

Does the 'Energy Union' help to solve European energy infrastructure problems?

J.A.G. van der Horst

UNIVERSITEIT TWENTE.

Institute: University of Twente

Faculty: School of Management and Governance

Programme: MSc in European Studies

Track: Regulation Track

Author: J.A.G. (Jasper) van der Horst

Student number: 0220663

Date: August 2015

First supervisor: Prof.dr. Nico Groenendijk

Second supervisor: Prof.dr. Gert-Jan Hospers

Acknowledgements

I would expressly like to thank my supervisor Prof. dr. Nico Groenendijk for the opportunity he gave me to finish my study. And I would sincerely thank him for all his time, energy and guiding during my thesis.

Subsequently, I would like to thank my second supervisor Prof.dr. Gert-Jan Hospers for his time, especially on such a short notice.

Also I would like to be grateful to my parents, without them I was not able to do this study at all. Thanks to their support I am able to become Master of Science.

Finally I want to thank my girlfriend for supporting me, especially during the final stages of this thesis.

August, 2015

Jasper van der Horst

Table of contents

Acknowledgements	3
1. Introduction.....	6
1.1. Background and research problem	6
1.2. Research questions and methodology	7
1.3. Demarcation of the research.....	8
1.4. Relevance of the research	8
1.5. Outline of the thesis	9
2. What's the 'Energy Union'?.....	10
2.1. European energy policy.....	10
2.1.1. Legal basis.....	10
2.1.2. EU Actors	11
2.1.3. Internal Energy market.....	12
2.1.4. Trans-European Network – Energy (TEN-E)	13
2.2. The Framework Strategy for the 'Energy Union'	16
2.2.1. The Framework Strategy	16
2.2.2. Latest developments	18
2.2.3. Analysis.....	19
3. What are currently the main European energy infrastructure problems?	21
3.1. Energy and Electricity	21
3.2. Energy infrastructure.....	23
3.3. EU Energy infrastructure problems.....	24
3.3.1. Energy infrastructure problems	24
3.3.2. Obstacles of lack of investment in European energy infrastructure.....	29
4. What does the Framework Strategy of the 'Energy Union' say about Energy Infrastructure?	35
4.1. Method	35
4.1.2. Overview of outcomes	36
4.2. 'Energy Union' documents findings	38
4.2.1. Infrastructure development issues	38
4.2.2. Investment and financial issues	44
4.2.3. Authorization procedures	51
4.2.4. Infrastructure management issues	55
4.3. Conclusion	59
5. Discussion of findings and conclusions	60

5.1. Main findings	60
5.2. Conclusion	67
5.3. Limitations of this research and recommendations for further research.....	69
References.....	70

1. Introduction

This thesis is the result of a study on energy infrastructure problems and the energy policy of the European Union (hereafter EU). Is the concept of the 'Energy Union' for Energy infrastructure a step forward or not?

As energy is getting more and more important for the economy of Europe, the single European market, the level of welfare, environment and security of supply, an adequate energy infrastructure is also becoming more and more important. Especially in the European countries themselves very little is known about the problems Europe faces regarding its infrastructure in such an important sector and what the implications are for energy infrastructure when dealing with renewable energy sources. In the academic literature, little is written about European energy infrastructure problems and how they could be solved within the EU. This study contributes to the academic literature by providing insight into the specific European energy infrastructure problems and linking them with the concept of the 'Energy Union' from an economic perspective.

1.1. Background and research problem

The original idea behind this thesis research becomes clear when one focuses on a specific part of Energy Infrastructure: namely energy infrastructure projects and then especially cross-border European energy infrastructure projects. The unique character of the European Union and its Member States makes such projects unique. Studies show that planning, financing and management of energy infrastructure projects take place predominantly along national lines. Every member state has their own national network administrator/owner and these are regulated by national regulation authorities. Each regulation authority wants to take care of the interests of its own state, national interests prevail.

However the energy system does not end at borders. Systems are more and more cross linked. This causes a discrepancy: on the one hand there are national targets, such as those related to the fuel mix and the share of renewable energy sources, as well as policy instruments such as subsidy schemes, fiscal measures and permitting procedures which can be utilized at a national level.

On the other hand, much of the issues at stake cannot be dealt with in a meaningful way at national level only. Grid stability, the development and accommodation of renewable energy sources have become supranational issues.

This discrepancy raises some questions: What are actually the main European Energy infrastructure problems? What exactly is the role of the EU concerning Energy Infrastructure and how does that appear in EU policy? And is EU policy on the area of Energy Infrastructure problems effective?

Does the latest Energy plan of the EU the 'Energy Union' help to solve European energy infrastructure problems?

1.2. Research questions and methodology

In this section the research aims and research question will be described. Also how this research is done methodologically will be explained.

The following research question will provide guidance throughout the entire research and support the achievement of the research aims in a structured way:

To what extent is the concept of the 'Energy Union' helping to solve European energy infrastructure problems?

To be able to answer this question a view sub questions are formulated:

- What is the 'Energy Union'?
- What are currently the main European energy infrastructure problems?
- What does the 'Energy Union' say about energy infrastructure?

The unit of analysis of this thesis is: Energy infrastructure problems in Europe.

This research is of a qualitative descriptive nature and uses primary, secondary and tertiary literature (Saunders et al., 2009). By analyzing scientific literature, research reports and official EU websites, documents and reports, and by inductive and deductive reasoning (Babbie, 2007) the research aims to find out to what extent the EU is helping to solve energy infrastructure problems.

This study combines literature analysis, use of policy documents, and more specific content analysis. By means of the literature analysis an overview of EU energy policy and European Energy Infrastructure problems will be given. By means of content analysis this research will use the overview of the European energy infrastructure problems, as given in EU policy documents, to check if those problems are actually addressed in the 'Energy Union' or not. And if so, to what extent is the EU trying to solve those problems. It will also create a definition of both terms. EU documents and research documents on energy will provide information on the characteristics of European Energy Infrastructure and the current situation and will provide insights on EU Energy Policy. In this case all the main EU Energy documents are used. Studying EU reports and scientific literature will provide insights on specific European Energy infrastructure problems.

Content analysis is a research methodology, which uses a set of procedures to derive valid inferences from text material. It concerns both inferences about the channels, the message itself, as the audience of the message (Weber, 1985). It is an investigation technique to derive replicable and valid inferences from the data collected about the context (Krippendorff, 1980). For analyzing the 'Energy

Union’ the following 5 main documents are used: The Framework Strategy for a Resilient ‘Energy Union’ with a Forward-Looking Climate Change Policy, the ‘Roadmap for the ‘Energy Union’, the EU Commission ‘Energy Union’ Fact Sheet, the European Council summary’s on the ‘Energy Union’ and the EU Commission Connecting power markets to deliver security of supply, market integration and the large-scale uptake of renewables European. Those documents are except form the Council conclusions all from the European Commission and dated in 2015.

The idea of this thesis is to research European Energy Infrastructure problems and EU policy. What are really the main specific European Energy Infrastructure problems? How did the EU come to the concept of the ‘Energy Union’? Are those specific energy infrastructure problems addressed in the ‘Energy Union’? And is the ‘Energy Union’ helping European infrastructure problems?

1.3. Demarcation of the research

As the scope of a thesis like this obviously has to be limited, this research solely focuses on electricity energy infrastructure as a form of energy infrastructure. This is done because electricity is one of the most important energy carriers and it was the first energy form to be regulated in the EU’s internal market. This research focus on electricity will be further explained in section 3.1.

Furthermore, this thesis primarily uses an economic perspective.

1.4. Relevance of the research

In several ways, this research is relevant from a scientific point of view. First, not much literature on the ‘Energy Union’ has focused solely on the energy infrastructure problems. Second, concerning energy infrastructure problems, this research focuses specifically on the European energy sector, while most studies focus on the US or on other sectors. Further, most studies like this one focus mainly on global warming (sustainability). This study is especially relevant because its emphasis is only on efficiency. This gives other insights than when the focus lays on sustainability.

Finally, taking the idea of to what extent the ‘Energy Union’ is helping energy infrastructure problems as a starting point makes it original and thus relevant. As written in the background section the topic is very important and is as such automatically relevant. As the specific European energy infrastructure problems are combined with the concept of the ‘Energy Union’ it can reveal new insights.

This thesis can be practically relevant for organizations that have to deal with energy infrastructure. It can be useful for public as well as private organizations.

1.5. Outline of the thesis

This thesis is structured as follows.

Section 2 will give an overview of EU energy Policy. It starts with the origin of EU energy policies and will end with the concept of the 'Energy Union'.

Section 3 will discuss the energy infrastructure problems in the current energy infrastructure situation in Europe. What are the main infrastructure problems in Europe?

Section 4 will compare the theoretical situation with the practical one. It is the main analytical part of the thesis. It will compare the main energy infrastructure problems as identified in section 3 with the main contents of the 'Energy Union'

Section 5 will give some conclusions and discussion based on the chapters 2, 3 and 4 and will answer the main research question: to what extent is the 'Energy Union' helping to solve Energy Infrastructure problems?

2. What's the 'Energy Union'?

The 'Energy Union' is [...] *the biggest energy project since the Coal and Steel Community [...]*, according to the words of Marcos Šefčovič, the vice president of the Commission and responsible for the 'Energy Union', at the presentation of the 'Energy Union' plan (Euractive, 2015).

The 'Energy Union' is a project of the European Commission to accelerate the transformation of European energy supply. The final plan for this project was launched in February 2015 with the aim of providing secure, sustainable, competitive and affordable energy (European Commission, 2015a).

This chapter will explain what the 'Energy Union' contains and how the EU got to this plan.

When one wants to understand the concept of the 'Energy Union' and the citation of Šefčovič, one has to start at the beginning of the EU Energy policy. That is why this chapter is divided into two main parts. The first part is about the origin of EU energy policy, which is divided in four general paragraphs: the legal basis, EU actors, the internal market and the Trans-European Networks (hereafter TEN's). The second part is about the framework strategy of the 'Energy Union' itself.

2.1. European energy policy

The energy policy of the EU has its origin at the foundation of the European Community of Steel and Coal (ECSC treaty) in 1952 and the Euratom Treaty in 1958. However it lasted until the signing of the Lisbon Treaty that EU has officially named it EU energy policy (Langsdorf, 2011).

Consequently the EU has not concentrated on a concrete European Energy Policy for long. Some policies however were separate among other policy areas and especially the economic based; like internal market, competition policy for electricity and gas and measures adopted in line with EU's climate policy (Andoura & Vinois, 2015). Those areas were the main drivers in creating an EU energy policy.

2.1.1. Legal basis

Unless it took until the signing of the Lisbon Treaty for the EU to have a more coordinated energy policy. From the ECSC (European Coal and Steel Community) on the EU already had some legal authority. However the signing of the Lisbon Treaty gave, EU energy policy as a whole a legal basis. The problems of previous treaties were lack of a legal basis for an autonomous energy policy.

The main ground of this legal basis lays in Article 194 (TFEU) of the Treaty on the Functioning of the European Union (hereafter, TFEU). Because article 194 of the TFEU provides the facility for a broad range of measures in the energy sector. The Lisbon Treaty (TFEU) contains a specific chapter on energy which defines the key competencies and the overall objectives of energy policy: the

functioning of energy markets, security of supply, energy efficiency and savings, the development of new and renewable forms of energy and the interconnection of energy networks.

According the European Union on their law summaries website 2014, the goals of their energy policy are backed by “market-based tools and by Community financial instruments (mainly taxes, subsidies and the CO₂ emissions trading scheme), by developing energy technologies (especially technologies for energy efficiency and renewable or low-carbon energy)”. Additionally, the EU agreed on a series of measures to help reducing global warming and secure energy supply (EU summary legislation, 2014).

Concerning the point of energy supply the principle of solidarity is added, the new article 122 on energy requires member-states to act “in a spirit of solidarity” to ensure the functioning of the internal market and security of supply, enhance energy savings and efficiency, promote the use of renewable energy and, last but not least, interconnect energy networks. This word ‘solidarity’ is of great importance and a step forward for really creating a single European energy market. Article 194 TFEU makes some areas of energy policy a shared competence, signaling a move towards a common energy policy. However and that is also important, each Member State maintains its right to “determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply” (Article 194(2) TFEU) (European Parliament Factsheet, 2015a).

Other specific provisions found in the TFEU concerning EU energy policies are:

- Security of supply: Article 122 TFEU (solidarity principle).
- Energy networks: Articles 170-172 TFEU.
- Coal: Protocol 37 clarifies the financial consequences resulting from the expiry of the ECSC Treaty in 2002.
- Internal energy market: Article 114 TFEU.

2.1.2. EU Actors

The main actors of EU Energy Policy are the Commission, the Parliament and the Council. Each of those actors has its own task. The task of the Commission is to be the administrative supervisor of the EU. Further the Commission is entitled to introduce legislation and can be authorized by the Council to prepare some of the energy legislation.

The EU Commission is a government and each policy area is headed by a Commissioner for the day-to-day business. The Commission has even appointed a Commissioner especially for the 'Energy Union'; Maroš Šefčovič.

In the legislative process the EU Council and the EU Parliament are pivotal actors. All the ministers of Energy from the EU Member States are gathering together in the Council. According to Langsdorf (2011) the Council is the EU actor with the strongest focus on the interests of the Member States. Concerning the changes of the Lisbon Treaty, the consequences are that most issues can be decided with qualified majority for the Council. For the second legislative body in the EU, the European Parliament now a simple majority vote is enough for decision making (Langsdorf, 2011).

To conclude accordingly to the TFEU the main four goals of the EU energy policy are;

- to ensure the functioning of the energy market;
- to ensure the security of supply in the Union;
- to promote energy efficiency and energy saving, and develop new and renewable forms of energy;
- to promote the interconnection of energy networks.

2.1.3. Internal Energy market

As mentioned above one of the main areas that helped developing Energy policies was the creation of the internal market. When the Single European Act was signed in 1986 it included the goal of an internal Energy market, defining it as “an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured”. This also related to the Energy Market as well. In the same act inclusion of environmental protection was arranged for the first time (Langsdorf, 2011). The aim of the internal energy market was to ensure better energy prices and more efficiency by increasing competition and furthermore enhancing energy security (Langsdorf, 2011). The main drivers for EU energy market liberalization and integration have been laws (the three energy market packages) and competition policy (European Parliament Factsheet, 2015b).

The Commission has made market integration and liberalization policies to stimulate a single energy market since the nineties. The main goal of these policies was as Buchan (2011) puts it: “to make transmission networks independent of supplier interests so that, having no business other than running power grids and gas pipelines, and no domestic supply market to protect, transmission operators would extend their networks across borders, acting as common carriers for all and providing open access to all”. In this way, new cross-border infrastructure would be virtually self-initiating and self-financing.

The first two major energy market packages of legislation, passed in 1996/1998 and 2003 led to liberalization of the gas and energy markets, addressing market access, transparency and regulation, consumer protection, supporting interconnection and adequate levels of supply (European Parliament Factsheet, 2015b). The main goal of the third energy package (2009) was to force integrated energy companies to 'unbundle' their production and/or import businesses from the transport and distribution of energy and create more competition. Those companies, or parts of companies, that own and operate pipelines and power grids (transmission system operators) need to sell access to this infrastructure to other companies (Barysch, 2011). Consequently to help this plan work, the EU created supranational organizations namely: the Agency for the cooperation of Energy Regulators, hereafter ACER and for transmission operators the European Network of Transmission System Operators for electricity and gas, hereafter ENTSO-E and ENTSO-G. This way a more powerful European network can be created. As a result of these packages new gas and electricity suppliers can enter the Member States market, while consumers (industrial consumers from 1 July 2004 and domestic consumers from 1 July 2007) are now free to choose their supplier (European Parliament Factsheet, 2015b).

The last main development on the area of the internal energy market was at 4 February 2011. On that day the European Council set a goal of completing the internal energy market in 2014. No energy island must exist in the EU anymore. This goal was again brought up during the European Council in March 2014 and reaffirmed. So to be able to reach this goal the EU has created some legislative instruments.

Nowadays the main legislative instruments for a better functioning of the internal energy market are the Third Energy Package, the Regulation on Guidelines for Trans-European Energy infrastructure (Regulation (EU) No 347/2013) and the Regulation on Wholesale Energy Market Integrity and Transparency (Regulation (EU) No 1227/2011) (European Parliament Factsheet, 2015a).

2.1.4. Trans-European Network – Energy (TEN-E)

As mentioned in the previous paragraph, in order to help the functioning of the internal energy market the EU created Trans-European Networks. The main reason for this is that the internal market only has a chance to succeed if all national networks are interconnected and interoperable with each other.

The EU created the Trans-European Networks on three main areas: Transport, Telecom and Energy. Although the idea of a Trans-European Network sounds very European. The EU has, in line with the principle of subsidiarity no exclusive competence for the developing, financing or building the infrastructures themselves (European Parliament Factsheet, 2015c). The main responsibility for create and connect to the Trans-European Network (hereafter TEN) lays with the Member States. Until now the EU only contributes substantially to the development of these networks by acting as a catalyst and by providing financial support, particularly at the outset, for infrastructures of common interest (European Parliament Factsheet, 2015c).

