources of energy and RES expansion, since new sources of energy are dominated by RES options: RES share in the European energy mix has increased from 8.3% in 2004 to 14.1% in 2012 (European Commission 2014). The balance points towards a strongly positive interaction. +2

Fossil exploration and increasing renewable energy

There are some concerns that the interest in shale gas might divert investment away from renewable energy (EREC 2013). Therefore, a potentially weakly negative interaction between fossil exploration and RES expansion can be argued. However, given the current import dependence and the aim to displace imported sources with domestic ones, in reality the conflict is likely to be very weak. From a more dynamic perspective, there is also increasing evidence that because of the variability of both wind and solar power generation, EU will increasingly need to balance power production with gas power plants (Keyaerts et al. 2014). The balance points thus towards neutral or weakly positive. +/-0

3.2.2. Accessibility and increasing renewables: Overall score: +/-0

Overall, the interaction between accessibility and increasing renewables is positive. However, this depends on the specific renewable support policy and price signals.

Strategic reserves and increasing renewable energy

Because of the legacy of the past, the strategic reserves question is dominated by policies to ensure minimum stocks of crude oil, and thus it does not significantly affect current RES expansion. The need for RES stocks in the future depends both on likelihood of, and vulnerability to, disruptions. On balance, the interaction becomes neutral. +/-0

Gas transportation infrastructures and increasing renewable energy

Securing gas imports by developing pipelines and LNG infrastructure might impact negatively the development of RES by allowing an inflow of cheap gas (Moryadee, Gabriel, and Avetisyan 2014). Promoting gas infrastructure development carries the risk of “carbon lock-in”. Assuming gas consumption in a decarbonised EU in 2050 between 0 and 150 bcm and a gas production capacity of 20-30 bcm by 2050 (without shale gas), the current trends in gas import infrastructure capacity surpasses forecasted energy needs (Dupont and Oberthür 2012). However, from the point of view of distribution gas infrastructure should be advantageous also for biogas development. This includes LNG terminals which could also be used to receive biogas. Mixing of biogas into natural gas is a possibility to create the wider market for biogas, but this requires strong ancillary policy (Thamsiriroj, Smyth, and Murphy 2011). If the gas goes to electricity it is a useful contribution to balancing variable RES production. The interaction thus depends on RES policy and on the emissions price signal. Without a high price of carbon, the development of gas infrastructure and RES can be in conflict. The balance points towards a neutral interaction. +/-0

Power transmission infrastructure and increasing renewable energy

RES makes power production more decentralised (Deichmann et al. 2011), and potentially more resilient (Bouffard and Kirschen 2008). Technical problems with variability in the quality of RES power are possible to mitigate (Crabtree et al. 2011). Network infrastructure and variable production is a very big and complex issue: on the one hand, RES puts new requirements on transmission, while on the other hand, building new infrastructure will positively affect both accessibility and RES. For example, (Battaglini et al. 2009) argue that both super grids and small-scale decentralised smart grids are complementary and necessary to guarantee a transition to a decarbonised economy. On balance, the interaction becomes moderately positive. +1

3.2.3. Affordability and increasing renewables: Overall score: +/-0

Overall, the interaction between affordability policies and increasing renewables is judged to be neutral in the short term to weakly positive in the longer term as RES expansion puts pressure on electricity prices.

Internal market and increasing renewable energy
In the preparation of the "green package", the European Commission sought to establish a common RES support system but member states resisted and today, RES policy instruments remain a national affair. However, RES-based energy systems require power exchange between countries to address variability (Boie et al. 2014). The internal market, in turn, facilitates the expansion of RES since larger energy systems can smoothen out local variations in supply and demand, making it easier to balance the grid. However, although in the long term RES policy is shifting the cost curves, strong RES expansion has also led to price spikes and volatility, e.g. in Germany and Denmark (Bach, 2009). Developing RES implies higher upfront investment. On balance, the interaction becomes neutral. +/-0

Demand response and increasing renewable energy
Costs of electricity may at certain points go up as a result of RES expansion and contribute to demand reduction. The use of demand response strategies, by allowing greater efficiency and flexibility in the grid management, could contribute to address intermittency-related issues of RES (Pina, Silva, and Ferrão 2012; Nair and Zhang 2009). Conversely, under current regulations, efficiency measures creates disincentive to RES expansion. On balance, the interaction becomes weakly negative. +/-0

Demand side investments and increasing renewable energy
RES expansion induces new investments and R&D in both production, transmission and distribution infrastructure (Johnstone, Haščič, and Popp 2010), which suggests there is a potential for synergy between RES expansion and electricity sector innovation to manage demand better, such as smart grids. On balance, the interaction becomes moderately positive. +1

3.3. Energy security and improving efficiency

3.3.1. Availability and improving efficiency: Overall score: +1

Overall, efficiency improvements will interact positively with availability policies. For example, import dependency should decrease as a result of efficiency enhancements. Efficiency efforts can also go hand in hand with efforts to enhance diversity of supply.

