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Security of Electricity Supplies in the EU

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Prohlášení

Prohlašuji, že jsem předkládanou práci vypracovala samostatně a použila jen uvedené prameny a literaturu. Současně dávám svolení k tomu, aby tato diplomová práce byla umístěna v Ústřední knihovně UK a používána ke studijním a výzkumným účelům.

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Anotace

Magisterská práce "Bezpečnost dodávek elektřiny v EU" si klade za cíl ověřit platnost argumentu, že tři cíle v oblasti energetické politiky, které v roce 2007 oficiálně odsouhlasila Evropská rada, si mohou při praktické implementaci odporovat. Tyto cíle byly definovány jako: zvýšení konkurenceschopnosti evropských ekonomik a energie za dostupné ceny, boj proti klimatickým změnám a zvýšení bezpečnosti dodávek energie. Za účelem ověření relevance této hypotézy zužuje tato případová studie bezpečnost dodávek na bezpečnost dodávek elektrické energie jakožto specifické komodity. S přihlédnutím k dalším dvěma cílům identifikuje hlavní výzvy. Následně provádí analýzu politických a legislativních opatření přijatých na úrovni EU, které se s těmito výzvami mají potýkat, a hodnotí jejich adekvátnost. Jako hlavní problémy práce chápe nedostatek investic do síťové infrastruktury a absenci koordinovaného rozvoje a provozování sítí. V neposlední řadě zkoumá, jaké vysvětlení identifikovaných nedostatků poskytují čtyři teorie evropské integrace: neofunkcionalismus, liberální intergovernmentalismus a víceúrovňové vládnutí.

Klíčová slova: bezpečnost dodávek elektrické energie, energetická bezpečnost, energetická politika EU, investice do infrastruktury, obnovitelné zdroje energie, „kruhové toky“

Abstract

The aim of the thesis ‘Security of electricity supplies in the EU‘ is to verify validity of the argument that three objective of EU energy policy which the European Council officially agreed upon in 2007 might be conflicting in their practical implementation. Those objectives involve: increasing the competitiveness of European economies and the availability of affordable energy, combating climate change and increasing security of supply. In order to verify relevance of this hypothesis, security of supply is narrowed down to the case of electricity as a specific commodity. With regard to the other two goals, the paper identifies main challenges to security of electricity supplies. Subsequently, the analysis of policy and legislative measures adopted at the EU level which should tackle these challenges is performed and their adequacy evaluated. Inadequate network infrastructure investment and absence of coordinated grid development as well as coordinated system operation are perceived as main concerns. Last but not least, the thesis analyzes interpretations of identified deficiencies provided by four theoretical approaches to European integration – neofunctionalism, liberal intergovernmentalism, new institutionalism and multi-level governance

Keywords: security of electricity supply, energy security, EU energy policy, infrastructure investment, renewables energy sources, ‘loop flows‘

Poděkování

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Za cenné připomínky děkuji také Ing. Lence Kovačovské.

To my beloved grandmother,
who will never read it

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List of abbreviations

ACER	Agency for the Cooperation of Energy Regulators
BANANA	'Build Absolutely Nothing Anywhere Near Anything'
BEUC	Bureau Européen des Unions de Consommateurs
CEER	Council of European Energy Regulators
CCGT	combined-cycle gas turbine
CHP	combined heat and power
DG COMP	Directorate General for Competition
DG TREN	Directorate General for Energy and Transport[1]
DSO	distribution system operator
ECJ	European Court of Justice
EFET	European Federation of Energy Traders
ENTSO-E	European Network of Transmission System Operators of Electricity
EP	European Parliament
EPIA	European Photovoltaic Industry Association
EREC	European Renewable Energy Council
ERGEG	European Regulators' Group for Electricity and Gas
ETS	Emission Trading System
ETSO	European Transmission System Operators
EUFORES	European Forum for Renewable Energy Sources
EURELECTRIC	Union of the Energy Industry
EWEA	European Wind Energy Association
FITs	feed-in tariffs
IEA	International Energy Agency
IEM	internal energy market
IFIEC Europe	International Federation of Industrial Energy Consumers
ISO	independent system operator
ITC	inter-TSO compensation
ITO	independent transmission operator
MLG	multi-level governance
NIMBY	'Not In My Backyard'
NRA	national regulatory authority
OU	ownership unbundling
PBR	performance based regulation
PSOs	public service obligations
PST	phase shifting transformer
QMV	qualified majority voting
RES-E	renewable energy sources of electricity
RIO	regional independent operator
RTO	regional transmission operator
SEA	Single European Act
TEN	Trans-European Networks
TEN-E	Trans-European Energy Networks

[1] Since 2010 DG Energy.

TGCs	tradable green certificates
TPA	third party access
TSC	TSO security cooperation
TSO	transmission system operator
TYNDP	Ten Year Network Development Plan
UCPTE	l'Union pour la Coordination de la Production et du Transport de l'Electricité/ Union for the Co-ordination of Production and Transmission of Electricity
UCTE	l'Union pour la Coordination du Transport de l'Electricité/ Union for the Co-ordination of Transmission of Electricity

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"Climate change and energy security are two sides of the same coin. The same remedies must be applied to both problems."

Andris Piebalgs (EUFOCUS, 2009:1)

Introduction

The EU-level activities in the area of energy policy have recently gone through substantial development. From the Finland's EU Presidency in 2006 on, energy security issues have been at the top of the agenda resulting in the adoption of Energy-Climate package and so-called third Energy Market packages in December 2008 and June 2009, respectively. In December 2009, the Lisbon Treaty came into force constituting energy policy as a shared competence between the Union and its member states (Art. 4 of TFEU) for the first time.

Nevertheless, energy has stood at the heart of European integration since its very beginnings. The trend towards integration in the area of European energy policy picked up again in the mid-1980s.[2] Parallel to this development, climate change policy started gaining relevance during the 1990s.[3] Conversely, security of energy supplies attracted only very limited attention of policy-makers compared to the aftermath of the oil shocks of the 1970s. This trend started to change at the dawn of the new millennium and peaked with the Russo-Ukrainian crisis of January 2006.[4] When the European Council agreed to establish an EU Energy Policy in the spring of 2007, a three-tier approach was officially adopted: the *first* level involved increasing the competitiveness of European economies and the availability of affordable energy, the *second* constituted promoting environmental sustainability and combating climate change and the *third* increasing security of supply (Council of the European Union, 2007).

All in all, contemporary EU Energy Policy is aimed at attaining all of the three underlying objectives of the *"three-tier approach"*: i.e. increasing sustainability and the effectiveness of environmental protection, creating a competitive internal market and assuring security of

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[2] Via the Single European Act (SEA) which came into force in 1987.
[3] So-called Earth Summit held in Rio de Janeiro in 1994 and signature of the Kyoto Protocol in1997.
[4] Green Paper Towards a European Strategy for the Security of Energy Supply (European Commission, 2006).

energy supplies. The European Commission claims that these goals are compatible, however, a concern that all of the measures adopted in the three sections of the triad are inconsistent or even conflicting has been raised many times by some politicians, energy professionals as well as academics (e.g. De Jong, Glachant & Hafner, 2010; Egenhofer, 2007; Eikeland, 2004 & 2008; Glachant et al., 2010; Lenshaw, 2010).