The legal basis of the TEN's was founded within The Maastricht Treaty. According to the factsheet of the European Parliament about TENs: "This Treaty gave the Union the task of establishing and developing TEN's in the areas of transport, telecommunications and energy, in order to help develop the internal market, reinforce economic and social cohesion, link island, landlocked and peripheral regions with the central regions of the Union, and bring EU territory within closer reach of its neighboring states" (European Parliament Factsheet, 2015c). The title on energy in the Lisbon Treaty (Article 194(1) (d)) also provides a solid legal basis for promoting energy network interconnections (European Parliament Factsheet, 2015c).

The financing of the TENs are nowadays not only a cause of the Member States. More and more is the EU helping to get funding for those networks starting. According to their factsheet about financing of the TENs: The financing of the TENs can also be complemented by structural fund assistance, aid from the EIB (European Investment Bank) or contributions from the private sector (European Parliament Factsheet, 2015d).

2.1.4.1. Energy

The EU adopted the guidelines on Trans-European energy networks (hereafter TEN-E) through Decision 1364/2006/EC of 6 September 2006. The objectives of the guidelines are to diversify supplies, to increase security of supply by strengthening links with third countries (accession countries or other countries in the Mediterranean Sea, Black Sea and Caspian Sea basins, and in the Middle East and the Gulf) and to incorporate networks in the new Member States. In addition, access to the TENs-E by insular, landlocked and peripheral regions strengthens in particular territorial cohesion within the EU.

With these guidelines for TENs, the EU has indicated energy infrastructure projects that are eligible for Community financing and divided them into three categories: projects of common interest

relating to electricity and gas networks displaying potential economic viability; priority projects which are accordingly to the European Parliament Factsheet (2015) about TEN's: "given priority when Community funding is granted and projects of European interest, which are also priority projects and are of a cross-border nature or have a significant impact on cross border transmission capacity". The word cross-border is here a key word. Cross-border infrastructure is the key for a TEN-E to succeed.

In April 2013, the EU guidelines for the development of European energy infrastructure were approved (regulation (EU) No 347/2013). One of the priorities of the Europe 2020 strategy is sustainable growth to be achieved by promoting a more resource-efficient, more sustainable and more competitive economy. That strategy put energy infrastructure at the forefront of this effort by underlining the need to urgently upgrade Europe's networks, interconnecting them at the continental level, in particular to integrate renewable energy sources. The essential background to this is that EU Member States agreed in 2011 that:

- Europe's energy infrastructure needs to be modernized and expanded;
- networks across borders need to be interconnected;
- there is a need to provide for alternative supply or transit routes;
- there is a need for alternative sources of energy, including renewables;
- Every EU member State should be connected to the internal energy market. No island areas with no connections to the internal energy market will exist after 2015.

The guidelines established 12 regional groups for trans-European energy infrastructure, which selected projects. In October 2013, the Commission adopted a list of 248 key energy infrastructure projects (projects of common interest), which benefits from faster and more efficient permit granting procedures and improved regulatory treatment. The projects may also have access to financial support from the Connecting Europe Facility (hereafter CEF), under which almost EUR 6 billion has been allocated to TEN-E up to 2020. For a project to be included in the list, it has to have significant benefits for at least two EU Member States, contribute to market integration and further competition, enhance security of supply and reduce CO2 emissions.

2.1.4.2 Conclusion

However, as mentioned above the Lisbon Treaty created a new energy chapter, it maintained status quo of the internal market and environment regulations as sources for energy policies (Langsdorf, 2011). The political situation concerning energy policies maintained status quo despite all the measures the EU took as described in this chapter. Energy Policy is still a matter of national member

states. Thus to speed up the process of a fully integrated internal energy market, the EU wants to create an 'Energy Union'.

2.2. The Framework Strategy for the 'Energy Union'

The origin of the idea for creating an 'Energy Union' was a matter of security of supply and came from Donald Tusk (currently European Council President), when he was Prime Minister of Poland during the first Russian/Ukraine gas crisis in 2009. He wanted to create a response to Russia and give security of supply for EU citizens a more important place on the political agenda. As Jean-Claude Juncker said it in the official press release of the European Commission accord of the 'Energy Union' Strategy; *"For too long energy exempt from the fundamental freedoms of our Union, The events of today show what is at stake, now many Europeans fear that they might sometimes have no more energy to heat their homes"*.

The concept of an 'Energy Union' is an appreciation, that Energy problems cannot be contained within national borders or managed in isolation from each other. The EU is hoping to generate an external dimension on energy policy with this plan.

In order to start the project 'Energy Union' the EU has released some 'Energy Union' packages, the latest on 25 February 2015. These packages are a framework strategy for the 'Energy Union'. All the 28 European Energy markets need to be merged into one union and need to interact increasingly; while allowing the member states to retain their own energy policy.

2.2.1. The Framework Strategy

The 'Energy Union' is based on the three long-established objectives of EU energy policy: security of supply, sustainability and competitiveness. To reach these objectives, the 'Energy Union' will rely on five 'dimensions': energy security, renewable energy, efficiency, the internal energy and research.

The vision of the committee relies heavily on Jeremy Rifkin, a 'famous' American energy guru. He wrote the book 'The Third Industrial Revolution', in which he explains how a combination of internet, sustainable energy and modern transport will change the world.

Rifkin sees Germany as an example for Europe: "Germany is already working on a development which puts together millions of people, small businesses and farmers to form energy-collectives" (NOS nieuwsuur, 2015).

The Commission describes the current infrastructure as outdated and suggest that the European energy market is poorly integrated and that national policies are uncoordinated. According to the Commission this situation ensures that "consumers, households and businesses in the EU do not benefit from increased choice and lower energy prices". A well interwoven European grid could save European consumers 40 billion euro accordingly to the Commission. For this reason the Commission wrote in a press statement: "It is time for the single European energy market a reality".

According to the plans, the EU Member States must become less dependent on one single supplier. Countries must "fully draw on each other as neighbors, especially when the 'Energy Union' is faced with disruption of supply." The example given is: seven EU Member States depending for all their gas imports on one supplier, which makes them very vulnerable for disruptions. These Member States are Bulgaria, Estonia, Finland, Latvia, Lithuania and Slovakia. Furthermore, Member States should make agreements in a more transparent way on the supply of energy or gas from outside the EU. The Commission calls it in 'the solidarity clause' in their press release.

That same press release also stated; "Energy flows, as if it were a Fifth freedom: that of free flow of energy across borders". The Commission wants to enforce a strict adherence to existing rules such as the unbundling of the energy and independence of regulators and "taking legal action if needed" (European Commission press release, 2015). The interference by Member States in the internal market needs to be addressed thoroughly and harmful subsidies should be phased out for protection of the environment.

Furthermore, the European Commission is preparing in the framework "an ambitious legislative proposal to redesign the electricity market and linking wholesale and retail". The network should include more renewable energy and better respond to demand. This idea will also increase security of supply.

Another important point of the framework is decarbonizing the economy. Making a transition to a low-carbon society that is built to last: ensuring that locally produced energy can be absorbed easily and efficiently into the grid.

A reliable, transparent and integrated governance system for the 'Energy Union' will be launched. This governance should secure the attainment of the objectives of the 'Energy Union', notably the implementation of the internal energy market and the delivery of the 2030 Framework for Climate and Energy (European Commission Factsheet, 2015).

The annex of the framework strategy includes an action plan which presents specific measures that will be prepared and implemented over the next years.

According to the Commission, the following is adopted on 25/02/2015

“A Framework Strategy for a Resilient ‘Energy Union’ with a Forward-Looking Climate Change Policy. This sets out, in five interrelated policy dimensions, the goals of an ‘Energy Union’ – and the detailed steps the Juncker Commission will take to achieve it, including new legislation to redesign and overhaul the electricity market, ensuring more transparency in gas contracts, substantially developing regional cooperation as an important step towards an integrated market, with a stronger regulated framework, new legislation to ensure the supply for electricity and gas, increased EU funding for energy efficiency or a new renewables energy package, focusing European R&I energy strategy, reporting annually on the ‘State of the ‘Energy Union’’, just to name a few” European Commission Press release 25/2/15.

Furthermore agreed is to set out an interconnection communication plan to achieve 10% electricity interconnection by 2020, which is the minimum necessary for the electricity to flow and be traded between Member States. Also a communication plan for a global climate agreement in Paris in December is scheduled.

2.2.2. Latest developments

The first challenge of the framework strategy was the European Council meeting at 03-09-2015. At this meeting the EU agreed on the ‘Energy Union’ Framework strategy. The European council main conclusions on ‘Energy Union’ (2015) were:

The first conclusion was “The EU is committed to build an ‘Energy Union’ with a forward-looking climate policy on the basis of the Commission's framework strategy” (...)“The EU institutions and the Member States will take work forward and the Council will report to the European Council before December. The European Council will continue to give guidance”.

Secondly and most important for this research, “The European Council agreed to “accelerate infrastructure projects, to ensure electricity and gas energy security and a well-functioning internal energy market: in particular including interconnections to peripheral regions”.

Thirdly, the European Council approved the point of that the EU will ensure “full compliance with EU law of all agreements related to the buying of gas from external suppliers, notably by reinforcing transparency of such agreements and compatibility with EU energy security provisions”.

Quoting the president of the EU council after the meeting; "All leaders agreed to reinforce transparency in the gas market, so suppliers cannot abuse their position to break the EU law and reduce our energy security".

Another point that reached the final conclusions of the summit was that the EU will be “fully implementing and rigorously enforcing existing energy legislation” and that the EU is “assessing options for voluntary demand aggregation mechanisms in full compliance with WTO (World Trade Organization) and EU competition rules”.

Also stated in the conclusion of the summit is: “the confidentiality of commercially sensitive information needs to be guarantee” and “the right of member states to decide on their own energy mix is respected and sovereign rights of member states to explore and develop their natural resources are safeguarded”.

EU leaders further agreed to develop innovative strategies for a new generation of renewable energies and increase energy efficiency and to stepping up the EU climate diplomacy for a successful Paris climate summit in December 2015 (European Council, 2015a).

2.2.3. Analysis

The ‘Energy Union’ is one the priorities of the Juncker-Commission and it consists of the ‘Energy Union Package’, which is a package of actions and plans (mostly not legally binding) the Commission wants to realize, in order to realize a EU Energy Union in the future. In that way the ‘Energy Union’ is part of the EU’s energy policy.

Between the original idea from Donald Tusk and the final strategy lays a big difference. With this Framework of the ‘Energy Union’ the chances of real huge changes in the area of energy policy are very small. However it the Framework has been given a much wider dimension (addition of climate and single market) then was originally planned.

No member state is forced to give up the power to set its own energy mix. And it still can explore and deploy their own their natural resources. Each country has its own interests, its own contracts with

Russia, and its own energy strategy. Illustrative is the call from the President of the European Council, Donald Tusk, last year and EU to jointly buy gas from Russia. That should prevent countries being played off against each other, as is happening now. Mainly the Netherlands and Germany reacted negatively to the idea (Euroactive , 2015).

The main point of the plan backed by the European Council which remains is the development of new infrastructure that would link all the member states to a common flow of supply (gas and electricity). The plan talks of completing the internal market in energy, which means removing the national barriers which cause different prices and supply systems.

A lot of the points mentioned in the 'plan' of the 'Energy Union' remains vague, it will enforce existing EU law on competition and create an ambitious legislative proposal to redesign the electricity market (linking wholesale and retail markets) with a reliable, transparent and integrated governance system for the 'Energy Union' will be launched. How or what is unclear and not very concrete. It will be followed by legislative proposals. It will be interesting to see how the Commission is going to elaborate these points.

The allocation of powers and responsibilities will be a challenge according to Alice Stollmeyer (EU energy Expert) and Buchan (Oxford Institute for Energy Studies). David Buchan puts it this way; *"The Commission will need some new power to supervise member states' performance in renewables and energy efficiency,"* (Euractive, 2015) (Buchan and Keay, 2015). In the plan of the Commission it is mentioned to strengthen the position of ACER is in this case. However it doesn't come back in the conclusions of the European Council. Buchan is clear and stated that *"ACER needs to be given more power over the European networks of transmission system operators (ENTSOE, for electricity, and ENTSG, for gas),"* Granting ACER such powers could *"speed up agreement on cross-border trading arrangements and priorities and direct new infrastructure investment for which there currently is no real incentive or reward"* (Euractive, 2015).

Despite the haziness of the framework strategy the 'Energy Union' has potential to create a new level of policy making above nation states.

3. What are currently the main European energy infrastructure problems?

“Europe is at an unprecedented crossroads for its energy future. We are currently going through a paradigm shift in the way we produce, transmit, distribute and trade energy, as we try to reduce the carbon footprint of the energy sector as a whole. This shift will increase the role of electricity compared to other energy vectors. This can be not reached without solid, reliable and smart energy networks. They are and will become even more so the backbone of our energy system”.

These are the words of Günther H. Oettinger, Former European Commissioner for Energy, 2011 at the presentation of the EU Blueprint Energy infrastructure priorities for 2020 and beyond.

This chapter will discuss what these words exactly mean. After the previous chapter which described and introduced the ‘Energy Union’, this chapter will focus on the EU energy infrastructure and it will point out the main current difficulties the EU is facing concerning energy infrastructure. This chapter will look at those difficulties from an economic perspective.

This chapter will start with framing the topic by defining the concept of EU Energy Infrastructure and will narrow energy down to electricity in paragraph 3.1. Subsequently this chapter will give an introduction to Energy Infrastructure in paragraph 3.2. Thereafter the main problems the EU is facing with electricity infrastructure will be discussed in paragraph 3.3. Finally in paragraph 3.4 the underlying problem of EU infrastructure will be discussed as well as the barriers which prevent to solve this problem are covered in this paragraph.

3.1. Energy and Electricity

The term energy is a very broad and abstract concept. For this research we use it in an economic way, as a synonym of energy resources (as well non-renewable as renewable energy is necessary for an economy to function). When used in this research energy refers only to heat and power like the EU also does in its Energy Statistics Manual (IEA, 2005).

All economic activity requires energy resources. In 2009, the 27 member states of the EU had a gross inland energy consumption of 1703 million tons of oil equivalent (toe). Around 46.1% of the energy consumed was produced within the member states while 53.9% was imported. The EU currently imports 84.1% of its oil, 64.2% of its natural gas and 97.48% of its uranium demands (Eurostat, 2012). Without energy, facilitating primary infrastructure sectors like oil and gas, potable and waste water,

transportation, communications and electric power itself is difficult (Fourie, 2006). In order to prevent this research from becoming too complex and extensive, gas will be disregarded from this research.

Besides disregarding gas, another demarcation is made concerning the concept of energy; the focus is on energy forms also called energy carriers. Energy carriers are defined according to the definition of ISO 13600, “either a substance or a phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes. It is any system or substance that contains energy for conversion as usable energy later or somewhere else”. One of the energy carriers with the widest range of applications is electricity and according to the IEA (2015) in their energy technology perspectives (ETP) electricity is also going to be the largest energy carrier (by 2050). The reason for this is that all sorts of energies can be converted somehow into electricity with existing technologies.

In economic terms, electricity (both power and energy) is a commodity capable of being bought, sold and traded. Concerning the internal energy market the first legislative package was about electricity and adopted in the late 1990s (Directive 96/92/EC concerning common rules for the internal market in electricity). Because electricity is one of the most important energy carriers and as it was the first energy form to be regulated, this research is focused on electricity.

Electricity is used in almost all kinds of human activity ranging from industrial production, household use, and agriculture, commerce for running machines, lighting and heating.

Electricity can be produced from coal, natural gas, nuclear power, wind, solar energy, and biomass, Electricity is produced as primary as well as secondary energy. Primary electricity is obtained from natural sources such as hydro, wind, solar, tide and wave power. Secondary electricity is produced from the heat of nuclear fission of nuclear fuels, from the geothermal heat and solar thermal heat, and by burning primary combustible fuels such as coal, natural gas, oil and renewables and wastes. After electricity is produced, it is distributed to final consumers through national or international transmission and distribution grids (IEA, 2005).

Nevertheless, how is electricity produced? Electricity is produced in a power station. In a power station fuel (coal, oil or natural gas) is being heated to produce electricity. The fossil fuel is burned in a boiler. In this boiler are pipes located filled with water. The heat of the boiler changes the water into steam. The steam comes under high pressure and at high speed from the pipes. The steam is blowing against the turbine blades of a kind of a windmill, which then rotate in a high speed. The rotary movement of the turbine rotates a generator which generates the electricity (Morgan, 2009).

3.2. Energy infrastructure

The term infrastructure is a broad concept and contains various definitions. The definition used by Fulmer (2009) is, "Infrastructure is characterized by expansive systems that link supply and demand and involve interconnected assets performing different functions and enabling the operability of their respective networks". This definition is rather vague and based on infrastructure in general, fortunately the EU has its own definition of energy infrastructure:

"Energy infrastructure means any physical equipment designed to allow transmission and distribution of electricity or gas, transportation of oil or carbon dioxide, or storage of electricity or gas, which is located within the Union or linking the Union and one or more third countries."
(2011/0300/COD)

As one can read in this definition the economic so called "hard" version of the term infrastructure is being used. As "hard" relates here to the physical equipment of the infrastructure.

Physical equipment refers in this definition to the technical structures that support a society, such as roads, water supply, sewers, electrical grids, telecommunications, and so forth. These technical structures can be defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions" (Fulmer, 2009). In other words, the services and facilities, which are necessary for an economy to function (Sullivan, 2003).