Neighbourhood policy and improving efficiency
Efficiency can contribute to strengthening neighbourhood policy and relationships through technology cooperation, such as in the case of INOGATE. As highlighted by (Boute 2013), energy efficiency is increasingly important in European external energy policy. Thus, the interaction is moderately positive. +1

New sources of energy and improving efficiency
Efficiency in buildings includes concepts of integrated energy supply of solar and wind- made possible by efficiency, for example Net Zero Energy Buildings, which are defined as having a net balance of on-site energy, or net export of electricity to the power grid (Marszal and Heiselberg 2009). In the transport sector fuel efficiency standards promote new energy

sources and hybrids (European Commission 2014b), thus contributing to supply diversification. On balance, the interaction becomes strongly positive. +2

Fossil exploration and improving efficiency
Efficiency policies have very little impact on the incentive to explore in Europe, as these domestic explorations compete with imports. The interaction is assessed as neutral. +/-0

3.3.2. Accessibility and improving efficiency: Overall score: +/-0

Overall, the interaction between accessibility and efficiency fields points to a moderately positive interaction.

Strategic reserves and improving efficiency
The pursuit of strategic reserves does not significantly affect efficiency policy efforts. Conversely, with more efficient and smart energy systems, strategic reserves can be smaller. In particular, having very efficient cars will be beneficial for strategic reserves: then the 90 days reserve will entail lower fuel quantities. On balance, the interaction becomes moderately positive. +1

Gas transportation and improving efficiency
Today, gas is used predominantly for heating of houses and water in buildings (Eurogas 2013), and more efficiency in the built infrastructure would to some extent contribute to decreasing the vulnerability and reliance on gas transport infrastructure, but at the same time the lower profitability in the gas market would result in less resources for infrastructure development. On balance, the interaction becomes neutral or weakly negative. +/-0

Power transmission and improving efficiency
Some efficiency strategies require investment in robust and smart power infrastructure (El-hawary 2014) and points to coherence between the two fields. However, great improvements in efficiency can lead to lower requirement for major interconnections - with greater efficiency there is less power to transmit. Lower demand is already leading to generally lower profitability in the power sector resulting in fewer resources for infrastructure development ('How to Lose Half a Trillion Euros' 2013). On balance, the interaction becomes neutral or weakly negative. +/-0

3.3.3. Affordability and improving efficiency: Overall score: +2

Overall, affordability and efficiency are strongly in synergy (and to a certain degree overlapping).

Internal market and improving efficiency
Efficiency policies can be positively related to internal market efforts: the efficiency instruments market, and the Ecodesign Directive and the 120g/km target are all consistent with the development of the internal market. Besides, regulations to harmonize energy service companies' activities are being developed, which also encourages further integration of the energy market in Europe. At the same time, there have been some experiences that EU state aid rules, a corner stone in the internal market, have caused problems for efficiency programmes. On balance, the interaction becomes moderately positive. +1

Demand response and improving efficiency

This interaction is fully integrative as the two policy areas share the same objective. +2

Demand side investment and improving efficiency
Efficient houses are easier to control and link well to new smart grids and other technologies that can be used to enhance energy security from both an affordability and reliability perspective (see Smith 2012). There is a strong synergy in these connected innovation systems. On balance, the interaction becomes strongly positive. +2

4. Discussion and outlook

This paper has presented a rapid and simplified exercise to map out the coherence patterns in general terms. Table 1 summarizes the scores derived from the assessment, where we have combined each of the nine principal energy security policy dimensions in the EU with the three major climate mitigation policies. Understanding the interactions in more detail would require using policy scenarios combined with quantitative measurements, modelling, literature review and broader elicitation of expert and stakeholder opinions.

Table 1: Summary of coherence scores in screening matrix

Energy security policies	**Climate mitigation policies**		
	Reducing emissions	**Increasing renewables**	**Improving efficiency**
Availability (e.g. physical import dependency, diversity of supply)	**+/-0**	**+1**	**+1**
Neighbourhood policy	*+1*	*+/-0*	*+1*
New sources of energy	*+/-0*	*+2*	*+2*
Exploration of fossil resources	*+/- 0*	*+/-0*	*+/-0*
Accessibility (e.g. infrastructure quality and resilience)	**+/-0**	**+/-0**	**+0**
Strategic reserves	*-1*	*+/-0*	*+1*
Gas transport infrastructure	*+1*	*+/-0*	*+/-0*
Power transmission infrastructure	*+/-0*	*+1*	*+/-0*
Affordability (e.g. market prices, volatility)	**+1**	**+/-0**	**+2**
Internal market functioning	*+/-0*	*+/-0*	*+1*
Demand response	*+1*	*+/-0*	*+2*
Demand side investment	*+2*	*+1*	*+2*

With this caveat in mind, this simplified assessment indicates that the two policy fields are mostly coherent but that policy subareas require attention where coherence is dependent on ancillary measures. Real conflicts are few: e.g. the interactions between reducing emissions and strategic reserves, and between increasing renewable energy and demand response. Many energy security aspects that may, upfront, appear to be in conflict with climate mitigation, such as gas infrastructure and strategic reserves, have the potential to become synergistic.