The purpose of this paper is to test the validity of this argument with a focus on one part of the triangle, namely security of energy supply using the case study of the electricity sector. Electricity is a very particular commodity due to its non-storability and secondary character. Its dependency on the external input for its generation makes it interrelated with the rest of energy sector development, or equally dependent on natural conditions. Representing more than 20 % of the final energy consumption in the EU (Commission of the European Communities, 2010:34), it is essential for the running of the economy – we could hardly imagine our daily lives without it. Yet, many challenges arise in assuring the security of electricity supply, a term primarily defined as *"the ability of an electricity system to supply final customers with electricity"* (2005/89/EC, Art. 2), while also taking into account various economic aspects, particularly with regard to system adequacy[5]. They were epitomized by large blackouts in 2003 in Europe (Italy/Switzerland and Sweden/Denmark) and supply disturbances affecting 15 million European citizens in 2006 originating in Germany. In spite of this fact, security of electricity supply, unlike that of natural gas with its geopolitical dimension, has not been paid much attention to in political debates at the EU level, probably because electricity is not a primary fuel and Europe is relatively self-sufficient in this regard.

Bearing in mind the premise that absolute security is impossible and this argument is fully valid also for this dimension of what Buzan et al. call "economic security", *the main aim of this paper is to reveal the potential inconsistencies between the security of electricity supply and the other two poles of the energy policy "trilemma"*. Zooming in on the security of electricity supplies in relation to an adequately narrowed internal electricity market and

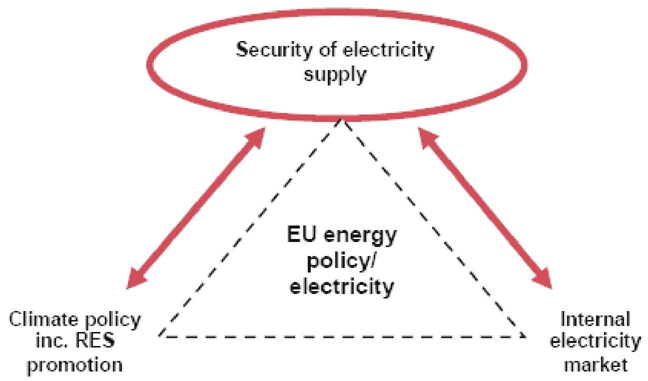
[5] System adequacy involves access to primary fuels as well as adequate state of power network, for details see Chapter 1.3.

renewable energy sources promotion policies (see Figure 1) will enable us to focus on the particularities of these challenges in more detail and therefore reveal possible discrepancies.

Due to the overarching character of electricity, other energy sources (and therefore also the internal market in natural gas) and some elements of climate policy such as the Emission Trading Scheme also play a relevant role in the challenges surrounding the generation of investments, in particular. Subsequently, it will be analyzed *what role have the corresponding EU policies played in mitigating, or contrariwise in aggravating the possible challenges, how and whether this development can be theoretically explained*. Last but not least, account of future visions and proposals for mitigation of identified deficiencies will be provided.

First of all, it will be verified whether there exist any connections between the main challenges to the security of electricity supply and the other two energy policy goals through the analysis of risks emerging from political and regulatory, but also economic and technical areas.

Figure 1: Simplified EU energy policy "trilemma" zoomed in on electricity sector



Source: Author

As previewed, the second aim is to perform thorough policy analysis of the measures adopted at the EU level to deal with these challenges (in other words, the EU policy contribution to risk management) as well as measures originating from the other two policy pillars which may aggravate the identified risks. Attention will be devoted to their essence as well as the preceding negotiations in the context of the overall discourse. It will be observed that most of the measures directly related to security of electricity supplies or influencing it in either positive or negative way were primarily exerted in the context of internal market concerns and climate policy. At the same time, it needs to be taken into account that while the discourse is "three-tier", policy measures relating to energy were historically adopted under fragmented multitude of EU policies (such as competition, internal market, trans-European networks, environmental and consumer policy), multitude of actors coming into play at the same time.

The hypothesis of this paper is that while some of the measures adopted in order to facilitate the completion of a competitive internal electricity market and security of electricity supply are, to a certain extent, mutually reinforcing if properly implemented, policies belonging under the two other pillars may have some negative repercussions. In particular, measures to ensure a sustainable power generation can pose challenges to both long and short-term security of electricity supply through exerting pressure on power grids.

The following roots of the aforementioned deficiencies are put forward:

- *General lack of regulatory capacity* due to the fact that this policy stream has the shortest tradition out of the three and due to member states resistance;
- *The imperfections of existing tools* (given by imperfect legislative and regulatory framework) which would favour security of electricity supplies if fixed;
- *Discrepancy between lofty goals at the EU level and missing tools in the area of security of electricity supply* – e.g. too much focus on problems associated with the generation of electricity (such as greenhouse emissions or fossil fuel depletion) which overshadowed the need to ensure the security of the power grid (Silvast & Kaplinski, 2007:7);
- *Lack of coordination* between the three policies as well among policy-actors.

Last but not least, the paper also explores the theoretical explanations of the relevant policy and legislative developments resulting in the aforementioned imperfections. The value of the four theories dealing with European integration will be tested in order to explain the policy developments leading to this situation: neofunctionalism, liberal intergovernmentalism, new institutionalism and multi-level governance.

All in all, the above-mentioned concerns cannot be played down. At the same time, however, we tend towards the argument that the addressed deficiencies affecting security of electricity supply in the EU could be reconciled. They could be mitigated or even *de facto* eliminated by new suitable policy solutions. Therefore, an overview of policy solutions and visions is provided.

As far as the structure of the paper is concerned, it corresponds with the above-mentioned sub-goals. In chapter 1, the context of the EU energy policy and the complexity of the security of electricity supply concept is outlined. In chapter 2, the author formulates the main challenges to security of electricity supply and looks at how these articulate with the other two policy pillars. In chapter 3, the author investigates the adopted measures and policy processes leading to their adoption as well as outlines alternative and desirable future solutions. In chapter 4, the theoretical approaches to European integration are employed as an explanatory framework for the abovementioned policy outcomes.

The paper is intended to provide an input into the academic debate on EU energy security, as well on the challenges stemming from dependence on import and geopolitical issues (e.g. Bahgat, 2006; Barysch, 2008; Luciani, 2004), this dimension, due to its technical nature, has not been systematically covered to such an extent by international relations scholars (even though e.g. Nies, 2010 or Silvast & Kaplinski, 2007, partly addressed it).

1. The EU energy policy "trilemma"

In order to properly grasp the issue of security of electricity supplies in the EU, the overall context of the EU energy policy "trilemma" with a natural focus on the electricity sector has to be sketched. In practice, energy policy has been driven by a great number of EU competencies other than energy as there was no formal basis for energy policy in the Treaty of the European Union (for details, see Chapter 3).