Besides the "hard" physical definition of energy infrastructure, energy infrastructure has more specific characteristics which are important. One main characteristic of energy infrastructure is that it is a capital good. According to Fourie (2006) energy infrastructure relates "to capital goods as opposed to consumption goods". "Even though the services provided by infrastructure are consumed by firms and households (for example, water and electricity), the infrastructure providing these services are stock variables". Another characteristic of Energy infrastructure is that according to the same Fourie (2006): "Energy infrastructure is provided with a long-term perspective; infrastructure projects have high initial fixed-costs with maintenance, replacement or upgrading costs over time". Subsequently those high initial fixed-costs makes that infrastructure systems or networks are known by the fact that energy infrastructure is often monopolistic in terms of local or regional control of a good or service and typically involve substantial capital investment (Fulmer, 2009). The last main aspect of energy infrastructure is that the physical equipment of infrastructure

is often not bound by boundaries. Additionally Infrastructure can be divided in three levels, local, national and transnational (Fourie, 2006).

In practice for electricity examples of energy infrastructures are according to the OECD (2012): Electrical power network (including generation plants), electrical grid, substations, and local distribution. Grid has its own specific meaning in the case of energy infrastructure. The electricity production and distribution infrastructure is also known as 'The grid'. The grid consists of transmission lines, power transformers, metering equipment, and electric generation control systems.

3.3. EU Energy infrastructure problems

Energy infrastructure has been explained. Following from that energy infrastructure problems can be elaborated upon. The focus for those problems will be on energy infrastructure problems that EU member states are facing. According to the Commission there are two main problems the EU member states are facing concerning energy infrastructure: The increasing shares of generation from Renewable Energy Sources (hereafter RES) and the additional needs for market integration and security of supply. Those two problems are converging on an underlying problem, the lack of investment in EU energy infrastructure. There are a lot of EU specific barriers that cause the lack of investment in energy infrastructure.

3.3.1. Energy infrastructure problems

With the start of the industrialization era, the European electric infrastructure was developed "to satisfy national needs which were largely based on fossil and nuclear generating plants located near important load areas" (Battaglini et al., 2012). Nowadays the situation has totally changed. The reasons are that the European electric infrastructure is near the end of its lifetime (Buijs et al., 2011) and is not calculated on renewable energy sources and on today's energy problems (Battaglini et al., 2012).

The International Energy Agency (hereafter IEA) gives in their world energy outlook 2013 a good overview of today's and future energy problems. The world energy demand will increase by one third until 2035 according to the IEA in their world energy outlook 2013. This increase is mainly accounted for by Asian countries such as India. Energy consumption stabilizes in the European countries.

The world remains addicted to fossil fuels, however renewable sources are becoming increasingly important in the energy mix. In the scenario of the IEA electricity demand increases over the next twenty years by as much as two-thirds, of which half will be generated in a sustainable manner. The

IEA predicts that the share of electricity generated by renewable sources will thus increase by 20% in 2011 to 31% by 2035. In addition the EU has set their own climate goals as greenhouse gas emissions 20% lower than 1990, 20% of energy from renewables and 20% increase in energy efficiency in 2020 (Europe 2020). In Europe, the high energy prices have more influence on economic developments than in the US and China. Which is because energy can be produced more inexpensively over there and Europe is more dependent on the import of energy.

Those problems have their influence on the energy infrastructure of the Europe. When one reads Energy 2020, the Monti report or any important strategic policy of the EU, one discovers that they all declare one thing: “the new challenge for 2020 is to provide the backbone for electricity and gas to flow where it is needed. Without a proper infrastructure across Europe, comparable to the means of transport of other strategic sectors such as telecommunications or transport, the market will however never deliver on its promises” (Energy 2020).

According to their ‘Energy infrastructure priorities for 2020 and beyond - A Blueprint for an integrated European energy network’ from 2011 the main challenges for electricity infrastructure are reflected in two points, increasing shares of generation from RES and additional needs for market integration and security of supply.

3.3.1.1. Increasing shares of generation from RES

The increasing share of generation from RES creates two kinds of problems for the energy infrastructure of EU Member States. First, the current energy infrastructure of the EU member states is not able to cope with the increasing numbers of volumes of renewable energy. Secondly the current energy infrastructure is not able to get the renewable energy where it is needed or to cope with the renewable energy source at all.

The EU Commission confirms the IEA about the important role of energy generation from renewable sources in their EU blueprint 2011. About electricity specifically the EU Commission expects a rising demand and a double amount of electricity generated from renewable energy sources in the period between 2007 -2020.

More exact numbers of the increase and the forms of RES according to electricity are being researched by PRIMES. As a partial equilibrium model for the EU energy markets, PRIMES is used for forecasting, scenario construction and policy impact analysis up to the year 2030 (website European Commission, 2015). Total numbers of the growing demand of electricity are according to the PRIMES,

EU-27 gross electricity generation is projected to grow by at least 20% from about 3,362 TWh in 2007 to 4,073 TWh in 2030 under the PRIMES reference scenario and to 4,192 TWh under PRIMES baseline, even without taking into account the possible effects of strong electro-mobility development. The share of renewables in gross electricity generation is expected to be around 33% in 2020 according to the Reference scenario, out of which variable sources (wind and solar) could represent around 16% as also can be seen in this figure:

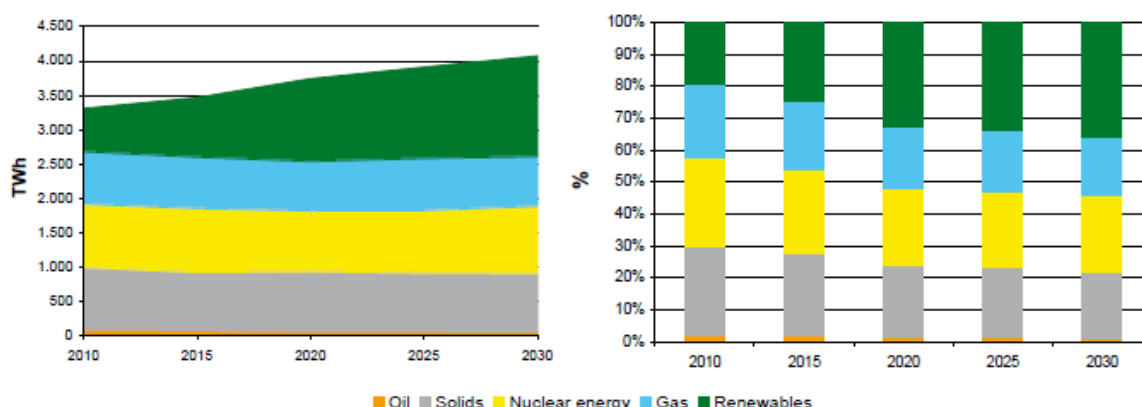


Figure 1: Gross power generation mix 2000-2030 by source in TWh (left) and corresponding shares of sources in % (right), PRIMES reference scenario

For electricity, those renewables are divided in the following table:

RES type	Generation 2010 (TWh)	Generation 2020 (TWh)	Share 2020 (%)	Variation 2010-2020 (%)
Hydro	342.1	364.7	32%	7%
Wind	160.2	465.8	40%	191%
Biomass	103.1	203	18%	97%
Solar	21	102	9%	386%
Other	6.5	16.4	1%	152%
TOTAL	632.9	1151.9	100%	82%

Table 1: Projected evolution of renewables electricity generation in GW, 2010-2020

There are numerous studies according to Battaglini (2012) pointing to the fact that the existing European electricity grid is inadequate to cope with the numbers of renewable electricity mentioned above. For example the ECF (2010) report is concluding that the current high voltage transmission grid architecture is already slowing down the spreading of renewable energies (Battaglini et al., 2012). According to ENTSO-E (2010) 42,000 km of transmissions lines need to be upgraded or

constructed in Europe to secure market integration, security of supply and to accommodate the renewable expansion planned for 2020. However, the construction of new power lines is extremely slow. In some countries not a single overhead power line at voltages higher than 200 kV exceeding 5 km has been built in the last 10 years (ETSO (now known as ENTSO-E), 2006). Numerous interconnection projects turn out to be trapped in the preparation stage and were never realized (European Commission, 2007a). This is confirmed in the EU energy infrastructure blueprint which states that the use of wind energy has been slowed down by insufficient grid connections. The SUSplan (PLANning for SUStainability, was a project initiated in 2008 under the European Union's 7th Framework Programme and was sponsored by the Directorate General for Energy (DG-ENER)) (SUSplan, 2011) report about development of energy infrastructure, adds, *"The region where additional RES generation is deployed does not necessarily correspond to the region where thermal generation is displaced or where electricity consumption growth is strongest. The level of 'mismatch' determines the need to expand European trans-national electricity infrastructure"*. (e. g. Germany) Thus EU member States are not always able to get the renewable generated energy where it is needed.

And on the long run according to the blueprint these issues are compounded by the EU decarbonization goal to reduce our greenhouse gas emissions by 80-95% by 2050, and raise the need for further developments, such as an infrastructure for large-scale electricity storage. A so-called smart grid for a more effective supply and demand of electricity, charging of electric vehicles, CO₂ and hydrogen transport and storage. The infrastructures built in the next decade will largely still be in use around 2050.

3.3.1.2. Additional needs for market integration and security of supply

Additional needs to reach the goals of EU Energy policy (as elaborated on in the previous chapter) are revealing specific European energy infrastructure problems. Member States are especially protective of their own energy supplies and energy mix. The cooperation between member states needs to be improved. With the current European Energy infrastructure the completion of the single European energy market and security of supply for each member state cannot be guaranteed.

Although the recognition of the importance of the infrastructure dimension of the single market and the central role played by the EU in developing Trans-European networks is a fact (Monti rapport, Europe 2020, Barysch, 2011, Buchan, 2011), yet a large amount of obstacles occur to prevent action as Monti phrases it as 'thinking European' in the development of European Energy infrastructure.

In the first place, to be able to handle the increasing share of generation from RES is only possible with additional interconnections within the EU and with neighboring countries. This cannot be done within member states alone. The EU pays nowadays the price for its outdated and poorly interconnected energy infrastructure (European Commission, 2010b).

Another aspect of poorly interconnected energy infrastructure is that security of supply for all EU Member States cannot be guaranteed. That the interconnections between EU member states can be improved came clear from the Ukraine gas crisis in 2009. The EU wasn't able to deliver gas to the Ukraine at any other way after Russia closed their gas stream to the Ukraine ("lack of reverse flow options and inadequate interconnection and storage infrastructures").

Security of supply can be improved through better access to electricity and gas from other countries within Europe as well as abroad as the SUSplan (2011) mentioned in their report. The grids must be urgently extended and upgraded to foster market integration and maintain the existing levels of system's security, but especially to transport and balance the electricity. Removing the bottlenecks (barriers) that are prohibiting transport and balancing the electricity is essential in this case (SUSplan, 2011).

Concerning the integrated electricity market there are still regulatory preferences that push artificial trades between the nations, with consequence on the flows in the network. The net production costs are not the same and this can cause market disturbances (European Commission, 2010b and SUSplan, 2011). More and better interconnections between member states also reduce economic inequality in the EU.

Furthermore, the risk and cost of disruptions and wastage for member states alone will become much higher unless the EU invests as a matter of urgency in smart, effective and competitive energy networks, and exploits its potential for energy efficiency improvements (European Commission, 2010b). Those risks are high because according to Ecofys (2008) most of the European transmission systems needs to be renewed, adapt or improved because those systems are more than thirty or forty years old.

The numbers of needed investments in European energy infrastructure according to the sources differ but are substantial. The EU Commission estimates that around one trillion euros must be invested in our energy system between today and 2020 in order to meet energy policy objectives and climate goals. About half of that number will be required for networks, including electricity and gas distribution and transmission, storage, and smart grids (European Commission, 2010b). However according to Buijs (2011) the IEA estimates "the required investments in transmission infrastructure

for the period 2007–2030 at 187 billion US dollar and an additional 567 billion dollar is estimated as investment need in the distribution grid between 2007 and 2030”.

3.3.1.3. Conclusion

On the basis of the EU energy infrastructure blueprint (2011) and the other sources mentioned the problems for EU energy infrastructure are: that the infrastructure is aging, the current energy infrastructure is not calculated on the increasing shares of generation from RES and the current energy infrastructure is not calculated on the additional needs for market integration and security of supply. A lot of investments in the European energy infrastructure are needed. This leads to the overarching problem, the lack of investments (and the lack of cross border investments) in European energy infrastructure.

3.3.2. Obstacles of lack of investment in European energy infrastructure

As mentioned in the previous chapter the EU is already aware of the investment problems in EU energy infrastructure and tries with their latest energy infrastructure packages to stimulate more investments in EU energy infrastructure. Accordingly to the European Commission with more investments in European Energy infrastructure, the EU has economic benefits from better market integration, better security of supply and better use of RES to gain. As a result European Energy Infrastructure will become more developed. Apparently because of investment problems this development cannot be left to market itself. There are a lot of obstacles that cause a lack of investment in EU energy infrastructure.

A lot of studies Battaglini, 2012 gives an overview, (ENTSO-E, 2010), (European Commission, 2007), (Greenpeace, 2008), (EWIS, 2007), (Eclareon, 2012) have been elaborated on the obstacles which cause lack of development of energy infrastructure. The main obstacles for lack of energy infrastructure development are according to those studies, the lack of appropriate regulatory frameworks and public acceptance for energy infrastructure. Relatively non important obstacles for energy infrastructure are technical obstacles (Battaglini, 2012).

However the overview of Battaglini (2012) is not comprehensive, because investment and financial issues are not concluded in the overview. Consequently for a good overview of all obstacles this chapter uses the division of the SUSplan (2011) report as framework. This division reflects the main non-technical obstacles to Energy infrastructure deployment and also added investment and financial issues. This overview is necessary because most of the obstacles are overlapping.

3.3.2.1. The main non-technical obstacles to Energy infrastructure deployment

The division of SUSplan (2011) for energy infrastructure problems contains infrastructure development issues, investment and financial issues, authorization procedures and infrastructure management issues. Each issue will be elaborated upon on the basis of their main obstacles.

Infrastructure development issues

There are a lot of development obstacles concerning energy infrastructure which cause lack of infrastructure deployment. Development here means especially planning and long-term vision. This section will discuss the four main obstacles.

The first main obstacle is lack of long term vision and lack of long term integrated development. This is clear by the absence of European or national guidelines for strategic and long-term grid planning (Greenpeace, 2008 and EWIS, 2007) which makes it difficult to plan energy infrastructure deployment (See also obstacle 11, figure 2).

Secondly when there is a plan, another main development obstacle is complicated planning procedures. Lack of coordination of network planning mostly related to the non-coordinated and non-harmonized action of the national authorities responsible of energy infrastructures (Evides and Mercados, 2010 and SUSplan, 2011) cause infrastructure projects to delay.

Thirdly, differences in network security standards are one main energy infrastructure development obstacle. This is an obstacle because national regulators or other authorities might apply different network security standards to deliver a high quality of supply for their respective system areas in case of a failure of the largest single infrastructure (SUSplan, 2011) which might conflict with the desire of security of supply for all EU member states.

Fourthly and the last main energy infrastructure development obstacle is lack of proper incentives for TSOs (transmission system operators) to make cross-border investments. This is an obstacle because “TSOs are often confronted with pressure from the regulator to keep transmission tariffs low. Keeping these tariffs low often implies postponing investments, which has a return only on the short run” (Buijs et al., 2011) subsequently, does not initiate energy infrastructure development.

Investment and financial issues

Investment and financial issues are in addition to the overview of Battaglini (2012) making this overview more compressive. Especially the national based orientation of EU member states in this area causes lack of infrastructure deployment. This paragraph will discuss the four main obstacles.

The first main investment and financial obstacle is nationally orientated legal and regulatory regimes. This is an obstacle because large variation in legal and regulatory treatment of new cross-border infrastructure of EU member states obstructs new infrastructure investments (SUSplan, 2011).

Secondly a main investment and financial obstacle is national orientation and incompatibility of support schemes. As cross-border benefits of infrastructure projects of European interest are often not taken into account when EU member states are looking at national energy infrastructure projects (SUSplan, 2011). EU member states only look at their national priorities which obstructs cross-border energy infrastructure (See also obstacle 11, figure 2).

Thirdly, unequal financing opportunities are a main investment and financial obstacle. Financing opportunities of new network investments are unequal between member states. Especially because of different regulatory rates of return for investments by national authorities (European energy Infrastructure package) which obstructs cross-border energy infrastructure.

Fourth and last main financial and investment obstacle is lack of appropriate international infrastructure cost-allocation. Since cost-allocation across borders or direct funding from the European Level has been limited (Buijs, 2010). In combination with the previous investment and financial points this obstructs cross-border energy infrastructure and creates inequalities.

Authorization procedures

In almost all research papers authorization procedures are present and one of the main causes of lack of energy infrastructure deployment. This paragraph will discuss the three main obstacles.

The first main obstacle is long, complicated and uncertain authorization procedures. The large variety of different authorization and permitting procedures at different levels (national, regional, local) and badly designed procedures makes the length of authorization procedures often unpredictable and time-consuming and lacking transparency (Battaglini et al., 2012), (SUSplan, 2011), (European Commission, 2007) and (ETSO, 2006) (See also obstacle 7, figure 2). According to the European Commission this is the result of insufficient regulatory frameworks.