Our assessment also identified additionally some interactions that policy makers need to look at closely so that synergies can be exploited: neighbourhood policy and increasing renewables, gas transport infrastructure and increasing renewables, internal market and increasing renewables, power transmission and improving efficiency, and new sources of energy and improving efficiency. The complexity of these interactions is the result of a number of intervening factors (including policies) such as continued abundance of gas, ancillary policies for low carbon energy expansion and ancillary policies for mobilizing capital for investment. Particular attention should also be given to potential game-changers in technology, such as the wide spread adoption and commercialization of new gas extraction (shale) and gas transport (LNG) techniques, CCS, or breakthroughs in renewable energy technologies.

Continued abundance in, and integration of regional gas markets is a key determinant in the interaction between energy security and climate policies in Europe. Indeed, if gas becomes more abundant on international markets, and dependency on Russia as supplier diminishes, with a great variety of sources and connections, it is possible that resistance on behalf of Poland and other new member state to strengthened EU climate policy could also diminish (see Roth 2011). The current debate and actions that have been undertaken on energy security in Europe as a result of the political crisis in Ukraine illustrates to what extent some countries are sensitive to their dependency on Russian as a supplier.

Other crucial factors in the relation between energy security and mitigation in Europe are ancillary policies in terms of supporting the development of low-carbon options which determines whether gas pushes out coal or renewables and becomes a complement to renewables to provide base load power as well as for of capital mobilization for maintaining and enhancing energy markets. Mobilizing capital, both through EU common rules and through investment in infrastructure, is essential to ensure coherence. In the absence of these investments, the interaction between energy security and climate policy becomes more problematic, because the opportunities to integrate more renewable energy and use gas to replace coal will be limited.

Our rapid assessment suggests that the current security focus in the European energy agenda is not significantly impeding the opportunity for the EU to engage in climate change mitigation strategies. A relevant question is however whether a new securitisation move would change this relationship. The answer depends on the way in which energy security is framed in terms of agency. Energy security as described and analysed in this paper corresponds to a security framing where the agency for providing energy security relies on both the European Union and its member states (Braun 2011).

Still, how individual member states securitize energy issues, and therefore, the policies they prioritize to address risks/threats to their energy systems, also determine coherence. Today, as member states re-evaluate their priorities and the risks/threats toward their energy systems, they might try to reframe energy security in a more national-based way, where decisions are based on shorter-term assessments and where the agency is mainly attributed to the national institutions, rather than to a combination of European and national institutions. Such a securitisation move, if successful, is likely to result in less European coordination of policies since it provides more agency to deviate from the established rules (Taureck 2006). This could encourage short-term solutions that privilege the development of fossil fuels, thus putting at stake the coherence between energy security and the renewables and reducing emissions strategies for climate mitigation. A current example is Poland, there have been attempts to redefine energy security, based on a much more national and fossil fuels oriented framing. Indeed, the Polish government has expressed its interest in pursuing energy independence, notably through the development of coal industry (Easton 2014). In 2014, the Prime Minister of Poland argued that greater energy security in Europe must be promoted through a greater flexibility towards fossil fuels, despite environmental concerns (Tusk 2014).

The European Commission, on the other hand, emphasises the need for "real Europeanisation of energy policies" and energy security and decarbonisation are presented as "two sides of the same coin" (European Commission 2014d). Such an energy security framing would attribute agency mainly to European institutions, resulting in a greater margin for new regulation and rules to be imposed to governments and actors of the internal market (as long as the securitisation move is successful). A widely accepted framing in this direction could enable the development of renewable energy becoming one of the main strategies for energy security (in terms of diversification of the energy mix), which means that extraordinary measures could be legitimately implemented. The 2014 Ukraine crisis has triggered some political reactions in this direction (Jones 2014). This could provide a window of opportunity for ensuring that adequate ancillary policies are in place to encourage the development of renewable energy and to make sure enough resources are available for financing a low-carbon energy system.

Securitisation thus carries risks and opportunities for the climate agenda. An assessment of the future relationships between EU energy security and climate change policy agendas is very uncertain. In particular, the future strength of the EU cooperation in general, as well as the policy tools and resources at its disposal to advance their energy and climate change policy agendas, remain uncertain, as well as the future strength and functioning of international economic and political relations in general, and the effectiveness of institutions concerned with climate and energy in particular. Therefore, such an analysis will need to be based on a more profound scenario analysis concerned both with technology uncertainties and political uncertainties within the EU and in the international system.

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