Nevertheless, there were two basic ideas, which pushed the development in this policy area forward: competitive internal energy market and climate change reduction. Whereas the idea of free competition in the internal energy market attracted the bulk of EU policy-makers' attention already in mid-1980s, renewable energy sources promotion was not launched until approximately one decade later, triggered by the establishment of a global climate change policy at the Earth Summit in Rio de Janeiro in 1992. Energy security motivation which was, among other motivations, at the heart of the European integration since its beginnings, reappeared on the agenda in following the oil shocks in the 1970s and again at the offset of the new millennium.

1.1. Internal market in electricity

The construction of the internal energy market covering electricity and natural gas, is situated at the intersection of two robust EU policies – the single European market and competition policy (Buchan, 2010:361) or in other words, economic integration and liberalization (Welfens & Keim, 2006:89). The European Commission was determined to advance in this area as well as in other network industries since the release of the Single European Act, which came into force in 1987, strengthening its powers in many policy areas (Pelkmans, 2008:5). However, the real implementation of internal market in electricity has started with the Directive 96/92/EC, often called first liberalization package.¨

It was followed by the second liberalization package in 2003 and, last but not least, the third liberalization package, which was adopted in June 2009.[6]

The internal market in electricity is supposed to deliver a whole range of benefits in terms of efficiency gains, new business opportunities, competitive prices (while 2003/54/EC mentions "price reductions", this formulation was rephrased because it has had an opposite impact in many countries), higher standards of service and increased competitiveness (2009/72/EC, Recital 2).

What does the establishment of an internal market require? Market integration happens when the activities of market participants in different regions are geared to supply-and-demand conditions in the entire union and economic barriers between them are eliminated (Pelkmans, 2008:30-41). In the EU context, internal market creation rests on a combination of negative integration or liberalization elements which involve *inter alia* enabling free movement of goods and undistorted competition through the removal of tariffs and barriers of trade and positive integration through adoption of common rules necessary for proper market functioning, in other words the re-construction of a system of economic regulation at the level of the larger economic unit. In practice, gradual creation of internal market in electricity comprises four main areas of activity embodying elements of both positive and negative integration: industry restructuring, third party access, market opening and establishment of regulation (for overview see Figure 2).

Industry restructuring

In order to achieve market liberalization, clear distinguishing between competitive segments of the industry (generation and retail supply to customers) and non-competitive regulated segments (distribution, transmission, system operation) is required – either structurally (through divestiture) or functionally (separating affiliates within the same corporation) in order to prevent cross-subsidization of competitive businesses and to guard against the exercise of vertical market power through affecting access to distribution and

[6] Second package comprises Directive 2003/54/EC and Regulation No 1228/2003 and other provisions regarding internal market in natural gas; Third package involves Directive 2009/72/EC, Regulation No 713/2009, Regulation No 714/2009 and other provisions regarding internal market in natural gas.

transmission networks (Glachant, 2009). By the third liberalization package, the EU made a further step in the splitting of vertically integrated utilities. It requires full ownership unbundling (OU) of transmission networks – transmission system operator (TSO), or two other compromising options: creation of independent system operator (ISO) or independent transmission operator (ITO).[7]

Third party access

Another requirement is to free up the supply side of the market by removing barriers preventing alternative suppliers – the third parties – from importing or producing energy by obliging the operators of the non-competitive parts of the industry (transmission and distribution networks) to allow them access the infrastructure in order to be able to deliver energy to one of its customers. The EU's liberalization efforts actually started in this area. At the onset, the first legislative package allowed for negotiated or regulated market access to networks, the second package then only through regulated terms of access based on tariffs approved by regulators, which enable the user to choose a supplier. In contrast, US policymakers focused much more on horizontal market issues and industry restructuring, which the EU is currently seeking to address in order to support efficient retail competition programs. This sequence of steps is supposed to be more difficult (Glachant, 2009:xviii).

Market opening

The opening of the formerly regulated national electricity markets to competition from other EU member states and removing restrictions on customers from changing their supplier proceeded gradually. The first package required the opening up of 35 % of the sector by 2003 – even though Finland, Sweden, UK and Germany have already opened their markets fully as of 1999 (IEA, 2001a:37). The second package demands that all non-household customers should be free to purchase electricity from the supplier of their choice by 1 July 2004 and all customers by 1 July 2007 (2003/54/EC, Art. 21/1(a-b); Buchan, 2010:364).

[7] For detailed definitions, see Chapter 3.1.2.

Regulation

Application of regulatory rules and the introduction of independent national regulators to monitor the sector was established by the second package and broadened by the third package. It enables the creation of a regulative framework for private activities and the promotion of efficient access to the transmission network by wholesale buyers and sellers. However, the National Regulatory Authorities (NRAs) are prevented by their statute to consider any factors beyond their national borders (Buchan, 2010:367). The European Commission, as the guardian of the treaties, is the organ in charge of reporting only on violations of competition law and the Agency for the Cooperation of Energy Regulators (ACER) established by the third package for both electricity and gas sectors, will have only limited powers (see chapter 3.1.2). Unlike the EU, both the U.S. market and Australian market have a single regulator for cross-border trade, Federal Energy Regulatory Commission (FERC) and Australian Competition and Consumer Commission (ACCC)[8], respectively (IEA, 2007:21).

Figure 2: Main elements of internal electricity market regulation

	Unbundling of networks	Access to networks	Market opening	Regulation
First liberalization package 1996	Separate management & accounts	Negotiated or regulated terms of access	35 % open by 2003	Mechanism for regulation
Second liberalization package 2003	Separate subsidiary (legal unbundling)	Regulated terms of access	100 % open by July 2007	Specific national regulatory authority/ies (NRA)
Third liberalization package 2009	Separate ownership or operator: TSO, ISO or ITO	Regulated terms of access	No change from 2nd package	Single NRA at national level - with upgraded powers Establishment of ACER (by March 2011)

Source: Author, inspired by Buchan, 2010:364.

It was generally believed that liberalisation would increase both security of supply and environmental objectives by opening up the markets and increasing the number of market participants (Egenhofer et al., 2004:1; Barysch, 2008:4). But as will be apparent in Chapter

[8] Besides other, FERC approves rates for wholesale electricity market, regulates unbundled transmission and oversees mergers and acquisitions; ACCC works both as independent regulatory agency specializing in transmission and wholesale markets and competition authority (IEA, 2001b:40-1; 92-3).

2, in a situation where security of electricity supply becomes a common responsibility shared among firms, governments, and whenever applicable, individual consumers, imperfect implementation of the adopted rules and insufficient regulation might pose challenges to system adequacy.

1.2. Renewable energy sources promotion as a part of climate policy

Renewable energy policy grew out of environmental policy, having backing in the 'environmental articles' in the Treaty (Art. 175 of TEU in particular) (Oberthür & Pallemaerts, 2010:122). Development of renewable energy sources (RES) was considered a part of the Community's objective to ensure security of energy supplies since 1978, after the two oil shocks (Lovinfosse, 2008:71), but in the end, most countries gave preference to coal and nuclear energy. Renewable energies continued to feature in the EU energy discussions from mid 1980s but the adopted directives had little impact, as did the various aims of the environmental policy integration, unlike the area of energy market liberalization.