Secondly a main authorization obstacle is lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation. This is an obstacle because new energy infrastructure projects can produce a strong NIMBY (not in my backyard) attitude by the public opinion for health, safety or environmental risks (European Commission, 2007) (See obstacle 1 t/m 4, Figure 2). Mechanisms to compensate aggrieved parties might be lacking (Lobato et al., 2009).

Consequently lack of public acceptance is the last main authorization obstacle. Public opposition (to the construction of new overhead power lines) is identified as a major cause preventing the expansion of the electricity grid (Eclareon, 2012), (European Commission, 2007a) (See obstacle 1 t/m 4, Figure 2).

Infrastructure management issues

Infrastructure management obstacles cause lack of energy infrastructure deployment; especially deploying the right infrastructure at the right place. This paragraph will discuss the three main obstacles.

The first main infrastructure management obstacle is discrepancy of RES potential and energy demand. This is an obstacle because of the regions where additional RES generation is deployed does not necessarily correspond to the regions where thermal generation is displaced or where electricity consumption growth is strongest (SUSplan, 2011). This makes it difficult to develop the most suitable energy infrastructure in the correct regions.

Secondly, insufficient power system flexibility is a main infrastructure management issue. This is a problem since insufficient flexibility in the use (choice) of technology (Steinbach, 2013) makes grid expansion difficult. This in combination with the point above leads to energy infrastructure not being used to its full potential.

Third and last main infrastructure management obstacle is inefficient allocation of interconnection capacity. The fact that most allocations of cross-border capacity are still not coordinated between different countries brings to neglect the existence of loop flows through third countries and leads to the necessity to increase security margins (SUSplan, 2011). Which might conflict with the desire of security of supply for all EU member states.

Concrete examples of these obstacles

Finally as the literature has pointed out the lack of appropriate regulatory frameworks and public acceptance for energy infrastructure are the main obstacles for deployment of energy infrastructure some concrete example are added to these obstacles for better understanding of the problem. In the Priority Interconnection Plan (PIP) of the EU Commission in 2007 concrete obstacles are identified for specific cross border European energy infrastructure projects see Figure 2. “Although only cross-border projects are assessed, most of the identified barriers are not related to the cross-border character” (Buijs et al., 2011). The main ones are reflected in the overview.

Obstacles for PIP projects (based on data in European Commission, 2007b).

	Obstacle	# Projects
1	Electromagnetic fields (EMF)	11
2	Environmental issues	9
3	Visual impact	7
4	Densely populated/urban/rural areas	7
5	Grid issues	9
6	Dependency on other project(s)	2
7	Authorization procedure and legal framework	12
8	Identification of cross-border points	3
9	Commercial problem	3
10	Difficult terrain and weather	4
11	No perception of supra-national or European perspective	2

Figure 2: Obstacles for PIP projects

Reasons for lack of appropriate frameworks are; convincing the public of the usefulness of a project, the problem of local veto powers and procedures can be badly designed.

Long and uncertain permit procedures were indicated by industry as well as TSOs and regulators, as one of the main reasons for delays in the implementation of infrastructure projects, notably in electricity (EU Commission, 2010b). With respect to cross-border projects, this is worsened by differences in authorization systems across borders (SUSplan, 2011).

The European Commission (2011) writes about this; public resistance due to (assumed) damage to the environment and safety risks may impede network investments. This may be explained by lack of political coordination between Member States, preventing projects of European interest to get the backing they need to overcome problems during implementation.

This leads in practice concerning financing electricity networks to the following problem; the different timescale of the generation and transmission investments constitutes a serious barrier for the planning. Whereas a new generation power plant can be entirely built within a couple of years, a new line is built in no less than five years, and the authorization path can stretch over ten years (SUSplan, 2011) which makes it very hard to invest in European Energy infrastructure.

3.3.2.2. Conclusion

This chapter aimed at giving a clear, distinctive and comprehensive overview of the obstacles of investing in EU energy infrastructure. However, despite of all the literature used here, it still has some limitations. Not all the obstacles are that distinctive: complicated planning procedures and authorization procedures as obstacles are much alike, as are the obstacles of insufficient power system flexibility and discrepancy of RES potential and energy demand. Moreover, the found obstacles are especially relevant for RES.

4. What does the Framework Strategy of the ‘Energy Union’ say about Energy Infrastructure?

In this chapter a content analysis will be done of the main policy documents on the ‘Energy Union’, in order to find out what the ‘Energy Union’ has to say about energy infrastructure. First the method will be described and a general overview of the outcome will be given (in section 4.1). Then (section 4.2) the results will be described in more detail.

4.1. Method

This chapter elaborates on the main obstacles for investing in European Energy infrastructure as they have been addressed in the previous chapter. For this research the five main policy documents (till now) of the ‘Energy Union’ will be analyzed.

1. A Framework Strategy for a Resilient ‘Energy Union’ with a Forward-Looking Climate Change Policy – European Commission (2015a).
2. Roadmap for the ‘Energy Union’ – European Commission (2015b).
3. European Commission ‘Energy Union’ Fact Sheet – European Commission (2015c).
4. The European Council summaries on the ‘Energy Union’ – European Council (2015a).
5. Connecting power markets to deliver security of supply, market integration and the large-scale uptake of renewables European Commission Fact sheet– European Commission (2015d).

There is one other document that could have been used; however that is a citizen summary of the ‘Energy Union’ and it does not add new information.

These 5 documents will be checked on keywords (that stay close to the obstacle and to electricity) to see if the obstacles that have been identified in the previous chapter as main obstacles to adequate energy infrastructure, are addressed in the documents or not. If the obstacle is not directly reflected in the text of the document the search of the obstacle in the text has been extended with synonyms. If the results of the search in the first document is concrete and the obstacle is addressed in the first document. The other four documents are besides the keywords also checked if they relate to the results of the first document. The result of all the documents will be shown in tables 4 to 17.

4.1.2. Overview of outcomes

To start with all documents have been checked with the general term infrastructure. Is the term used in a relevant way or not? Is it related to electricity or is it related to gas, transport or fuels and thus not relevant for this research? Table 2 shows the results.

Nr.	Policy documents	How many times the word Infrastructure appears in the documents		
		relevant	concrete	Not relevant
1	A Framework Strategy for a Resilient 'Energy Union' with a Forward-Looking Climate Change Policy	17	6	4
2	'Roadmap for the 'Energy Union''	3	3	0
3	EU Commission 'Energy Union' Fact Sheet	6	1	1
4	The European Council summaries on the 'Energy Union'.	1	1	0
5	Connecting power markets to deliver security of supply, market integration and the large-scale uptake of renewables European Commission Fact sheet	11	8	3

Table 2: Term infrastructure used in the documents

Let us have a closer look at the five documents. In the first three documents the five dimensions of the 'Energy Union' are the basis of the lay-out of these documents.

The main document is: A Framework Strategy for a Resilient 'Energy Union' with a Forward-Looking Climate Change Policy. European Commission (2015a), 'Energy Union' Package, Brussels, 25.2.2015. This document has a chapter for 'Energy Union' Governance and Delivering the 'Energy Union' and it ends with the 'Energy Union' in fifteen action points. The first 8 of them are very important. In any case of all the documents this is the most important document. The main focus of this analysis has been on this document.

The second important document is the annex to the first document. 'Roadmap for the 'Energy Union'' European Commission (2015b), 'Energy Union' Package, Brussels, 25.2.2015. This document accompanied the previous document and is a roadmap with concrete actions on how to realize the

‘Energy Union’ with a timetable and actions corresponding with the 5 dimensions of the EU energy policy in various areas: Infrastructure, Electricity, Retail, Gas, Regulatory framework, Renewables, Climate Action, Transport actions, Energy efficiency, Heating and Cooling, External Energy and Climate Policy, Industrial competitiveness, Cross cutting measures and Nuclear. An example of an infrastructure action point and how the scheme looks like from the Roadmap document is given in table 3.

Actions	Responsible party	Timetable	SoS	IEM	EE	GHG	R&I
Infrastructure							
Effective implementation of the 10% electricity interconnection target	Commission Member States National Regulatory Authorities Transmission System Operators	2015-20	X	X		X	

Table 3: View of the Roadmap document

Key: SoS: Security of Supply / IEM: Internal Energy Market / EE: Energy Efficiency / GHG: Greenhouse gases / R&I: Research and Innovation.

The third document is European Commission ‘Energy Union’ Fact Sheet. (2015b), MEMO/15/4485, Brussels, 25 February 2015. This document answers questions about the ‘Energy Union’ corresponding to the 5 dimensions of the EU energy policy.

The Fourth document is the European Council summaries on the ‘Energy Union’. European Council (2015a), Press release, Energy, 139/15, Brussels 19.03.2015. Already mentioned in paragraph 2.2 the summaries of the European Council are now used to give a more balanced view of the ‘Energy Union’ and to catch the latest developments.

The Fifth and last document is the communication plan of the EU Commission for: Connecting power markets to deliver security of supply, market integration and the large-scale uptake of renewables fact sheet (2015d), MEMO/15/4486, Brussels, 25 February 2015. This document is actually a plan of the Commission that stands beside the ‘Energy Union’ plan. Nevertheless it was introduced together with the Framework document and explains how the EU Commission wants to achieve their interconnection targets which are an important point in the ‘Energy Union’.

4.2. 'Energy Union' documents findings

For the main analysis the same framework as used in the previous chapter will be used to display the findings. The documents of the 'Energy Union' will be checked if they address the main non-technical obstacles to Energy infrastructure deployment or not. And if so to what extent the obstacle is addressed.

4.2.1. Infrastructure development issues

Table 4 will show the findings of the obstacle lack of long term vision and integrated development.

	Lack of long term vision and integrated development
	'Energy Union' Documents findings:
1	<p><i>'Our vision is of an 'Energy Union' where Member States see that they depend on each other to deliver secure energy to their citizens, based on true solidarity and trust, and of an 'Energy Union' that speaks with one voice in global affairs;</i></p> <p><i>Our vision is of an integrated continent-wide energy system where energy flows freely across borders, based on competition and the best possible use of resources, and with effective regulation of energy markets at EU level where necessary; (Document 1, page 2)</i></p> <p><i>The 'Energy Union' also needs an integrated governance and monitoring process, to make sure that energy-related actions at European, regional, national and local level all contribute to the 'Energy Union's objectives.</i></p> <ul style="list-style-type: none"> - <i>bring together energy and climate actions as well as actions in other relevant policy areas, leading to more and longer-term policy coherence. This also provides long term certainty and guidance for investors; (document 1, page 17)</i> <p><i>Energy infrastructure is ageing and not adjusted to the increased production from renewables. There is a need to attract investments, but the current market design and national policies do not set the right incentives and provide insufficient predictability for potential investors (document 1, page 3)</i></p> <p><i>A specific minimum interconnection target has been set for electricity at 10% of installed electricity production capacity of the Member States, which should be achieved by 2020. The necessary measures to achieve this 10% target are set out in the Commission Communication presented with this 'Energy Union' Strategic Framework. In 2016, the Commission will report on the necessary measures to reach a 15% target by 2030. (document 1, page 8)</i></p> <p><i>Action Point</i></p> <p><i>The right infrastructure is a precondition for completing the energy market, integrating renewables and security of supply.</i></p> <p><i>The Commission will support the implementation of major infrastructure projects, particularly the Projects of Common Interest, through the available financial means, the Connecting Europe Facility, the European Structural and Investment Funds and the future European Fund for Strategic Investments to leverage the necessary private and public funding. (document 1, page 19)</i></p> <p><i>The Commission will bring together information on EU-funded infrastructure projects to bring more coherence and to maximise their impact. (document 1, page 19)</i></p> <p><i>The Commission will create a dedicated Energy Infrastructure Forum to discuss progress on major infrastructure projects with Member States, regional cooperation groups and EU institutions. It will meet for the first time in late 2015. (document 1, page 19)'</i></p>

2	<p><i>'Effective implementation of the 10% electricity interconnection target 2nd list of Projects of Common Interest (PCI) – leading to Commission Delegated Act (document 2, page 2)</i></p> <p><i>Communication on the progress towards the completion of the list of the most vital energy infrastructures and on the necessary measures to reach the 15% electricity interconnection target for 2030.</i></p> <p><i>Establish an Energy Infrastructure Forum (document 2, page 2)'</i></p>
3	<p><i>'The 'Energy Union' is based on the three long-established objectives of EU energy policy: security of supply, sustainability and competitiveness. To reach these objectives, the 'Energy Union' focuses on five mutually supportive dimensions: Energy security, solidarity and trust; the internal energy market; energy efficiency as a contribution to the moderation of energy demand; decarbonisation of the economy; and research, innovation and competitiveness. All these dimensions are areas that require more integration and coordination. Within these dimensions, the action plan annexed to the framework strategy presents specific measures that will be prepared and implemented over the next years. This action plan will be followed-up and reviewed as time progresses to ensure that it keeps responding to evolving challenges and new developments (document, 3 page 1)'</i></p>
4	<p><i>'While emphasising the importance of all dimensions of the 'Energy Union', today, the European Council focused on some of the aspects and called for:</i></p> <p><i>a) accelerating infrastructure projects, including interconnections in particular to peripheral regions, for electricity and gas 1 to ensure energy security and a well-functioning internal energy market; (document 4, page 1)'</i></p>
5	<p><i>'The main tool for reaching the target is through the list of infrastructure 'projects of common interest'(PCIs). The first list was adopted in 2013, containing 248 projects. 37 of these are electricity interconnection projects in Member States below the 10% target. All these projects benefit from accelerated licensing procedures, improved regulatory conditions, and some will have access to financial support. The PCIs will significantly contribute to achieving the target. In fact, when the foreseen projects will be completed, by 2020 all of the Member States (except for Spain and Cyprus) will achieve the 10% target. The PCI list will be updated every two years in order to integrate new projects and remove those that have been completed. (document 5, page 2)</i></p> <p><i>What are the next steps for the Commission? The Commission will intensify its support for the critical projects through several targeted measures. It will assess each project to identify and help address any obstacles and risks that might delay construction. It will help bring together the infrastructure project promoters in order to help tackle any technical, planning, design and implementation issues and facilitate their contacts with the European Investment Bank and other banks. The Commission will follow up the implementation by the Member States of all relevant EU laws, notably the TEN-E Regulation. It will work closely with the Agency for the Cooperation of Energy Regulators and with Member States to ensure that the implementation of the projects takes place on time. Regional fora are an important tool to ensure better cooperation of Member States also in the context of infrastructure building. The Commission will report annually to the European Council on the implementation of PCIs and on progress in reaching the 10% target. Still in 2015 the Commission will convene the first Infrastructure Forum to discuss and find solutions to issues that are common to all regions across Europe. (document 5, page 3)'</i></p>

Table 4: Lack of long term vision and integrated development

The words long-term, vision, integrated and development all occur in the Framework document.

The framework itself is document that wants a long term integrated development (integrated energy market). The first chapter of the framework is a long vision on why there needs to be an 'Energy Union'. The most important ones are shown in the table. The Framework document is stating something on how it wants to reach this vision in combination with the long term and integrated governance. The Framework document is also concrete concerning infrastructure. An interconnection target has been set together with a plan by itself. And the Framework document has added an action point for infrastructure.

In the Roadmap document has infrastructure its own page and it formulates three points of which one can say are some kind of vision. In the Factsheet document a clear vision is described however not directly related to energy infrastructure. In the Council document one of the main concrete points is about infrastructure. So this does give a vision. In the Connecting power document concrete points of what the Commission has to do are given related to energy infrastructure.

Table 5 shows the findings of the obstacle complicated planning procedures.

	Complicated planning procedures
	'Energy Union' Documents findings:
1	<p><i>'The 'Energy Union' also needs an integrated governance and monitoring process, to make sure that energy-related actions at European, regional, national and local level all contribute to the 'Energy Union's objectives. The governance process should serve the following purposes: (document 1, page 17)</i></p> <p>- <i>streamline current planning and reporting requirements, avoiding unnecessary administrative burden;</i></p> <p><i>Transmission system operation will need to become much more integrated to meet the challenges of the transformed energy system. The European Networks of Transmission System Operators for Electricity and Gas (ENTSO-E/G), which were also set-up by the 3rd Internal Energy Market Package, need to be upgraded to fulfil such a role. Regional operational centers will have to be created, so that they can effectively plan and manage cross-border electricity and gas flows. (document 1, page 9)'</i></p>
2	The obstacle is not identified in the Roadmap document.
3	<i>'the governance process should streamline existing planning and reporting mechanisms for energy and climate policies and reduce unnecessary administrative burdens while monitoring the implementation of the acquis communautaire. (document 3, page 2)'</i>
4	The obstacle is not identified in the Council document.
5	The obstacle is not identified in the Connecting plan.

Table 5: Complicated planning procedures

The words complicated and procedures do not occur in the Framework document. The word planning occurs one time in the framework document. The word plan as derivative of planning occurs one time in the Framework document however complicated planning as an obstacle is not directly addressed.

In the Roadmap document, complicated planning is not identified in any way. In the Factsheet document, the word planning occurs one time. Nor is complicated planning as an obstacle directly addressed. In the Council document and in the Connecting power document complicated planning is not identified in any way.

Table 6 will show the findings of the obstacle different network security standards.

	Different network security standards
	'Energy Union' Documents findings:
1	<i>'The 3rd Internal Energy Market Package also provided for the adoption of network codes in order to help harmonise the flow of electricity and gas across different transmission systems. This work has to be completed to ensure a better functioning of cross-border energy markets. (document 1, page 9)</i> <i>Strict enforcement of the Treaty's competition rules will help to prevent companies from distorting the internal energy market. Antitrust enforcement will ensure that energy can flow freely by addressing territorial restrictions in supply contracts as well as upstream/downstream and network foreclosure issues (including interconnectors). The Commission will also assess – through competition law enforcement – the evolution and formation of energy prices. (document 1, page 9)'</i>
2	The obstacle is not identified in the Roadmap document.
3	The obstacle is not identified in the Factsheet document.
4	The obstacle is not identified in the Council document.
5	The obstacle is not identified in the Connecting plan.

Table 6: Different network security standards

The words different network security standards are not occurring together in the framework document. However the framework talks about different transmission systems and different network codes and network foreclosure issues.

In the Roadmap document, the Factsheet document, the Council document and the Connecting power document, different network security standards are not identified in any way.

Table 7 will show the findings of the obstacle lack of proper incentives for TSOs (transmission system operator) to make cross-border investments.

	Lack of proper incentives for TSOs (transmission system operator) to make cross-border investments
	‘Energy Union’ Documents findings:
1	<p><i>‘Member States, transmission system operators, the energy industry and all other stakeholders have to work closely together to ensure a high-level of energy security for European citizens and companies. (document 1, page 5)</i></p> <p><i>A well-functioning internal energy market needs an effective regulatory framework. The 3rd Internal Energy Market Package set up bodies to ensure cooperation among transmission system operators and regulators. In the context of the market design discussion, the functioning of these bodies will be strengthened. Currently decisions in these bodies still reflect national views. (document 1, page 9)</i></p> <p><i>Transmission system operation will need to become much more integrated to meet the challenges of the transformed energy system. The European Networks of Transmission System Operators for Electricity and Gas (ENTSO-E/G), which were also set-up by the 3rd Internal Energy Market Package, need to be upgraded to fulfil such a role. Regional operational centres will have to be created, so that they can effectively plan and manage cross-border electricity and gas flows. (document 1, page 9)</i></p> <p><i>Technical implementation of the different elements of our ‘Energy Union’ strategy will be very complex. Some elements, such as new market arrangements for short term markets in gas and electricity or integrating the operations of transmission system operators should be developed and implemented at regional level as a step towards full EU-wide market integration. (...). The Commission will ensure that all regional initiatives evolve in a coherent way and lead towards a fully integrated Single Energy Market. (document 1, page 11)</i></p> <p><i>6. The regulatory framework set-up by the 3rd Internal Energy Market Package has to be further developed to deliver a seamless internal energy market to citizens and companies.</i></p> <ul style="list-style-type: none"> <i>- The Commission will review the regulatory framework, in particular the functioning of ACER and the ENTSOs, in 2015-2016 and will propose appropriate actions to reinforce the European regulatory framework. (document 1, page 20)</i> <p><i>However, this will only work if market prices send the right signals. In a number of Member States, regulated tariffs still limit the development of effective competition, which discourages investments and the emergence of new market players. Regulated end-user prices are often used to protect households or even non-household customers from increases in energy costs. The impact of such measures falls on non-regulated customers, on electricity companies and/or public finances, where electricity tariff deficits are incurred. However, in the long run, these measures harm the interests of the consumers they are meant to help. The Commission will seek the phasing-out of below cost regulated prices through the competition and economic governance frameworks. It will also encourage Member States to establish a road map for the phasing-out of all regulated prices. (document 1, page 12)’</i></p>

2	<i>'Effective implementation of the 10% electricity interconnection target</i> - <i>Transmission System Operators (document 2, page 1)</i> <i>Analysis of energy prices and costs (including taxes and subsidies)</i> - <i>Commission (Every 2 years) (document 2, page 9)'</i>
3	The obstacle is not identified in the Factsheet document.
4	The obstacle is not identified in the Council document.
5	The obstacle is not identified in the Connecting plan.

Table 7: Lack of proper incentives for TSOs to make cross-border investments

Transmission System Operators (TSOs) and as ENTSO occurs six times in the Framework document. One time in an action point. Under the word tariffs, the obstacle of the lack of proper incentives is somehow mentioned.

In the Roadmap document, Transmission System Operators and Energy prices (as other word for tariffs) occur one time, however both not directly related to the obstacle as found in document 1. In the Factsheet document, the Council document and the Connecting power document the obstacle of lack of proper incentives for TSO's to make cross-border investments is not identified in any way.

4.2.2. Investment and financial issues

Table 8 will show the findings of the obstacle nationally oriented legal and regulatory regimes.

	Nationally orientated legal and regulatory regimes
	'Energy Union' Documents findings:
1	<p><i>'We have to move away from a fragmented system characterized by uncoordinated national policies, market barriers and energy-isolated areas. . (.)Today, the European Union has energy rules set at the European level, but in practice it has 28 national regulatory frameworks. This cannot continue. (document 1, page 3)</i></p> <p><i>Particular attention will be paid to upgrading the Strategic Partnership on energy with Ukraine. This will address issues related to Ukraine's importance as a transit country as well as those related to Ukraine's energy market reforms, such as the upgrade of its gas network, the setting up of an appropriate regulatory framework for the electricity market and increasing energy efficiency in Ukraine as a means of reducing its dependence on imported energy. (document 1, page 7)</i></p> <p><i>A well-functioning internal energy market needs an effective regulatory framework. The 3rd Internal Energy Market Package set up bodies to ensure cooperation among transmission system operators and regulators. In the context of the market design discussion, the functioning of these bodies will be strengthened. Currently decisions in these bodies still reflect national views. (document 1, page 9)</i></p> <p><i>In an 'Energy Union', consumers in one Member State should be able to make informed choices and buy their energy freely and simply from a company in another Member State. This requires the further adaptation of the current national regulatory frameworks since the vast majority of European households remain passive consumers. In some Member States consumers have a limited choice of suppliers and switching between suppliers is relatively cumbersome. (document 1, page 11)</i></p> <p><i>Full implementation and strict enforcement of existing energy and related legislation is the first priority to establish the 'Energy Union'. There is no point in developing new policies and approaches on weak foundations. (document 1, page 9)</i></p> <p><i>The Commission will use all available policy instruments in this regard and will insist that Member States fully implement and enforce the 3rd Internal Energy Market Package, in particular as regards unbundling and the independence of regulators. Certain ex-ante conditions must be met so that the European Structural and Investment Funds can be used for co-financing energy investments. This will help to ensure compliance with EU energy legislation. (document 1, page 9)</i></p> <ol style="list-style-type: none"> 1. <i>Full implementation and strict enforcement of existing energy and related legislation is the first priority to establish the 'Energy Union'.</i> - <i>The Commission will use all instruments to ensure that Member States fully implement energy legislation, in particular the 3rd Internal Energy Market Package, and it will strictly enforce the Treaty's competition rules.(document 1, page 19)</i> 3. <i>Intergovernmental agreements should comply fully with EU legislation and be more transparent.</i> - <i>The Commission will propose a revision of the Decision on Intergovernmental Agreements in 2016 to ensure compatibility with EU legislation before agreements are negotiated, involve the Commission in such</i>

	<p><i>negotiations, develop standard contract clauses covering EU rules and make commercial gas supply contracts more transparent.(document 1, page 19)</i></p> <p>5. <i>Creating a seamless internal energy market that benefits citizens, ensuring security of supply, integrating renewables in the market and remedying the currently uncoordinated development of capacity mechanisms in Member States call for a review of the current market design.</i></p> <ul style="list-style-type: none"> - <i>The Commission will propose legislation on security of supply for electricity in 2016.</i> <p><i>The Commission will propose a new European electricity market design in 2015, which will be followed by legislative proposals in 2016. (document 1, page 19)</i></p> <p>6. <i>The regulatory framework set-up by the 3rd Internal Energy Market Package has to be further developed to deliver a seamless internal energy market to citizens and companies.</i></p> <ul style="list-style-type: none"> - <i>The Commission will review the regulatory framework, in particular the functioning of ACER and the ENTSOs, in 2015-2016 and will propose appropriate actions to reinforce the European regulatory framework (document 1, page 19)'</i>
2	<p><i>'Review of the Agency for the Cooperation of Energy Regulators (ACER) and the energy regulatory framework – Commission 2015-2016 (document 2, page 4)</i></p> <p><i>Review of the Decision on information exchange mechanism with regard to intergovernmental agreements between Member States and third countries in the field of energy. Commission ,HR/VP 2016 (document 2, page 7)</i></p> <p><i>New and strengthened energy dialogues with countries of importance for EU energy policy (document 2, page 7)'</i></p>
3	<p><i>'Compliance checks for Intergovernmental Agreements (IGAs) are currently carried out after a Member State and a non-EU country have concluded an agreement. In future, the Commission should be informed about the negotiation of intergovernmental agreements from an early stage, so that a better ex ante assessment of IGAs' compatibility with in particular internal market rules and security of supply criteria is ensured. Commission participation in such negotiations with third countries and a move towards standard contract clauses will also more effectively avoid undue pressure and ensure respect of European rules. Therefore, the Commission will review the Intergovernmental Agreements Decision and will propose options to ensure that the EU speaks with one voice in negotiations with third countries. (document 3, page 2)</i></p> <p><i>Will the Commission propose a European energy regulator?</i></p> <p><i>The Commission will consider how to strengthen the European energy regulatory framework so it can better govern the increasingly integrated European energy system. The Commission considers that EU wide regulation of the single market should be strengthened through a significant reinforcement of the powers and independence of ACER. This is necessary for it to effectively oversee the development of the internal energy market and the related market rules as well as to deal with all cross-border issues necessary to create a seamless internal market. (document 3, page 2)</i></p> <p><i>the Commission will:</i></p> <p><i>fully implement existing legislation and put in place new market rules in order to integrate renewable production efficiently into the market, including by the development of new infrastructure, especially interconnections; (document 3, page 3)'</i></p>
4	<p><i>'b)fully implementing and rigorously enforcing existing energy legislation;</i></p> <p><i>c) reinforcing the legislative framework for the security of supply for electricity and gas; energy security can also be strengthened by robust grids, increased energy efficiency and having recourse to indigenous resources as well as safe and sustainable low carbon technologies;(document 4, page 1)'</i></p>
5	<p><i>The obstacle is not identified in the Connecting plan.</i></p>

Table 8: Nationally orientated legal and regulatory regimes

National oriented legal and regulatory regimes did not have success as keywords. However the words national, legislation and regulatory frameworks did. In all areas of the Framework document the term regulatory framework appears. The term even comes back in four action points.

In the Roadmap document the term regulatory framework appears one time and corresponds to one of the action points of the framework document. The other points are reflecting the other action points that are related to the obstacle found in document 1. The same counts for the Factsheet document and the Council document. The three action points appear in the document. In the Connecting power document the obstacle of nationally orientated legal and regulatory regimes is not in any way identified.

Table 9 will show the findings of the obstacle national orientation and incompatibility of support schemes.

	National orientation and incompatibility of support schemes
	'Energy Union' Documents findings:
1	<p><i>'A fully functioning internal energy market, providing efficient investment signals, is the best means to reduce the need for capacity mechanisms .The Commission has already set out guidance (Communication "Making the most of public interventions", C(2013)7243.) and rules (Environmental and Energy State Aid Guidelines (EEAG), OJ C 200, 28.6.2014, p. 1-55.) to limit the detrimental effects of badly-designed, fragmented and uncoordinated public interventions. However, effective application of this guidance can only be a first step to ensure that divergent national market arrangements, such as capacity mechanisms and uncoordinated renewables support schemes become more compatible with the internal market. (document 1, page 10)</i></p> <p><i>Even though in some cases required and justified to address market failures, some forms of public intervention have had a serious negative impact on the effective functioning of the internal energy market. The Commission will work together with Member States to ensure that capacity mechanisms and support for renewable electricity are fully in line with existing rules and do not distort the internal energy market. Environmentally harmful subsidies need to be phased out altogether. A reformed Emission Trading System will also play an important role in setting the right investment signals. The application of Energy and Environmental State aid Guidelines to the support schemes approved to date has partly mitigated the effects of fragmentation, however, further action is needed. (document 1, page 10)</i></p> <p><i>The EU is already on track to meet its 2020 target of 20% renewable energy in its energy mix, costs for new wind and photo-voltaic capacity have reduced significantly due in large part to the EU's commitment in this area, and reform of support schemes to further drive down costs is well under way. But to achieve the 27% target, new challenges must be faced. (document 1, page 15)</i></p> <p><i>In line with the Environmental and Energy Aid Guidelines, renewable production needs to be supported through market-based schemes that address market failures, ensure cost effectiveness and avoid overcompensation or distortion. Low-cost financing for capital intensive renewables depends on having a stable investment framework that reduces regulatory risk. This is necessary to ensure investor confidence and to attract investments from international funds, large scale project promoters and cooperatives and households in a market-based framework that keeps capital costs down. The Commission will facilitate cooperation 26 and convergence of national support schemes leading to more cross border opening through in-depth discussions with Member States on the respective Commission Guidance 27 and the Environmental and Energy Aid Guidelines. (document 1, page 15)</i></p> <p><i>26 Several Member States are looking into using cooperation mechanisms from the Renewable Energy Directive to</i></p>

	<p><i>meet their national targets cost-efficiently. The Commission has been supporting this process by helping Member States to find solutions for technical and financial issues related to these cross-border mechanisms.</i></p> <p><i>27 European Commission guidance for the design of renewables support schemes, SWD(2013)439; Guidance on the use of renewable energy cooperation mechanism, SWD(2013)440.</i></p> <p><i>The Commission will also bring together information on infrastructure projects funded by the Connecting Europe Facility and EU Cohesion Policy Funds, to bring more coherence in the wide array of existing funding schemes and maximise their impact. (document 1, page 8)</i></p> <p><i>5. Creating a seamless internal energy market that benefits citizens, ensuring security of supply, integrating renewables in the market and remedying the currently uncoordinated development of capacity mechanisms in Member States call for a review of the current market design. (document 1, page 20)</i></p> <ul style="list-style-type: none"> - <i>The Commission will propose legislation on security of supply for electricity in 2016.</i> - <i>The Commission will propose a new European electricity market design in 2015, which will be followed by legislative proposals in 2016. (document 1, page 20)'</i>
2	<p><i>'Renewable Energy Package: including a new Renewable Energy Directive for 2030; best practices in renewable energy self-consumption and support schemes; bioenergy sustainability policy.</i></p> <ul style="list-style-type: none"> - <i>Commission 2015-2017 (document 2, page 4)</i> <p><i>Review of the Guidelines on State aid for environmental protection and energy - Commission 2017-2019 (document 2, page 9)'</i></p>
3	<p><i>'facilitate cooperation and the convergence of national renewable energy policies and support schemes in line with the development of the internal market and in particular the new electricity market design, which will ensure fair competition between all generation sources as well as demand and lead to more cross border opening of renewables support; (document 3, page 3)'</i></p>
4	<p>The obstacle is not identified in the Council document.</p>
5	<p><i>'What do you do when a big part of an investment needs to be made by companies in one Member State while there are benefits across the border in another Member State? This issue has been addressed by the Regulation of Trans-European Energy Networks from 2013. The Regulation creates a possibility to allocate costs across borders based on the benefits they generate in the concerned Member State. (document 5, page 2)'</i></p>

Table 9: National orientation and incompatibility of support schemes

The words support schemes occurs 5 times in the Framework. It occurs together with public intervention and capacity mechanisms (state aid for electricity supplies), which obvious stands for national orientation. The term Capacity mechanisms even appears in an action point.

In the roadmap document the words support scheme occurs one time, however it is not directly related to the obstacle. The rest of the keywords used in document 1 do not appear in the Road map document. In the Factsheet document the words support schemes appear one time and is related to the obstacle. In the Council document the obstacle national orientation and incompatibility of support schemes is not identified in any way. In the Connecting power document the obstacle is addressed in such a way that the Trans-European energy network regulation helps with examine the benefits of a project.

Table 10 will show the findings of the obstacle unequal financing opportunities.

	Unequal financing opportunities
	'Energy Union' Documents findings:
1	<p><i>'Finally, the Commission will ensure greater transparency in the composition of energy costs and prices by developing regular and detailed monitoring and reporting, including on impacts of energy costs and prices on competitiveness. Particular attention will be paid to public interventions such as regulated tariffs, energy taxation policies and the level of public support, as well as their impact on pricing mechanisms, including electricity tariff deficits. (document 1, page 10)</i></p> <p><i>8. Greater transparency on energy costs and prices as well as on the level of public support will enhance market integration and identify actions that distort the internal market. (document 1, page 20)</i></p> <ul style="list-style-type: none"> - <i>The Commission will produce biennial reports on energy prices, analyse in depth the role of taxes, levies and subsidies and seek the phasing out of regulated prices below cost.(document 1, page 20)</i>
2	<p><i>Analysis of energy prices and costs (including taxes and subsidies)</i></p> <ul style="list-style-type: none"> - <i>The Commission 2016 and every two years thereafter (document 2 page 9)</i>
3	<p><i>Will the Commission propose energy taxes?</i> <i>The framework strategy for the 'Energy Union' does not include any new initiatives relating to energy taxation at the EU level. The Commission encourages Member States to take a fresh look at energy taxation both at national and European level. National taxation policies should strike the balance between providing incentives for a more sustainable energy use on the one hand and the need to ensure competitively priced and affordable energy to all consumers on the other. It will produce biennial reports on energy prices, with an in-depth analysis of the role of taxes, levies and subsidies, in order to create more transparency on energy costs and prices. (document 3, page 2)</i></p> <p><i>Finally, changes to the ETS Directive will be made to create a legal basis for establishing an innovation fund and a modernisation fund. These two financial vehicles are funded from the proceeds of allowances in 2021 to 2030. The innovation fund will support low-carbon demonstration activities across the EU and the modernisation fund will support the modernisation of energy systems in low income Member States. (document 3, page 4)'</i></p>
4	The obstacle is not identified in the Council document.
5	The obstacle is not identified in the Connecting plan.