In fact, the main driver for RES promotion was climate change policy. At first, the Rio conference on climate change gave rise to only a few policy proposals, which were not really successful (such as carbon tax) (Lovinfosse, 2008:71). In 1995, in a situation when liberalization effort gained momentum whereas the environmental concerns were being given little attention, a White Paper on energy policy addressed the need to reconcile competitiveness and environmental protection objectives for the first time (European Commission, 1999). Real policy promotion of renewable energy sources did not start until 1996, when the Commission Green Paper "Energy for Future: Renewable Energy" was released, proposing the doubling of RES contribution to 12 % in comparison with gross domestic energy consumption by 2010[9]. The 1999 Communication on the Single Market and the environment acknowledged that a liberalized market could stop the development of renewable energy sources and recognized the need of common rules for RES support, even though no support mechanism was picked as the "best" one (European Commission, 1999a).

[9] First numeric targets were adopted in conjunction with a renewable energy programme called ALTENER – to cover 8 per cent of the total energy demand by 2005 (Collier, 2002:178).

Directive 77/2001/EC (so-called RES-E directive) promoting a target of 10% for electricity production from renewables by 2010 (which, as we can see was substantially lowered compared to 12 % of all energy consumption) and 2009/28/EC directives aiming at 20% of energy produced from renewables by 2020 followed. Whereas the first targets were non-binding, the latter ones are already mandatory.

Today, renewable energy sources represent one of the key pillars of the EU environmental strategy. Even though there might not necessarily be a conflict between the liberalisation of the electricity sector and environmental performance goals (Glachant & Lévêque, 2009:xv), the problem of climate change addressed in the Kyoto Targets adopted in 1997 has required breaking business-as-usual mechanisms in spite of the fact that at the beginning of the liberalization process, the Commission argued that market alone will suffice to deliver lower carbon emissions (Barysch, 2008). It is promoted that the behaviour of both the competitive and the regulated segments of liberalized electricity sectors is compatible. However, uncertainties remain as to the longer-term assurances of the price of carbon in relation to massive investment needs in RES, energy efficiency and low/zero carbon technologies (De Jong, 2010:5).

Possible low energy prices resulting from IEM (which did not really happen) are not desirable from this point of view because they make renewable energies less competitive. RES were granted special concessions to ensure a level playing field. Some EU competition rules do not apply to renewable energy sources of electricity (RES-E) – e.g. relating to state aid or public service obligations. Moreover, state aid can even be granted to renewable energy sources of electricity (RES-E) in order to compensate for the absence of the internalisation of environmental externalities in the liberalized electricity market. Having guaranteed access to the grid, generators can sell and transmit electricity whenever the source becomes available (for details see Chapter 3.2).

The Commission tried to introduce EU-level support schemes harmonization through some form of a tradable green certificates (TGCs) scheme and by imposing quota obligations on suppliers to draw a certain percentage of their electricity from renewable resources but its efforts failed due to the strong lobby of the renewable energy industry and "green" member states both during the negotiations of 2001 and 2009 directives. Even though the "guarantees of origin" can be exchanged between EU member states, renewable energy sources are subject to national support schemes which the member states are free to choose (developed in the 1990s), some countries using a combination of more of them. The most commonly used scheme is that of price-driven feed-in tariffs; tax incentives (payment exemptions from the electricity taxes applied to producers) are less used. Feed-in tariffs have the form of a fixed amount of money being paid for RES-E production for a guaranteed time or an additional premium on top of the electricity market price paid to RES-E producers. Premiums are paid to the producer on the top of the electricity market price, which unlike the feed-in tariff system introduces competition between producers in the electricity market (Oberthür & Pallemaerts, 2010:121). Alternatively, quantity-driven quota obligations based on tradable green certificates or tendering systems are employed (Lafferty & Ruud, 2008:30-1).[10] The renewables Directive also allows EU member states to meet their renewable energy targets by statistical transfers of renewable energy from other member states or joint projects with either EU or third countries.

All in all, RES-E are considered to represent not only a necessary contribution to the fight against climate change, to the creation of job positions and leading the R&D sector in the EU but also to the effort to diversify the energy mix and lower fossil fuel import dependency, thus contributing to energy security. Although these arguments remain valid, we will see in chapter 2.3, that it is not necessarily always the case with regard to electricity.

1.3. Security of energy supplies and zoom in on electricity

Energy security motives were the golden thread of the European integration from its very beginnings. The European Coal and Steel Community (1951) submitted these industries to a common management in order to hinder their usage for new militarization. The Euratom

[10] This system is being used e.g. in the UK, Italy, Belgium, Sweden, Poland, Romania and Bulgaria (Silvast & Kaplinski, 2007:27-8).

Treaty (1957) created an analogous institutional framework for nuclear energy.[11] The oil shocks in 1973 and 1979 which led to shortage of energy supply in many countries prepared the ground for debate on common energy programmes in the European Commission – but compared to powers in nuclear and coal sectors, these regulatory mechanisms had only limited reach – attempt to extend EU s jurisdiction remained unsuccessful.[12]

In 1989, security of supply slipped off the agenda while the internal energy market alongside an environmental policy took precedence (Eikeland, 2004:23). The Commission argued that opening up markets for gas and electricity would be the best way of achieving the other two objectives but then it conceded that market alone will not make it (Barysch, 2008:4), at the same time acknowledging that some of EU's energy policy goals are hard but not impossible to reconcile by a coordinating policy instruments (Eikeland, 2004:27).

The interest to bring security of energy supply back on the agenda was first evident with the publication of its 2000 Green Paper *Towards a European Strategy for the Security of Energy Supply* (European Commission, 2000). Among other things, it was triggered by the revival of OPEC, higher crude oil prices and international political instability, and underscored by the terrorist attacks (9/11, Madrid, London) and the wars in Afghanistan and Iraq (Egenhofer, 2007:4). According to the Paper, energy supply security must be geared up to ensuring three elements: apart from the uninterrupted physical availability in order to enable proper functioning of the economy, it should be reached at a price which is affordable and with respect to environmental concerns. It adds that *"security of supply does not seek to maximise energy self-sufficiency or to minimise dependence, but aims to reduce the risks linked to such dependence"* (European Commission, 2000:2).

[11] In 1960, EURATOM Supply Agency was created whose main aim is to ensure regular and just provisions of nuclear fuel.

[12] One of the few exceptions was adoption of directive that restricted the use of natural gas for power generation (75/404/EEC) which was though revoked in 1991 (Eikeland, 2004:23).

An informal summit in Hampton Court in 2005 confirmed this trend[13] which further intensified after the Ukraine crisis in 2006 when Russia cut natural gas supplies to this country, and not even a year later to Belarus. As far as security of energy supply is concerned, Green Paper *A European strategy for sustainable, competitive and secure energy* from 2006 (European Commission, 2006) calls for better coordination of the EU's supply of and demand for energy within an international context and for the establishment of effective mechanisms to create emergency stocks and foster solidarity to avoid energy supply crisis. So it was the external dimension, which explicitly addressed in particular. The interconnectors issue was primarily dealt with in regard to market completion in terms of Trans-European networks programme (see chapter 3.1.3). Besides that, the opening up of markets was regarded as one way of guaranteeing a secure energy supply because it creates the stable, competitive environment in which companies invest.

In the Security of Energy Supplies Package consisting of EU Energy Security and Solidarity Action Plan: 2nd Strategic Energy Review released in November 2009 in support of the 20-20-20 climate change proposals series[14], the Commission sets out five areas where more action is needed to help set the EU on course for more secure and sustainable energy supplies in the future and to avert the risk of crisis in the EU as a whole: More effective support is needed in projects to build the required infrastructure. The EU has to make better use of its indigenous energy resources, both renewable and fossil. More attention has to be paid to solidarity, including EU crisis mechanisms, oil stocks and a variety of mechanisms to respond to possible gas disruption. Additional and more urgent efforts have to be made to improve energy efficiency.

The Lisbon Treaty refers to the security of supplies by addressing energy solidarity between member states in case of difficulties in supply (Art. 122 of TFEU) and via the promotion of energy networks interconnectedness (Art. 194 of TFEU).

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[13] EU leaders agreed to three main energy policy objectives here: market liberalization, energy security and fighting climate change (Barysch, 2008:4).

[14] So-called 20-20-20 targets involve: 1. Reduction in EU greenhouse gas emissions of at least 20% below 1990 levels. 2. 20% of EU energy consumption to come from renewable resources. 3. 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

Security of electricity supply

With continuing market integration, the trend towards a bigger focus on internal security of supply and electricity sector has been observable, since market causes intensification of cross-border electricity exchanges and thus requires adequate network and professional grid operation. Nevertheless, the sole legislation directly devoted to security of electricity supply (and security of supply as such) is Directive 2005/89/EC[15].

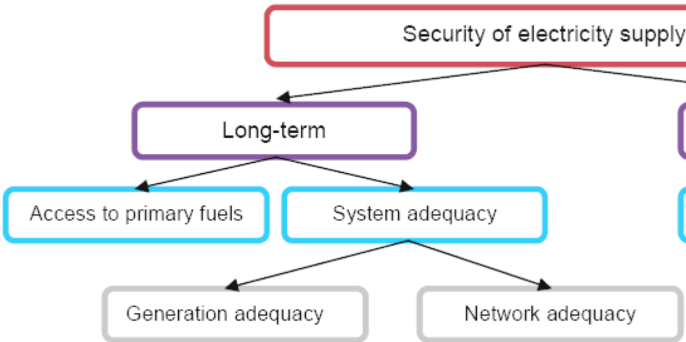
Electricity is a peculiar commodity characterized by a lack of product differentiation (Schmidt, 1997:255). Unlike oil products and national gas where the risk of supply disruption is reduced due to storage possibilities, electricity is practically non-storable (with the exception of pumped storage) and thus requires real time balancing and network control (WEC, 2008:15). Combined with very inelastic short-run demand, network congestion in places where there is insufficient capacity and long construction times, the power system is considered to be the second most sophisticated mechanism on this planet after the human body. For all of these reasons, security of electricity supplies is a very complex concept.

Collective bodies representing the energy sector, such as the International Energy Agency and EURELECTRIC, define security of electricity supplies almost identically as: *"the ability of the value chain to deliver electricity to all connected users within acceptable standards and in the amounts desired"* (IEA, 2005a:27) and *"the ability of the electrical power system to provide electricity to end-users with a specified level of continuity and quality in a sustainable manner"* (EURELECTRIC, 2004), respectively – while taking into account that a completely continuous provision of electricity and 100% reliability is economically unfeasible at the same time (EURELECTRIC, 2005). At the EU level, the only legal definition of security of electricity supplies provides Directive 2005/89/EC concerning measures to safeguard security of electricity supply and infrastructure investment defines it similarly, as *"the ability of an electricity system to supply final customers with electricity"* (Art. 2).

[15] Directive 2005/89/EC of the European Parliament and of the Council of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment.

Moreover, we can dismantle the term into long-term and short-term security of electricity supply aspects, which further split into concrete sets of requirements (see Figure 3).

Figure 3: Aspects of security of electricity supply

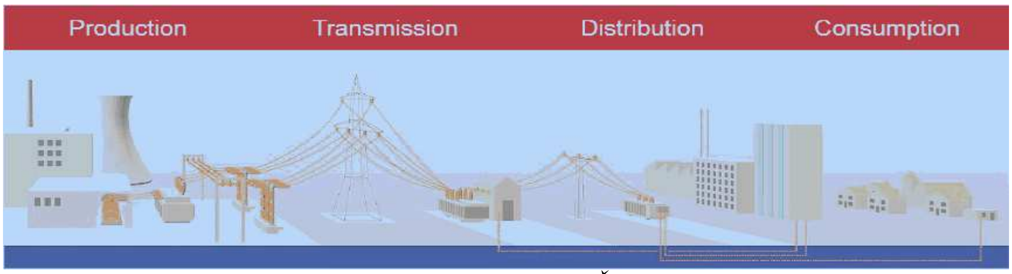


Source: EURELECTRIC (2006) modified by the author

Long-term security of electricity supply

The chain of physical electricity supply comprises generation, which means converting primary sources to electricity and transport of electricity. It involves its transmission over longer distances via high voltage lines (in Europe maximum 380 kV) in order to minimize network losses and distribution to areas of consumption where it is transformed in several steps back to low voltage levels (see Figure 4). Liberalization brings separation of this value chain, originally operated by vertically integrated utilities into three separate market segments. The regulator operates as an authority responsible for setting tariffs of transmission and distribution in order to ensure reasonable prices of electricity and more recently also for investment plans oversight.[16]

Figure 4: Physical electricity supply



Source: Author on the basis of internal material of ČEPS, a.s.

[16] Third liberalization package requires a single NRA at national level which is independent from any other public or private entity to be designed by each member state (2009/72/EC, Art. 35).

Long term security of supply requires system adequacy refers to long-term security of supply, involving both:

- Access to primary fuels;
- Adequacy of electrical power network to meet the demand.

The availability of primary sources for electricity generation allowing for power producers to choose from all fuel sources without being hindered by geopolitical constraints (EURELECTRIC, 2005) is crucial for the running of the system as much as are their price because it has an impact on the generation of investments – variable costs of generation and returns on investments, respectively (see chapter 2.1). Oil and gas will continue to meet over half of the EU's energy needs, with import dependency high in both sectors (over 90 % for oil and some 80% for gas in 2030). Electricity generation will also continue to be heavily dependent on gas and coal, in particular. The EU sees it important to promote diversity with regard to source, supplier, transport route and transport method of fuels and increase the proportion of energy from politically stable areas (European Commission, 2007c). Even though the scope of this paper does not enable to cover this dimension in detail, this link needs to be always kept in mind when talking about electricity as a secondary product – despite the fact that the definition does not emphasize political or geopolitical questions, unlike, for example, the security of gas and oil supplies (Delvaux, Hunt & Talus, 2007:131).