Table 10: Unequal financing opportunities

The words unequal financing opportunities are not found in the Framework Strategy. However under public support and transparency there's something to find about unequal financing opportunities. It even appears in an action point.

In the Roadmap document the action point of document 1: *"Greater transparency on energy costs and prices as well as on the level of public support"* also appears. In the Factsheet document the action point is more elaborated and indirectly related to the obstacle of unequal financing opportunities. The document mentions to support to the energy systems of low-income member states with a fund. This is indirect related to the obstacle of unequal financing opportunities. In the Council document and the Connecting power document the obstacle of unequal financing opportunities is not identified in any way.

Table 11 will show the findings of the obstacle lack of appropriate international infrastructure cost-allocation.

	Lack of appropriate international infrastructure cost-allocation
	'Energy Union' Documents findings:
1	<p><i>'EU-wide regulation of the single market should be strengthened, through a significant reinforcement of the powers and independence of ACER to carry out regulatory functions at the European level in order to enable it to effectively oversee the development of the internal energy market and the related market rules as well as to deal with all cross-border issues necessary to create a seamless internal market. Examples for this could be decisions relating to new infrastructure affecting more than two Member States, on exemptions from physical reverse flows in line with the Security of Gas Supply Regulation, cross-border cost allocations under the TEN-E Regulation or similar. (document 1, page 9)</i></p> <p><i>The Commission will also bring together information on infrastructure projects funded by the Connecting Europe Facility and EU Cohesion Policy Funds, to bring more coherence in the wide array of existing funding schemes and maximise their impact. (document 1, page 8)</i></p> <p><i>The transition towards a more secure and sustainable energy system will require major investments in generation, networks and energy efficiency, estimated at some € 200 billion annually in the next decade. While the private sector will bear the costs of much of these investments, access to financing will be key. Today, the European Investment Bank, the Connecting Europe Facility and financing under the European Structural and Investment Funds already provide the means. Moreover, the proposed European Fund for Strategic Investments will provide additional support, hence, further facilitating access to finance for projects of European significance such as in energy networks, renewable energy and energy efficiency. The Commission will explore proposals for energy investment regimes that pool resources to finance economically viable investments, avoiding market distortion and fragmentation. (document 1, page 8)</i></p> <p><i>The Commission will use all available policy instruments in this regard and will insist that Member States fully implement and enforce the 3rd Internal Energy Market Package, in particular as regards unbundling and the independence of regulators. Certain ex-ante conditions must be met so that the European Structural and Investment Funds can be used for co-financing energy investments. This will help to ensure compliance with EU energy legislation. (document 1, page 9)</i></p> <p><i>4. The right infrastructure is a precondition for completing the energy market, integrating renewables and security of supply.</i></p> <p><i>- The Commission will support the implementation of major infrastructure projects, particularly the Projects of Common Interest, through the available financial means, e.g. the Connecting Europe Facility, the European Structural and Investment Funds and the future European Fund for Strategic Investments to leverage the necessary private and public funding.</i></p> <p><i>- The Commission will bring together information on EU-funded infrastructure projects to bring more coherence and to maximise their impact. (document 1, page 19)'</i></p>
2	The obstacle is not identified in the Roadmap document.
3	<p>'How is the Commission going to leverage investment in energy infrastructure?</p> <p><i>Energy infrastructure is typically financed by the market and through tariffs paid by the users of the networks. Only a small number of infrastructure projects in Europe will need grants under the Connecting Europe Facility (CEF) to go ahead. These are projects which are not commercially viable, but are necessary because of the externalities they provide: security of supply, solidarity or technological innovation. Many other projects could make use of other financing methods that provide more leverage than the grants/direct financial aid. This is the case for the financial instruments which are part of the CEF but more so for the European Fund for Strategic Investments (EFSI) which will be a very important instrument complementing the CEF in order to finance energy infrastructure projects in Europe. It will help where financing for projects is not available from other sources on reasonable terms accepting a higher risk profile.</i></p>

	(document 3, page 2)'
4	The obstacle is not identified in the Council document.
5	<p><i>'What do you do when a big part of an investment needs to be made by companies in one Member State while there are benefits across the border in another Member State? This issue has been addressed by the Regulation of Trans-European Energy Networks from 2013. The Regulation creates a possibility to allocate costs across borders based on the benefits they generate in the concerned Member State. (document 5, page 2)</i></p> <p><i>First of all, most of the PCIs present a solid business case and can be financed under normal market conditions, mostly through the tariffs. Some projects, when they meet strict conditions and help enhance security of supply, can benefit from a grant from the Connecting Europe Facility (CEF). €5.35 billion has been earmarked for energy infrastructure projects in the CEF between 2014 and 2020.</i></p> <p><i>Whilst the CEF funding represents only around 3% of all the investment needed up to 2020 in electricity, but also in gas infrastructure, it can leverage other funds through using financial instruments, such as project bonds. To have the expected impact the CEF grants have to be combined with the efforts of regulators and governments to finance projects through network tariffs and by making use of the new European Structural and Investment Funds (ESIF), where possible.</i></p> <p><i>Energy infrastructure is one of the priorities of the ESIF. The Funds could cover PCIs or other interconnection projects, therefore accelerating and complementing the current structure of support for PCIs and beyond. The ESIF will mobilise at least €315 billion in private and public investment across the EU (document 5, page 2). '</i></p>

Table 11: Lack of appropriate international infrastructure cost-allocation

Cost-allocation occurs one time in the Framework document and then as a note. However broader search criteria (funding schemes, public funding, investment regime and co-financing) the obstacle appears in more places. And the obstacle even appears in an action point indirectly.

In the Roadmap document the obstacle lack of appropriate international infrastructure cost-allocation is not identified in any way. In the Factsheet document the obstacle of lack of international cost-allocation is addressed indirectly the action point of the Framework document is more elaborated. In the Council document the obstacle lack of appropriate international infrastructure cost-allocation is not identified. In the Connection power document cost allocation appears one time and is addressed to the obstacle. Further points of the document are addressing the obstacles indirectly.

4.2.3. Authorization procedures

Table 12 will show the findings of the obstacle long, complicated and uncertain authorization procedures.

Long, complicated and uncertain authorization procedures
'Energy Union' documents findings:
<p><i>'The Commission has already set out guidance (Communication "Making the most of public interventions", C(2013)7243.) and rules (Environmental and Energy State Aid Guidelines (EEAG), OJ C 200, 28.6.2014, p. 1-55.) to limit the detrimental effects of badly-designed, fragmented and uncoordinated public interventions. (document 1, page 10)</i></p> <p><i>Finally, the Commission will ensure greater transparency in the composition of energy costs and prices by developing regular and detailed monitoring and reporting, including on impacts of energy costs and prices on competitiveness. Particular attention will be paid to public interventions such as regulated tariffs, energy taxation policies and the level of public support, as well as their impact on pricing mechanisms, including electricity tariff deficits. (document 1, page 10)</i></p> <p><i>8. Greater transparency on energy costs and prices as well as on the level of public support will enhance market integration and identify actions that distort the internal market. (document 1, page 20)</i></p> <p><i>The 'Energy Union' also needs an integrated governance and monitoring process, to make sure that energy-related actions at European, regional, national and local level all contribute to the 'Energy Union's objectives. The governance process should serve the following purposes: (document 1, page 17)</i></p> <ul style="list-style-type: none"> - <i>streamline current planning and reporting requirements, avoiding unnecessary administrative burden;</i> <p><i>Investment decisions in renewable electricity have to take into account the physical realities of resource availability and of the grid; public acceptance; consumption location and administrative barriers. Also, the development of new infrastructure, especially interconnections, needs to lower the cost of integrating renewable electricity into the internal energy market. (document 1, page 15)'</i></p>
The obstacle is not identified in the Roadmap document.
<i>'the governance process should streamline existing planning and reporting mechanisms for energy and climate policies and reduce unnecessary administrative burdens while monitoring the implementation of the acquis communautaire. (document 3, page 2)'</i>
The obstacle is not identified in the Council document.
<p><i>'One of the main obstacles to building new infrastructure is lengthy permit granting procedures. Is there a solution? Indeed, today, on average obtaining the necessary permits can take between 10 and 13 years. The TEN-E Regulation introduces a binding overall time limit of 3.5 years for permit granting. It foresees that a single national competent authority has to act as a one-stop-shop for all permit granting procedures. Such one-stop-shops should be in place in all Member States by spring 2015. (document 5, page 2)'</i></p>

Table 12: Long, complicated and uncertain authorization procedures

As already mentioned by the complicated planning procedures the word procedure is not mentioned in the Framework document. Also the word authorization does not appear in the Framework document. The word badly-designed procedure does not appear either however badly-designed does appear in combination with public intervention (See obstacle National orientation and incompatibility of support schemes).

However as one can read by the obstacle unequal financing opportunities the Framework document is stating about public interventions that: *“Finally, the Commission will ensure greater transparency in the composition of energy costs and prices by developing regular and detailed monitoring and reporting, including on impacts of energy costs and prices on competitiveness. Particular attention will be paid to public interventions such as regulated tariffs, energy taxation policies and the level of public support, as well as their impact on pricing mechanisms, including electricity tariff deficits”*. So the focus is on price and not on long, complicated and uncertain authorization procedures. Also transparency seems to be mainly focused on cost not on time.

A procedures is an administration and that word appears two times in the Framework document. In the Roadmap document the obstacle of long, complicated and uncertain authorization procedures is not addressed in any way. In the Factsheet document, the word planning occurs one time. However complicated planning as an obstacle is not directly addressed. In the Council document the obstacle of long, complicated and uncertain authorization procedures is not addressed in any way. In the Connecting power document the obstacle is directly addressed.

Table 13 will show the findings of the obstacle lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation.

	Lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation
	'Energy Union' documents findings:
1	<p>'When the conditions are right, the EU will consider reframing the energy relationship with Russia based on a level playing field in terms of market opening, fair competition, environmental protection and safety, for the mutual benefit of both sides. (document 1, page 7)</p> <p>The Framework is often linking to the Environmental and Energy State Aid Guidelines (EEAG), OJ C 200, 28.6.2014, p. 1-55 for Guidelines on State aid for environmental protection and energy 2014-2020 rules about. As here as note 19: The Commission has already set out guidance and rules¹⁹ to limit the detrimental effects of badly-designed, fragmented and uncoordinated public interventions. (document 1, page 10)</p> <p>Domestically produced energy also contributes to decreasing Europe's energy import dependence. This includes notably renewables, needed for decarbonization, as well as conventional and - for those Member States that choose it - non-conventional fossil resources. Producing oil and gas from unconventional sources in Europe such as shale gas is an option, provided that issues of public acceptance and environmental impact are adequately addressed. (document 1, page 5)'</p> <p>'The EU needs to invest in advanced, sustainable alternative fuels, including biofuel production processes, and in the bio-economy more generally. This allows us to retain technological and industrial leadership and to meet climate change objectives. The EU will also need to take into account the impact of bioenergy on the environment, land-use and food production. The EU Investment Plan, as well as other EU financing sources, could help to ensure the necessary financing. (document 1, page 15)</p> <p>Energy poverty negatively affects living conditions and health. (document 1, page 12)'</p>
2	<p>'Review of the Guidelines on State aid for environmental protection and energy</p> <p>- Commission 2017 - 2019 (document 2, page 9)'</p>
3	The obstacle is not identified in the Factsheet document.
4	The obstacle is not identified in the Council document.
5	<p>'How will the EU guarantee that the new electricity grids will not endanger the environment or the health of EU citizens? Already today, the EU has the most stringent environmental protection laws in place. In addition, the MEMO/15/4486 TEN-E Regulation sets new rules on enhanced consultation and transparency to ensure better involvement of citizens in the planning process. The objective is to make the process more efficient while safeguarding the EU's high standards in environmental protection (document 5, page 2/3).'</p>

Table 13: Lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation.

In the framework document itself nature conservation does not appear. Also the term NIMBY does not appear. However the words environment protection and safety do appear. In the rest of the Framework document, the Framework is often linking to the Environmental and Energy State Aid Guidelines (EEAG), OJ C 200, 28.6.2014, p. 1-55 for Guidelines on State aid for environmental protection and energy 2014-2020 rules about. As here as note 19:

The Commission has already set out guidance and rules (EEAG) to limit the detrimental effects of badly-designed, fragmented and uncoordinated public interventions.

Also the words environmental impact do appear. Finally the word health appears one time in the Framework document. In the Roadmap document the words environmental protection appears one time and is indirectly addressed to the obstacle. In the Factsheet document and the Council Document the obstacle of lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation is not identified in any way. In the Connecting power document the obstacle is addressed and directly related.

Table 14 will show the findings of the obstacle lack of public acceptance.

	Lack of public acceptance
	'Energy Union' documents findings:
1	'Producing oil and gas from unconventional sources in Europe such as shale gas is an option, provided that issues of public acceptance and environmental impact are adequately addressed. (document 1, page 5) Investment decisions in renewable electricity have to take into account the physical realities of resource availability and of the grid; public acceptance; consumption location and administrative barriers. Also, the development of new infrastructure, especially interconnections, needs to lower the cost of integrating renewable electricity into the internal energy market. (document 1, page 15)'
2	The obstacle is not identified in the Roadmap document.
3	The obstacle is not identified in the Factsheet document.
4	The obstacle is not identified in the Council document.
5	The obstacle is not identified in the Connecting power document.

Table 14: Lack of public acceptance

The words public acceptance appears two times in the Framework document and is indirectly related to the obstacle. In all the other documents the obstacle of lack of public acceptance is not identified in any way.

4.2.4. Infrastructure management issues

Table 15 will show the findings of the obstacle discrepancy of RES potential and energy demand.

	Discrepancy of RES potential and energy demand
	'Energy Union' Documents findings:
1	<p><i>'The 3rd Internal Energy Market Package also provided for the adoption of network codes in order to help harmonise the flow of electricity and gas across different transmission systems. This work has to be completed to ensure a better functioning of cross-border energy markets. Market integration of renewable electricity generation requires flexible markets, both on the supply and demand side, within and beyond a Member State's borders. Electricity grids must therefore evolve significantly. There is a need to expand the possibilities for distributed generation and demand-side management, including intraday markets, to develop new high-voltage long distance connections (supergrids) and new storage technologies. (document 1, page 10)</i></p> <p><i>To integrate renewable production progressively and efficiently into a market that promotes competitive renewables and drives innovation, energy markets and grids have to be fit for renewables. Making markets fit for renewables means short term markets need to develop into deep, liquid and real time functioning. Existing power grids designed and often managed for conventional power production in a national scope are suboptimal for a future where supply from renewable sources will become ever more important and where balancing is needed to compensate for their inherent variability (document 1, page 15)</i></p> <p><i>5. Creating a seamless internal energy market that benefits citizens, ensuring security of supply, integrating renewables in the market and remedying the currently uncoordinated development of capacity mechanisms in Member States call for a review of the current market design. (document 1, page 20)</i></p> <ul style="list-style-type: none"> - <i>The Commission will propose legislation on security of supply for electricity in 2016.</i> - <i>The Commission will propose a new European electricity market design in 2015, which will be followed by legislative proposals in 2016.'</i>
2	<i>'Initiative on market design and regional electricity markets, and coordination of capacities to ensure security of supply, boosting cross-border trade and facilitating integration of renewable energy (document 2, page 3)'</i>
3	<p><i>'Meeting the current challenges of the electricity market, in particular the integration of variable renewable energy and ensuring security of supply, requires a market design that provides for coordination of capacities at regional level, storage and more flexibility in demand response, enabling consumers to better participate in markets and allowing energy to be exchanged across borders with more ease. To this end, the Commission will provide enhanced rules for cross-border energy trade and propose appropriate measures to encourage renewable energy producers to better integrate in the wider electricity market. (document 3, page 2)</i></p> <p><i>the Commission will: fully implement existing legislation and put in place new market rules in order to integrate renewable production efficiently into the market, including by the development of new infrastructure, especially interconnections; (document 3, page 3)'</i></p>
4	<i>'f) developing a more effective, flexible market design which should go together with enhanced regional cooperation, including with neighbouring countries, and help integrate renewables, while ensuring that public intervention is compatible with the internal market and that the right of Member States to decide on their own energy mix is respected. This will help provide affordable energy to households and industry; (document 4, page 1)'</i>
5	<i>'Therefore, connecting isolated electricity systems is essential for security of supply and help achieve a truly integrated EU-wide energy market which is a key enabler for the 'Energy Union'. Put simply with good connections between neighbours: electricity grids can better manage increasing levels of renewables, particularly variable renewables like wind and solar. (document 5, page 1)'</i>

Table 15: Discrepancy of RES potential and energy demand

The words discrepancy of RES potential and energy demand do not appear directly in the Framework document. However the framework document does talk about market integration of renewable electricity generation. The words even appear in an action point.