The adequacy of reliable infrastructure relates to all elements of electrical power network: power plants and power grid including transmission and distribution networks and substations. It expresses the ability to convert primary fuels into electricity and to transmit and distribute the electricity to meet the demand. Margins of surplus installed capacity over peak-load,[17] the so-called *reserve margins*, are often used as a measure of generation adequacy (IEA, 2007:11). High margins of generation and network capacity were a priority in the public monopoly system as overinvestment is socially preferable to underinvestment from the point of view of security of supply (Ranci, 2007:8; WEC, 2008:15). Nevertheless, their decrease in the liberalized markets does not necessarily have to represent a negative market outcome (IEA, 2007:37) (see Chapter 2.1). Similarly, security of supply generally

[17] Peak-load is a time period when the demand is on extraordinarily high level.

requires adequacy of infrastructure. This involves both sufficient capacity of the domestic network to transport the generated electricity and under conditions of the internal market also interconnections that are well developed beyond national borders (Ranci, 2007:8).

Short-term security of electricity supply

System operation, which the system operators are in charge of, means real time balancing of the demand and supply in the system while keeping the reliability standards. One can imagine it in comparison with a brain sending out signals to the rest of the organism. If one of the nerves is harmed, it affects the entire system or its large part.

Short-term security of electricity supplies thus regards ensuring a so-called operational security. It implies the ability of a power system as a whole and all of its assets to withstand sudden disturbances caused by short-term failures of individual components, electric short circuits or unanticipated losses of components or unusual load conditions together with operating constraints (IAE, 2005a:27-8; EURELECTRIC, 2005). It requires that the operational system is effective in maintaining integrity and stability of the grid as well as conformity to reliability standards to ensure a high and consistent quality of the service. For example, constant levels of frequency (the rate at which the direction of current changes)[18] and to the given part of the value chain corresponding levels of voltage (the amount of electric force or pressure in a transmission system that causes current to flow in a circuit) need to be maintained.

An important criterion used to describe the operational security is the *N-1 security principle.* It means that a power system can be described as secure when it is capable of maintaining normal operations in the event of any single unplanned fault, such as loss of a transmission line, transformer or generator (including the largest one) (IEA, 2005a:31).

Besides effective operational rules and procedures on network management, system balancing requires reserve capacity (usually unused generation capacity which is employed

[18] In Europe it is 50Hz, in the US it is 60Hz.

only during peak-load situations) together with other system services[19] and a proper market framework providing instruments for system operators to balance supply and demand second by second. Their availability also comes under operational security (EURELECTRIC, 2006:7-20).

To sum up, the security of electricity supply, which has been addressed above is a very complex issue and will be referred to further in the paper together with its individual aspects and its main referential objects. *Availability of electricity supply* (physical security) will be referred to as the main premise throughout the paper. Although in line with Gawdat Bahgat's definition of energy security as *„sustainable and reliable supplies at reasonable prices"*(Bahgat, 2006:965), the affordability factor cannot be ignored or isolated under liberalized market conditions (and as Silvast & Kaplinski, 2007; EURELECTRIC, 2006 etc. also argue) since economic aspects play a crucial role in regard to system adequacy – generation capacity and network investment in particular. Electricity supply in general maintains the character of public services. In practice, if the prices rose to levels at which increasing number of customers could not afford to pay their bills and as a result of that the power supply was cut off to them, it would have vast societal consequences. By contrast, the sustainability dimension is not – unlike the Commission's definition of security of energy supply – considered as a part of our security of electricity supply paradigm.

[19] Those involve operational tools such as standing reserve, black start capability, remote automatic generation control, grid loss compensation, emergency control action, etc. (EURELECTRIC, 2006:21).

2. Challenges to security of electricity supplies

What are the main challenges to EU security of electricity supplies? There are different approaches to identify risk to security of energy supplies as such. The European Commission Green Paper identifies four areas of risks: *technical* (system failures caused by weather, lack of capital investments or poor conditions of the energy system), *economic* (lack of investment or insufficient contracting), *political* (including regulatory) and *environmental* (damage or accidents from pollution) risks (European Commission, 2000).

In order to be able to assess robustness of member states and EU energy policies, Behrens and Egenhofer expand the narrow concept of security of supply, identifying six risks while regrouping some of them: *import dependence* (on producer and transit countries), *investment risk*, *environmental risks* (from climate change or pollution, also as a result of accidents), *regulatory and political risks* (due to inefficient regulation or local market disruptions due to pressure group actions), *risks associated with market failure* and *excessive energy prices* (2008:21).

Bearing in mind the various aspects of security of electricity supply summarized as "the ability of the electricity system to supply final customers with electricity" which we identified in the last chapter, when we zoom in on most serious challenges, we will find that a lot of these risks are closely inter-related.

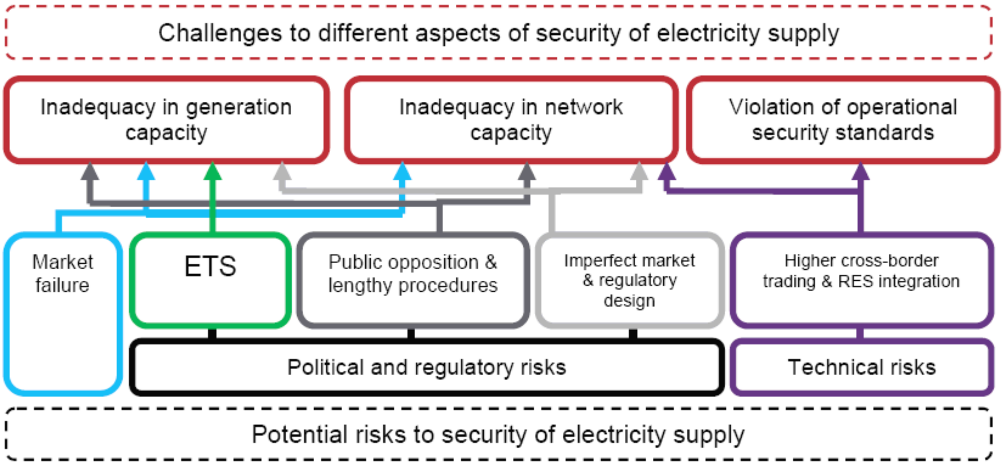
Taking into account the limited extent of this paper as well as its research purposes – i.e. the execution of a compatibility test of the EU Energy Policy "trilemma" pillars – politicians and academics often mention three challenges which can be at least partly addressed at the EU level,[20] potentially occupying the conflicting lines of the so-called European energy "trilemma" between security of supply, competitiveness and environmental objectives (for illustration see Figure 5):

- *Inadequacy of generation capacity, including reserve capacity;*
- *Inadequacy of network capacity, including cross-border capacity;*

[20] Moselle, 2008; Nies, 2010; Ranci, 2007; Silvast & Kaplinski, 2007; Stoft, 2006; Zachmann, 2010 etc.

- *Violation of operational security standards.*

Figure 5: Risks to security of electricity supply in the EU



Source: Author

That does not mean that there are no others. The *risk of excessive electricity prices* is almost omnipresent and will be referred to when addressing the above-mentioned issues. Another one is *high dependency on import from politically unstable areas* which is, in the case of electricity, and at least so far, relevant only for primary fuels such as natural gas, oil etc.,[21] because imports from outside of the EU represent less than 0.2% of the electricity required to meet this consumption and cross-border trading of electricity is more important than exchange with third countries (European Commission, 2007a:112). Therefore, it will not be dwelled upon here (respectively, only indirectly via addressing generation adequacy) as it is not in the scope of this paper to encompass it in its full complexity.

Another issue, which is even addressed by the Community policy, is the threat of terrorist attacks. Power networks that are vulnerable to both physical and cyber attacks were identified as objects ranking among critical infrastructure – in other words, assets essential for the maintenance of vital societal functions and whose disruption or destruction would have a significant impact in a member state or more member states (2008/114/EC, Art. 2). This issue has been addressed since the European Council called for preparation of an overall strategy to prepare critical infrastructures in June 2004 and several measures have

[21] Similarly, rising dependence on China as a key supplier of solar PV and wind turbines is not a negligible trend either (just shifting dependency from one country to another?) (Glachant et al., 2010:7).

been adopted since then, including the Directive 2008/114/EC.[22] The EU is currently reviewing security and resilience in the energy and ICT[23] sectors (Perks, 2009). But since it is a threat which is uninsurable or extremely unlikely to ever materialize, most routine blackouts are still caused by natural causes and technical faults and not catastrophic scenarios such as a terrorist attack (Silvast & Kaplinski, 2007:4)[24]. At the same time, this is somewhat detached from the rest of the EU energy policy – Justice and Home affairs having been part of the "third pillar" before the cancellation of the pillar structure by the Lisbon Treaty – with the non-existence of a link with the other two policy areas, it will not be analyzed in further detail either.

For the three above-mentioned challenges, it is important to first address the nature of the risks (which, as we can see in Figure 5 often stem from multiple areas) and only later to provide an account of overall EU balance in this regard. For this purpose, the so-called *"robustness indicators"* (Behrens & Egenhofer, 2008:22) will be employed: firstly, quantitative indicators, e.g. reserve and excess capacity in generation, capacity of interconnections in transmission and the number of supply disruptions and the amount of time when the system complies with the N-1 security principle; and secondly qualitative indicators, including market characteristics/indicators (most-detailed and complex account in this regard is provided by the Energy Sector Inquiry) and availability of insurance policy measures (in terms of chapter 3).

2.1. Inadequacy of generation capacity

As a result of the technological progress and rising standards of living, long-term demand for electricity has been on the rise. Organization for Economic Cooperation and Development (OECD) countries' electricity demand was projected to grow at an annual rate of 2.7% per cent on average in the period 2007-2030 (IEA, 2009:96). At the same time, many older power plants will be phased out. This will create requirements on a new

[22] Council Directive 2008/114/EC on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection.
[23] Information and Communication Technologies.
[24] At the same time Silvast & Kaplinski argue that: *"Although it is often represented as a novel security practice, critical infrastructure protection has clear continuities to the strategic bombing theories of WWI and WWII, the dawn of air-nuclear age and the need to protect "critical targets", and the discussion around oil crises and electricity blackouts in the 1970s and the 1980s"* (2007:6).

generation capacity, thus posing a challenge to system adequacy and operational security (because of reserve capacity). Moreover, demand patterns in some countries alter. For example, some winter-peaking countries turn into summer-peaking countries. This has a vast impact on the development of installed capacity and actual generation output.[25]

In the monopolised market structure, planning of electricity generation, transmission and distribution was done centrally and on a national basis and producers and consumers signed long-term contracts guaranteeing electricity provision (Silvast & Kaplinski, 2007:13-14). Stable regulated prices used to be set to cover costs of utilities investments. Vertically integrated sector mostly produced certain overcapacity.[26] This positive external effect bringing benefit to all users at the top of a simple supply of electricity brought consumers the reliability of service without charging them for it. High reserve margins possess the public good characteristics because the added reliability they provide is non-excludable (nobody can be excluded from using it) and non-rival (additional consumers do not add to cost) (Abbot, 2001:31-2; De Vries, 2004:6).

2.1.1. Risk associated with market failure

In liberalised competitive markets, the characteristics of reserve capacity remains unchanged. But there is a need of return on investments. The regulatory shield has been removed and the risk has been internalised. Generators are no longer guaranteed the ability to recover all costs from power consumers since the future price level is not guaranteed (IEA, 2003:27). The planning process is no longer "directed" by security of supply issues, but rather is reactive to market signals (EURELECTRIC, 2006:14). This naturally leads to a decrease in available reserve margins. Unused capacity improves the security of supply, but does not earn money and thus does not create incentives for investment into it – unless it can be exported. Incentives to overbuild have thus been removed, which results in more efficient use of resources but also in lowering the social optimum.

[25] On the other hand, short-term demand is very uncertain because its level depends on weather and the state of any interconnected power systems (Lévêque, 2006:31).
[26] As exceptions, e.g. Portugal was lacking reserve capacity in past.

In the ideal case, the need of investment is signalized by price spikes. However, another factor besides time-limitedness of the product comes into play. Because there is no available alternative for most applications of electricity and price information rarely reaches consumers in time so that they would be able to adjust their behaviour, the low elasticity remains a very characteristic and symptomatic feature of the demand side. Consumers have de facto no direct confrontation with the fluctuating price of electricity (higher in peak hours than in off-peak). Because electricity consumption is usually measured over long periods, they do not face the opportunity cost for shifting their consumption from peak hours to off-peak hours (Lévêque, 2006:4-5; De Vries, 2004). Consumer response to higher prices is thus still lacking in electricity markets even though in reality, a very small degree of demand response can play a critically important role for system balancing during periods of scarcity (IEA, 2007:22).

At present, there is no scientific consensus on whether markets are expected to produce adequate capacity levels continuously (Egenhofer et al., 2004:10). But since the price signals are only rarely strong enough to stimulate adequate continuous investment into reserve capacity, it tends to have a rather cyclical character. Investment particularly in small peak-units is quite risky since spot wholesale electricity market prices are rarely high enough to cover both the operating costs and the capital investment costs (Joskow, 2006a:3).

Referring to the theory of *irreversible investment under uncertainty*, Lévêque explains that due to the character of demand it is not sensible to make investments at the first signs of an increase in demand unless it is sustained. Investment is optimal if the conditions are at the level where the profit from investing now outweighs the benefit of waiting for more information and the firm should only invest when the trigger price exceeds a particular level, which is usually well above the minimal conditions at which investment would be just profitable (Lévêque, 2006:31-3). An investors' decision about the timing and choice of technology in this capital-intensive sector is influenced by many factors related to business risk, including market rules, price of electricity on the market, fuel price, outlook for resource availability and investment costs, environmental regulation (such as emission controls and certificates).