In the Roadmap document, the Factsheet document and the Council document the words integration of renewables in some form are appearing, and indirectly addressing the obstacle. In the Connecting power document the words manage increasing levels of renewables which is also addressing indirectly to the obstacle of discrepancy of RES potential and energy demand.

Table 16 will show the findings of the obstacle insufficient power system flexibility.

Insufficient power system flexibility	
'Energy Union' Documents findings:	
1	<p><i>'The 3rd Internal Energy Market Package also provided for the adoption of network codes in order to help harmonise the flow of electricity and gas across different transmission systems. This work has to be completed to ensure a better functioning of cross-border energy markets. Market integration of renewable electricity generation requires flexible markets, both on the supply and demand side, within and beyond a Member State's borders. Electricity grids must therefore evolve significantly. There is a need to expand the possibilities for distributed generation and demand-side management, including intraday markets, to develop new high-voltage long distance connections (supergrids) and new storage technologies. (document 1, page 9/10)'</i></p> <p><i>'To integrate renewable production progressively and efficiently into a market that promotes competitive renewables and drives innovation, energy markets and grids have to be fit for renewables. Making markets fit for renewables means short term markets need to develop into deep, liquid and real time functioning. Existing power grids designed and often managed for conventional power production in a national scope are suboptimal for a future where supply from renewable sources will become ever more important and where balancing is needed to compensate for their inherent variability. (document 1, page 15)'</i></p> <p><i>'5. Creating a seamless internal energy market that benefits citizens, ensuring security of supply, integrating renewables in the market and remedying the currently uncoordinated development of capacity mechanisms in Member States call for a review of the current market design. (document 1, page 20)</i></p> <ul style="list-style-type: none"> - <i>The Commission will propose legislation on security of supply for electricity in 2016.</i> - <i>The Commission will propose a new European electricity market design in 2015, which will be followed by legislative proposals in 2016.'</i>
2	<p><i>'Initiative on market design and regional electricity markets, and coordination of capacities to ensure security of supply, boosting cross-border trade and facilitating integration of renewable energy. (document 2, page 3)'</i></p>

3	<p><i>'Meeting the current challenges of the electricity market, in particular the integration of variable renewable energy and ensuring security of supply, requires a market design that provides for coordination of capacities at regional level, storage and more flexibility in demand response, enabling consumers to better participate in markets and allowing energy to be exchanged across borders with more ease. To this end, the Commission will provide enhanced rules for cross-border energy trade and propose appropriate measures to encourage renewable energy producers to better integrate in the wider electricity market. (document 3, page 2)</i></p> <p><i>the Commission will: fully implement existing legislation and put in place new market rules in order to integrate renewable production efficiently into the market, including by the development of new infrastructure, especially interconnections (document 3, page 3)'</i></p>
4	<p><i>'f) developing a more effective, flexible market design which should go together with enhanced regional cooperation, including with neighbouring countries, and help integrate renewables, while ensuring that public intervention is compatible with the internal market and that the right of Member States to decide on their own energy mix is respected. This will help provide affordable energy to households and industry; (document 4, page 1)'</i></p>
5	<p><i>'Therefore, connecting isolated electricity systems is essential for security of supply and help achieve a truly integrated EU-wide energy market which is a key enabler for the 'Energy Union'. Put simply with good connections between neighbours: electricity grids can better manage increasing levels of renewables, particularly variable renewables like wind and solar. (document 5, page 1)'</i></p>

Table 16: Insufficient power system flexibility

The words insufficient power system flexibility do not appear in the Framework document. However the framework document do talk about market integration of renewable electricity generation. These words also appear in an action point.

In the Roadmap document, the Factsheet document and the Council document the words integration of renewables are in some form appearing, indirectly addressing the obstacle. In the Connecting power document the words manage increasing levels of renewables appear which indirectly addresses the obstacle of discrepancy of RES potential and energy demand.

Table 17 will show the findings of the obstacle inefficient allocation of interconnection capacity.

	Inefficient allocation of interconnection capacity
	'Energy Union' Documents findings:
1	<p><i>'At this moment, the European electricity and gas transmission systems, notably crossborder connections, are not sufficient to make the internal energy market work properly and to link the remaining energy islands to the main electricity and gas network. (document 1, page 8)</i></p> <p><i>A specific minimum interconnection target has been set for electricity at 10% of installed electricity production capacity of the Member States, which should be achieved by 2020. The necessary measures to achieve this 10% target are set out in the Commission Communication presented with this 'Energy Union' Strategic Framework. In 2016, the Commission will report on the necessary measures to reach a 15% target by 2030. The Commission will regularly take stock of the implementation of major infrastructure projects which contribute to the 'Energy Union', in particular in the framework of the PCI follow-up. As part of this stock-taking exercise, it will make an annual report on the progress to reach the 10% electricity interconnection target with a specific focus on the implementation of the regional action plans. Finally, the Commission will also convene a dedicated Energy Infrastructure Forum where progress should be discussed with the Member States, relevant regional cooperation groups as well as with EU institutions. It will meet for the first time in late 2015. (document 1, page 8)</i></p> <p><i>Technical implementation of the different elements of our 'Energy Union' strategy will be very complex. Some elements, such as new market arrangements for short term markets in gas and electricity or integrating the operations of transmission system operators should be developed and implemented at regional level as a step towards full EU-wide market integration. Existing arrangements such as the Pentalateral Energy Forum or the Baltic Energy Market Interconnection Plan (BEMIP) are initiatives on which to build further. Successes in these regions should act as a catalyst for other regions. The Commission will ensure that all regional initiatives evolve in a coherent way and lead towards a fully integrated Single Energy Market. (document 1, page 11)</i></p> <p><i>Investment decisions in renewable electricity have to take into account the physical realities of resource availability and of the grid; public acceptance; consumption location and administrative barriers. Also, the development of new infrastructure, especially interconnections, needs to lower the cost of integrating renewable electricity into the internal energy market. (document 1, page 15)</i></p> <p><i>secure implementation of the internal energy market and the delivery of the 2030 energy and climate framework, notably the implementation of the agreed 2030 targets on renewables, energy efficiency, non-Emissions Trading System and interconnections. (document 1, page 17)'</i></p>
2	<p><i>'Effective implementation of the 10% electricity interconnection target</i> <i>Communication on the progress towards the completion of the list of the most vital energy infrastructures and on the necessary measures to reach the 15% electricity interconnection target for 2030</i> <i>(document 2, page 1)'</i></p>
3	<p><i>'Electricity interconnections between Member States are crucial to exchange electricity across borders as the energy mixes of Member States are often complementary. (document 3, page 2)</i></p> <p><i>the Commission will:</i> <i>fully implement existing legislation and put in place new market rules in order to integrate renewable production efficiently into the market, including by the development of new infrastructure, especially interconnections; (document 3, page 3)'</i></p>
4	<p><i>'accelerating infrastructure projects, including interconnections in particular to peripheral regions, for electricity and gas to ensure energy security and a well-functioning internal energy market; (document 4, page 1)'</i></p>
5	<p>The whole Connecting power document is an interconnection plan.</p>

Table 17: Inefficient allocation of interconnection capacity

Interconnection has its own paragraph in the Framework document. It also appears in the Framework document in combination with capacity. In the Roadmap document, the Factsheet document and the Council document the word interconnection appears and is addressed to the obstacle. The whole Connecting power document is about interconnection and is addressing the obstacle Inefficient allocation of interconnection capacity.

4.3. Conclusion

The 'Energy Union' says a lot about Energy Infrastructure and yet not much. The word infrastructure appears relevant 31 times in the documents and the Connection power document is clearly the most concrete.

From the five 'Energy Union' dimensions only Energy supply and the internal energy market do address the issue of infrastructure in the first place. However the plans of the other dimensions as Energy efficiency, decarbonizing and Research and Innovation are less likely to succeed without a fully functioning European energy infrastructure.

Concerning infrastructure there are a lot references to other EU documents, such as TEN-E regulation and the Environmental and Energy State Aid Guidelines (EEAG). The most concrete infrastructure document is not the Framework document but it is the interconnection plan (The Connecting Power document, is a communication about that plan) that came with the 'Energy Union'.

The main findings concerning the obstacles and the implications will be discussed in section 5.1. However 7 out of 8 main action points of the Framework document which are also appearing in the other documents are somehow related to Energy Infrastructure. And finally one the main conclusions of the Council on the 'Energy Union' is accelerating infrastructure projects, In particular including interconnections to peripheral regions, for electricity and gas to ensure energy security and a well-functioning internal energy market.

5. Discussion of findings and conclusions

This study has sought to find to what extent the concept of the 'Energy Union' is helping to solve European energy infrastructure problems? Furthermore the aim was to provide insights into specific European energy infrastructure problems and into EU policy on energy infrastructure.

It appeared that these problems (increasing shares of generation from renewable energy sources, additional needs for market integration, and security of supply) have an overarching problem, namely the lack of investment in European energy infrastructure.

An initial comprehensive overview of the main non-technical obstacles for investing in European Energy infrastructure based on existing literature and reports on European Energy infrastructure has been given in chapter 3. Those obstacles have been reviewed by means of a content analysis of the documents on the 'Energy Union'.

In this final chapter we will first summarize the main findings from the content analysis after which we can answer the main research question (5.1). In section 5.2 we point out the limitations of this research as well as possibilities for further research.

5.1. Main findings

Infrastructure development issues

Lack of long-term vision and long-term integrated development.

This obstacle is addressed in the documents of the 'Energy Union'. The obstacle has its own action point; "the right infrastructure is a precondition for completing the energy market, integrating renewables and security of supply". Also the interconnection plan (until 2030) is a concrete step forwards towards removing this obstacle and likely helping to solve energy infrastructure problems.

Complicated planning procedures

The obstacle is not addressed in 'Energy Union' documents. Lack of coordination of network planning is mentioned nowhere in the documents. However it comes up marginally in the Framework document, the plan of strengthen the role of TSO's and ENTSO and creating regional operational centers to 'effectively plan and manage cross-border electricity and gas flows' shows that the Framework Strategy document is aware of the obstacle.

Nevertheless the obstacle is not addressed within the 'Energy Union' documents thus not helping to solve energy infrastructure problems.

Different network security standards

The obstacle is addressed in the 'Energy Union' documents. However it only appears in the Framework document. The Framework document is stating that: "the adaption of network codes from the 3rd internal Energy Market Package has to be completed, especially for cross-border energy markets". Also strict enforcement of the Treaty's competition and Anti-trust rules will help hereby. Yet in all the other 'Energy Union' documents this obstacle is not identified at all. So although the obstacle is addressed it is not clear how to 'enforce' the treaty anti-trust and competition rules and to how 'complete' the adaption of network codes. So it is not likely that the obstacle will be removed in within the 'Energy Union' and will not help to solve energy infrastructure problems.

Lack of proper incentives for TSOs (transmission system operator) to make cross-border investments

The obstacle is not directly addressed in the 'Energy Union' documents. It only is indirectly identified in the Framework document and in the Roadmap document. The Framework document is stating that regulated tariffs still limit the development of effective competition, which discourages investments and the emergence of new market players. Via the competition and economic governance frameworks the Commission will seek the phasing-out of below cost regulated prices. Then again strengthen the role of TSOs and ENTSO and the regional operational centers that needs to be created to effectively plan and manage cross-border electricity and gas flows is indirectly helping. This is confirmed by the Roadmap document. In the roadmap document two concrete actions are scheduled on how to seek the phasing-out below cost regulated prices however those actions stay rather vague: "Effective implementation of the 10% electricity interconnection target' and 'Analysis of energy prices and costs (including taxes and subsidies)".

The obstacle is not addressed within the 'Energy Union' documents and the solution for the indirect problem stays very vague thus it is not likely that this obstacle will be removed within the 'Energy Union' and is helping to solve energy infrastructure problems.

Infrastructure development issues		
Obstacle	Addressed	Removed
Lack of long-term vision and long-term integrated development.	X	X
Complicated planning procedures	-	-
Different network security standards	X	-
Lack of proper incentives for TSOs (transmission system operator) to make cross-border investments	-	-

Table 18: Main findings infrastructure development issues

Investment and financial issues

Nationally orientated legal and regulatory regimes.

This obstacle is addressed in the documents of the 'Energy Union'. In the Framework document the obstacle has 4 action points that are somehow related to the obstacle. The obstacle is clearly very important.

- Full implementation and strict enforcement of existing energy and related legislation is the first priority to establish the 'Energy Union'.
- Intergovernmental agreements should comply fully with EU legislation and be more transparent.
- Creating a seamless internal energy market that benefits citizens, ensuring security of supply, integrating renewables in the market and remedying the currently uncoordinated development of capacity mechanisms in Member States call for a review of the current market design.
- The regulatory framework set-up by the 3rd Internal Energy Market Package has to be further developed to deliver a seamless internal energy market to citizens and companies.

Those four action points appear in all the other Energy Union documents except the Connection Power document. However (until now) it is not clear to what extent those action points are going to solve the obstacle.

Still, the four action points concerning this obstacle are a step forward to removing this obstacle and might help to solve energy infrastructure problems.

National orientation and incompatibility of support schemes.

This obstacle is addressed in the documents of the 'Energy Union'. In the Framework document the obstacle has its own action point: "Creating a seamless internal energy market that benefits citizens, ensuring security of supply, integrating renewables in the market and remedying the currently uncoordinated development of capacity mechanisms in Member States call for a review of the current market design". The Commission wants to achieve this by proposing new regulation for Electricity. This review appears in all the other Energy Union documents except for the Council document.

The obstacle is addressed within the 'Energy Union' documents, however it is now not clear to what extent the 'Energy Union' is helping to remove this obstacle.

Unequal financing opportunities

The obstacle is not directly addressed in the 'Energy Union' documents. The obstacle is only indirectly identified in the 'Energy Union' documents. The 'Energy Union' Framework, Roadmap and Factsheet document is stating particular attention will be paid to public interventions such as regulated tariffs, energy taxation policies and the level of public support.

However nowhere in 'Energy Union' documents is there a direct report of unequal financing opportunities for EU Member States. The only indirect item that comes close is the proposed ETS directive changes for "a modernization fund that will support the modernization of energy systems in low income Member States" which is stated in the Factsheet document.

Nevertheless the obstacle is not addressed within the 'Energy Union' documents thus not likely helping to solve energy infrastructure problems.

Lack of appropriate international infrastructure cost-allocation.

The obstacle is not directly addressed in the 'Energy Union' documents. The obstacle is only indirectly identified in the Framework, the Factsheet and the Connecting Power 'Energy Union' documents.

There is nothing to find in the framework document about infrastructure cost- allocation system on a European level. However there is an action point that is about public funding and infrastructure. The framework document is stating that the right infrastructure is a precondition for completing the energy market, integrating renewables and security of supply.

- The Commission will support the implementation of major infrastructure projects, particularly the Projects of Common Interest, through the available financial means, e.g. the Connecting Europe Facility, the European Structural and Investment Funds and the future European Fund for Strategic Investments to leverage the necessary private and public funding.

- The Commission will bring together information on EU-funded infrastructure projects to bring more coherence and to maximize their impact.

Those funds as stated above come back in the Factsheet and Connecting Power document. Those funds are specially for attracting private capital and are not to serve as an international cost-allocation structure. Also with estimated need of money (Chapter 3) those funds are only a drop in the ocean.

Thus the obstacle is not addressed within the 'Energy Union' documents thus not helping to solve energy infrastructure problems.

Investment and financial issues		
Obstacle	Addressed	Removed
Nationally orientated legal and regulatory regimes.	X	X
National orientation and incompatibility of support schemes.	X	?
Unequal financing opportunities	-	-
Lack of appropriate international infrastructure cost-allocation.	-	-

Table 19: Main findings investment and financial issues

Authorization procedures

Long, complicated and uncertain authorization procedures

The obstacle is addressed within the 'Energy Union' documents, however only in the Connection power document. Lengthy permit granting procedures are mentioned as an obstacle for building new infrastructure. TEN-E regulation (one national competent authority for permit granting procedures and a time limit for 3, 5 year) should remove this obstacle and according to the document should already be in place.

The obstacle is addressed within the 'Energy Union' documents and likely to be removed thus helping to solve energy infrastructure problems.

Lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation.

The obstacle is addressed within the 'Energy Union' documents, however only in the Connection power document. The Connecting power document is stating new electricity grids will not endanger the environment or the health of EU citizens. "TEN-E Regulation sets new rules on enhanced consultation and transparency to ensure better involvement of citizens in the planning process. The objective is to make the process more efficient while safeguarding the EU's high standards in environmental protection". Also indirectly within Guidelines on State aid for environmental protection and energy mentioned in the Framework document and the Roadmap document the obstacle is covered.

The obstacle is addressed within the 'Energy Union' documents and likely to be removed. Thus helping to solve energy infrastructure problems.

Lack of public acceptance

The obstacle is not addressed in 'Energy Union' documents. The obstacle is only indirectly identified in the Framework document. The Framework document is only stating "Investment decisions in renewable electricity have to take into account the physical realities of resource availability and of the grid; public acceptance; consumption location and administrative barriers".

So the obstacle is not addressed within the 'Energy Union' documents thus not helping to solve energy infrastructure problems.

Authorization procedures		
Obstacle	Addressed	Removed
Long, complicated and uncertain authorization procedures	X	X
Lack of definition of priority between conflicting objectives: RES deployment might be in conflict with nature conservation.	X	X
Lack of public acceptance	-	-

Table 20: Main findings authorization procedures

Infrastructure management issues

Discrepancy of RES potential and energy demand.

The obstacle is addressed in the 'Energy Union' documents. The obstacle is identified as integrate RES in the market. The Framework document is stating "it requires flexible markets, both on the supply and demand side, within and beyond a Member State's borders. Electricity grids must therefore evolve significantly. There is a need to expand the possibilities for distributed generation and demand-side management to develop new high-voltage long distance connections (supergrids) and new storage technologies. Existing power grids designed and often managed for conventional power production in a national scope are suboptimal for a future where supply from renewable sources will become ever more important and where balancing is needed to compensate for their inherent variability". This comes back in all the 'Energy Union' documents. Especially the important relations with electricity infrastructure are described. The interconnection plan and new legislation what has to be proposed are likely to overcome this obstacle.

The obstacle is addressed within the 'Energy Union' documents, however it is now not clear to what extend the 'Energy Union' is helping to remove this obstacle.

Insufficient power system flexibility

For this obstacles the same issues apply as the previous obstacle because they are closely related. The obstacle is addressed in the 'Energy Union' documents. The obstacle is identified as integrate RES in the market. The Framework document is stating "it requires flexible markets, both on the supply and demand side, within and beyond a Member State's borders. Electricity grids must therefore evolve significantly. There is a need to expand the possibilities for distributed generation and demand-side management to develop new high-voltage long distance connections (supergrids) and new storage technologies. Existing power grids designed and often managed for conventional power production in a national scope are suboptimal for a future where supply from renewable sources will become ever more important and where balancing is needed to compensate for their inherent variability". This comes back in all the 'Energy Union' documents. Especially the important relations with electricity infrastructure are described. The interconnection plan and new legislation what has to be proposed are likely to help to overcome this obstacle.

The obstacle is addressed within the 'Energy Union' documents, however it is at this time not clear to what extent the 'Energy Union' is helping to remove this obstacle.

Inefficient allocation of interconnection capacity.

The obstacle is addressed in the 'Energy Union' documents. A specific minimum interconnection target has been set for electricity at 10% of installed electricity production capacity of the Member States, which should be achieved by 2020. An interconnection plan is initiated to reach this target. This is addressed in all the 'Energy Union' documents. The Connection power document is all about the interconnection plan. The interconnection plan is a concrete step forwards towards removing this obstacle and helping to solve energy infrastructure problems.

The obstacle is addressed within the 'Energy Union' documents and likely to be removed. Thus helping to solve energy infrastructure problems.

Infrastructure management issues		
Obstacle	Addressed	Removed
Discrepancy of RES potential and energy demand.	X	?
Insufficient power system flexibility	X	?
Inefficient allocation of interconnection capacity.	X	X

Table 21: Main findings management issues

5.2. Conclusion

First the sub questions will get a short answer and then the main question will be answered.

What is the energy union?

The Energy Union is a plan of the EU Commission and it consists of the 'Energy Union Package', which is a package of actions and plans (mostly not legally binding) the Commission wants to realize, in order to realize an EU Energy Union in the future. The concept of an 'Energy Union' is an appreciation, that Energy problems cannot be contained within national borders or managed in isolation from each other. The EU is hoping to generate an external dimension on energy policy with this plan.

What are currently the main European energy infrastructure problems?

On the basis of the EU energy infrastructure blueprint (2011) and the other sources mentioned the problems for EU energy infrastructure are: that the infrastructure is aging, the current energy infrastructure is not calculated on the increasing shares of generation from RES and the current energy infrastructure is not calculated on the additional needs for market integration and security of supply. A lot of investments in the European energy infrastructure are needed. This leads to the overarching problem, the lack of investments (and the lack of cross border investments) in European energy infrastructure.

What does the 'Energy Union' say about energy infrastructure?

The 'Energy Union' says a lot about Energy Infrastructure and yet not much. The word infrastructure appears relevant 31 times in the documents and the Connection power document is clearly the most concrete. This seems not much, however 7 out of 8 main action points of the Framework document which are also appearing in the other documents are somehow related to Energy Infrastructure. And finally one the main conclusions of the Council on the 'Energy Union' is accelerating infrastructure projects, In particular including interconnections to peripheral regions, for electricity and gas to ensure energy security and a well-functioning internal energy market.

To what extent is the concept of the 'Energy Union' helping to solve European energy infrastructure problems?

As shown in table 18 to 21 from the 14 obstacles this research found (see chapter 3) 9 obstacles are addressed by the European Commission. 5 of those obstacles are probably going to be removed with the 'Energy Union'. From 3 obstacles it is not clear till what extend the 'Energy Union' is helping to remove those obstacles. And one obstacle although addressed is certainly not going to be removed.

Not one category at this moment is totally solved, however infrastructure management issues has the potential. However that depends on the “proposed legislation on security of supply for electricity in 2016” and the “new European electricity market design in 2015 the Commission will propose, which will be followed by legislative proposals in 2016”.

The ambition of the ‘Energy Union’ concerning energy infrastructure is high, however until now it lacks in the implementation of the ambition. The EU did not get any (extra) powers which is needed to really bring the Energy Union a step closer to an ‘Energy Union’. There is need for some kind of supervision to guide all plans. In the plan those task is given to the ENTSO, however the only action of the plan concerning this point is: “The Commission will review the regulatory framework, in particular the functioning of ACER and the ENTSOs, in 2015-2016 and will propose appropriate actions to reinforce the European regulatory framework”. Like the rest of the plans, the Commission will propose a plan or review the functioning. Most of the plans are vague and are likely to remain vague because of that. For this point also counts that it did not get backed by the EU leaders.

However even the points the EU leaders did agreed upon (related to energy infrastructure) remain vague:

- “Fully implementing and rigorously enforcing existing energy legislation”.
- “Reinforcing the legislative framework for the security of supply for electricity and gas”.
- “Developing a more effective, flexible market design”.
- “Reviewing and developing legislation related to emissions reduction, energy-efficiency and renewables “.

At this moment it still is unclear how the EU wants to accomplish those points and more important with what kind of power. Most of the documents of the Energy Union are documents in the policy-shaping stage of the policy process. However the most concrete plan for Energy Infrastructure is the interconnection plan, which is backed by the EU leaders. This document is supported by the findings of 4.1.2 and 4.2.

One can say at this moment that less than half of the obstacles are likely to be removed with the ‘Energy Union’ which makes it not very likely that the overall problem of lack of investment in European Energy Infrastructure will be solved. However the concept of the ‘Energy Union’ is still evolving. There’s a potential to solve 8 obstacles, which might be a small step forward to solve Energy infrastructure problems.

The process of the Energy Union originally started only focused on security of supply and is extended to all other areas of energy policy. It is likely to think that all the plans even if they don't succeed will create a move forward on energy policy and also on the energy infrastructure obstacles.

5.3. Limitations of this research and recommendations for further research

The research has some clear limitations; further research can be done to overcome these limitations.

- The research has only dealt with electricity infrastructure. Gas infrastructure has its own characteristics which are not part of this research, but merit research on its own.
- In terms of the use of literature and research documents, it should be pointed out that nearly all research reports on European energy infrastructure have either been written by the EU itself or have been commissioned by the EU; it is difficult to find fully independent work.
- Most official documents and reports about European energy infrastructure are especially focused on the environment and the climate, less so on efficiency issues and investment issues.
- The concept of the 'Energy Union' is still developing, e.g. the planned legislation of the electricity market could change some of the findings of this research, which has been based on documents in the policy-shaping stage of the policy process.

References

Articles

- Andoura, S., & Vinois, J. (2015). From the European Energy Community to the 'Energy Union': A Policy Proposal for the short and the Long Term. *Notre Europe-Jacques Delors Institute*.
- Battaglini, A., Komendantova, N., Brtnik, P., & Patt, A. (2012). Perception of barriers for expansion of electricity grids in the European Union. *Energy Policy*, 47, 254–259.
- Buijs, P., Bekaert, D., & Belmans, R. (2010). Seams issues in European transmission investments. *The Electricity Journal*, 23(10), 18-26.
- Buijs, P., Bekaert, D., Cole, S., Van, Hertem, D., & Belmans, R. (2011). Transmission investment problems in Europe: Going beyond standard solutions. *Energy Policy*, 39, (3), 1794-1801.
- Fourie, J. (2006). Economic infrastructure: a review of definitions, theory and empirics. *South African Journal of Economics*, 74, (3), 530-556.
- Fulmer, J. (2009). What in the world is infrastructure? *PEI Infrastructure Investor*, (7/8), 30–32.
- Morgan, T. (2009). Electricity: From Tabletop to Power Plant, *Phys. Teach.* 47, 18.
- Steinbach, A. (2013). Barriers and solutions for expansion of electricity grids. *The German experience*, 63, (12), 224–229.

Books

- Babbie, E. (2007). *The practice of social research*. Belmont: Thomson Wadsworth.
- Barysch, K. (2011). *Green, Safe, Cheap: Where Next for EU Energy Policy?* Centre for European Reform.
- Buchan, D. (2011). *Expanding the European dimension in energy policy: the Commission's latest initiatives*. Oxford: The Oxford Institute for Energy Studies.
- Krippendorff, K. (1980). *Content Analysis: an introduction to its Methodology*. London: Sage.
- Saunders, M. N., Thornhill, A., & Lewis, P. (2009). *Research Methods for Business Students*. Harlow: Pearson Education Limited.
- Sullivan, A., & Sheffrin, S. M. (2003). *Economics: Principles in action*. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall.
- Weber, R.P. (1985). *Basic Content Analysis*. Beverly Hills: Sage.

Documents:

- Burges, K., Bömer, J., Nabe, C., Papaefthymiou, G., Maher, M., Mills, C., & Hunt, J. (2008). Study on the comparative merits of overhead electricity transmission lines versus underground cables. Ecofys Germany GmbH.

E.C.F. (2010). 2050: a practical guide to a prosperous, low carbon Europe. Brussels: ECF.

ENTSO-E, (2010). Ten-year network development plan 2010–2020. European Network of Transmission System Operators for Electricity, ENTSO-E AISBL, Brussels, June 2010.

European Commission (2007a). Priority Interconnection Plan - Annex, COM (2006), 846 final, Brussels, January 2007.

European Commission (2007b). Priority Interconnection Plan, COM (2006), 846 final/2, Brussels, February 2007.

European Commission (2010a). Energy 2020. A strategy for competitive, sustainable and secure energy, COM 639 final, Brussels, November 2010.

European Commission (2010b). Energy infrastructure priorities for 2020 and beyond—a blueprint for an integrated European energy network, COM (2010) 677 final, Brussels, November 2010.

European Commission (2011a). Europe 2020 a strategy for smart, sustainable and inclusive growth, 2020, Brussels, March 2010.

European Commission (2011b). Proposal for a Regulation on guidelines for trans-European energy infrastructure and repealing Decision no 1364/2006/EC - (2011/0300 (COD)), October 2011.

European Commission (2015a). A Framework Strategy for a Resilient ‘Energy Union’ with a Forward-Looking Climate Change Policy, Energy Union Package, Brussels, February 2015.

European Commission (2015b). Roadmap for the ‘Energy Union’, ‘Energy Union’ Package, Brussels, February 2015.

European Commission (2015c). ‘Energy Union’ Factsheet, MEMO/15/4485, Brussels, February 2015.

European Commission (2015d). Connecting power markets to deliver security of supply, market integration and the large-scale uptake of renewables European Commission Fact sheet (2015). MEMO/15/4486, Brussels, February 2015.

European Commission (2015e). Press release ‘Energy Union’: secure, sustainable, competitive, affordable energy for every European, IP/15/4497, Brussels, February 2015.

European Council (2015a). European Council Conclusions on the Energy Union, Press release, Energy, 139/15, Brussels March 2015.

European Council (2015b). Remarks by President Donald Tusk after the first session of the European Council meeting, Press release, Energy, 131/15, Brussels March 2015.

European Parliament (2015a). Fact Sheets on the European Union. Energy policy: general principles, Mellár, Balázs, March 2015.

European Parliament (2015b). Fact Sheets on the European Union. Internal Energy Market, Kerebel, Cécile, March 2015.

European Parliament (2015c). Fact Sheets on the European Union. Trans-European Networks — guidelines, Ratcliff, Christina, May 2015.

- European Parliament (2015d). Fact Sheets on the European Union. Financing the Trans-European Networks, Ratcliff, Christina, May 2015.
- European Transmission System Operators (ETSO), (2006). Overview of the administrative procedures for constructing 110 kV–400 kV overhead lines, December 2006.
- European Wind Integration Study (EWIS), (2007). Towards a Successful Integration of Large Scale Wind Power into European Electricity Grids. Belgium, Brussels, June 2007.
- Evides and Mercados, (2010). From Regional Markets to a Single European Market. Report for DG-TREN, April 2010.
- International Energy Agency (IEA) (2013), World Energy Outlook 2013, Paris.
- International Energy Agency (IEA), (2015). Energy Technology Perspectives 2015 - Mobilising Innovation to Accelerate Climate Action. Paris.
- Lobato, E., Olmos, L., Gómez, T., Møller Andersen, F., Grohnheit, P. E., Mancarella, P., & Pudjianto, D. (2009). Regulatory and other barriers in the implementation of response options to reduce impacts from variable RES sources. Energy Research Centre of the Netherlands (ECN).
- Monti, M. (2010). A new strategy for the single market. Report to the President of the European Commission José Manuel Barroso, May, 10.ISO 690.
- SUSplan (PLANning for SUStainability), (2011). Development of regional an Pan-European guidelines for more efficient infra-integration of renewable energy into future infrastructure, “SUSPLAN”, D3.1 Trans-national infrastructure developments on the electricity and gas market, European Union’s 7th Framework Programme, Energy research Centre of the Netherlands (ECN), February 2011.
- Woyte, A., Decker, J. D., & Van, T. V. (2008). North Sea electricity grid [r] evolution–Electricity output of interconnected offshore wind power: a vision of offshore wind power integration. Greenpeace–3E, 2008.
- Zane, E. B., Piria, R., Frank, R., & Bauknecht, D. (2012). Integration of electricity from renewables to the electricity grid and to the electricity market–RES-INTEGRATION. Final Report for DG Energy, Eclareon and Öko-Institut eV.

Sites:

- Buchan, D. & Keay, M. (2015). Europe’s Energy Union plan; a reasonable start to a long journey, Oxford Energy Comments, the Oxford Institute for Energy Studies, Oxford, 02-03-2015.
<https://www.oxfordenergy.org/2015/03/europes-energy-union-plan-reasonable-start-long-journey/>
- Euractive Network (2015). Will EU states play ball on ‘Energy Union’? in www.euractiv.com, retrieved at 8 June, 2015, found at:
<http://www.euractiv.com/sections/energy/will-eu-states-play-ball-energy-union-312419>

European Commission (2011). Energy infrastructure priorities for 2020 and beyond—a blueprint for an integrated European energy network, retrieved at:
http://ec.europa.eu/energy/sites/ener/files/documents/2011_energy_infrastructure_en.pdf

European Commission (2015). Site www.ec.europa.eu , PRIMES EU-wide Energy Model, Activity and Emissions, retrieved at:
<http://ec.europa.eu/environment/archives/air/models/primes.htm>

European Commission (2015). Site Energy Union, retrieved at June 8, 2015, from:
http://ec.europa.eu/priorities/energy-union/index_en.htm

Eurostat (2012). Europe in figures - Eurostat yearbook 2012: Energy (tables and graphs). Retrieved at;
http://ec.europa.eu/eurostat/documents/3217494/5761157/CH_12_2012-EN.PDF/99091c9b-cd67-4a6e-9eee-99cc50ec5767

European Union (2014), Summary Legislation on Energy, retrieved at 30 December 2014, found at:
http://eur-lex.europa.eu/legislation_summaries/energy/

International Energy Agency (2005). Energy Statistics Manual, OECD/IEA, 2005, retrieved at:
https://www.iea.org/publications/freepublications/publication/statistics_manual.pdf

Langsdorf, S. (2011). EU Energy Policy: from the ECSC to the Energy Roadmap 2050. Green European Foundation, Brussels, 2011, retrieved at 29 June, 2015, found at:
http://gef.eu/uploads/media/History_of_EU_energy_policy.pdf

NOS nieuwsuur (2015). “Energie-unie moet Europa klaarstomen voor de toekomst” in www.nos.nl, retrieved at 7 June, 2015, found at:
<http://nos.nl/nieuwsuur/artikel/2021129-energie-unie-moet-europa-klaarstomen-voor-de-toekomst.html>

OECD (2012). Economic Infrastructure CRS Codes, retrieved at 1 May, 2015, found at:
<http://www.oecd.org/dataoecd/12/25/43860714.pdf>

Treaties:

Official Journal of the European Union (2012). Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union, 2012/C 326/01, V55, Brussels, October 2012.