Vulnerability to cycles can be lowered by long-term contracts, which reduce both the uncertainty of entrants and provide more precise information about supply and demand of retailing counterparties. However, retailing companies and consumers are discouraged from such contracts even if the contracts are usually shorter than the cycle (De Vries & Hakvoort, 2004:8-9; IEA, 2003:45). In liberalized markets, companies restructure to mitigate risks in such investments. They acquire upstream natural gas assets in order to hedge fuel cost risks associated with it or they attempt to assure stable cash flow for capital intensive investments through mergers and acquisitions (IEA, 2003:52-3). However, this can often overflow to the case of excessive market power. Other possibilities involve financial hedging instruments (futures and forward markets) which can be relied upon only when there is sufficient liquidity; organization of consumers – e.g. the TVO project (Olkiluoto nuclear power plant in Finland) as a co-operative consisting of both large electricity consumers and some municipal utility companies); or assistance of government on projects, which have long construction periods and high investment costs for large base-load units in order to reduce uncertainty (IEA, 2003:46-8).

The risk of underinvestment could also be theoretically offset by trade because investments in generation and transmission of electricity are partly substitutable (Lévêque, 2006:2). However, sufficient interconnection capacity, which would speed up the import competition to challenge the dominant generators, is often unavailable[27] (Egenhofer et al., 2004:10) (see chapter 2.2).

2.1.2. Regulatory and political risks

At the same time, investments are subject to internal market regulatory framework and climate policy as well as external factors such as stability and sustainability of supply.

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[27] Since the rules for using interconnectors are different from the regular transmission-access rules within the system, the markets that function within the interconnected systems are not fully integrated, but incompletely linked which can have repercussions upon the generation adequacy in the different markets (De Vries & Hakvoort, 2004:11).

In order to prevent market failure, well-designed regulatory framework and availability of safeguard measures are often mentioned as key pre-conditions for good functioning of the market towards investments into generation capacity including a reserve capacity, which needs to be maintained to continue reliable operation of the system. These measures enable to pursue the benefits of competitive markets to allow for more efficient and more transparent management of investment risks (Checci et al., 2009:38; IEA, 2007:20). By contrast, *imperfect market design and regulatory framework* can exacerbate investment conditions by creating possible instigation to market failure. Economist de Vries and Hakvoort list the following elements as detrimental:

- *Price restrictions*, particularly in form of price caps, are often argued as necessary to protect consumers from overcharging in times of scarcity but their level is difficult to determine – if they are too low generators will not cover their costs;[28]
- *Imperfect information* about future demand complicates socially optimal decisions of the producers;
- *Regulatory uncertainty* which is typical particularly for newly liberalised markets. It leads to strong uncertainties of companies over the returns of their investments and has adversary influences on the willingness to invest (Checci et al., 2009:35);
- *Regulatory and legislative restrictions to investment* such as obstacles to obtaining the necessary permits might even contribute to investment cycles;
- *Risk-averse behaviour* by investors which is difficult to prove (IEA, 2003:58) and discourage since the penalty (losses in case of supply shortages) is compensated by the high prices that develop during a period of supply shortage (De Vries & Hakvoort, 2004:4-6; Buchan, 2009:29).

It is usually not an established electricity market that fails but a developing market in an early transitional phase. The best-known example when shortages in generating capacity played a critical role (even though there were other factors) is provided by the so-called California crises from 2001. Shortage of capacity increased the bargaining strength of merchant generators signalling the enormous profits that could be gained through supply

[28] Prices caps should be equal to the value of the lost load (VOLL) which is very difficult to quantify.

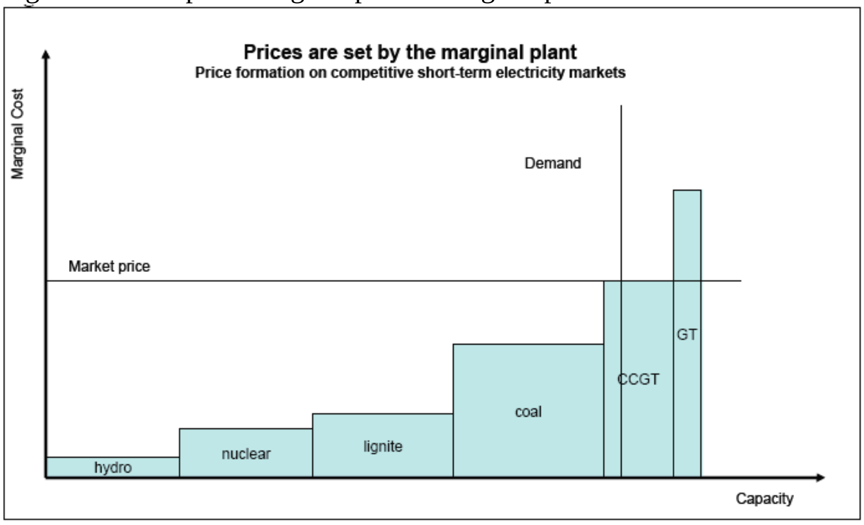
shortages for overall of thirty hours spread in six days, with total costs estimated at $45 billion (Weare, 2003:vi). With a contribution of manipulation by generators, who were motivated to withhold the capacity from the market in spite of the risk of being convicted for abusing the market power, multiple large-scale blackouts occurred. With this event in mind, state-owned entities stepped in to contract for additional generating capacity or required incumbent distribution companies to contract for new supplies to mitigate adequacy concerns also in other countries, e.g. Chile, Brazil, New Zealand or Ontario in Canada (Joskow, 2006a:1-2).

Climate policy can also have impact on investments and the fuel mix, in particular. It is often claimed that if the competitive market is backed by ongoing government commitment and if there are well-functioning markets for fuel and CO2 emissions at the same time, it should lead to diversification and an opt out for clean technologies as a result of market incentives for investors (IEA, 2007:14). Nevertheless, the uncertainty about the future – and the fact that the old EU Emission Trading Scheme was going to run only till 2012 – was criticized for creating investment risks and costs, which had no positive but even a negative impact on investment by making it more difficult to decide about the portfolio of sources in particular (Szabó, 2008:1436). A similar effect of uncertainty can create moving *renewable energy targets* as well as *national support schemes for renewable energy sources, which also* influence the energy mix. Last but not least, lengthy *authorization procedures* often finding their origin in environmental policy also create access barriers for investors.

Another factor, which might have an impact on security of electricity supplies, is favouring one type of fuel over another. Apart from subsidised investments into renewables (especially wind farms), market liberalization prompts the generation investors to build mainly *natural gas*-fuelled power plants (Politt, 2005:6), and particularly combined-cycle gas turbines (CCGTs) (Rious, Glachant & Dessante, 2010:9). Natural gas demand for power generation has been increasing strongly over the last 15 years, driven both by the development of CCGT technology and low gas prices (in last years also thanks to the economic crises) (IEA, 2009). In comparison to other technologies, CCGT has many undisputed advantages over other technologies. Firstly, they are low up-front investments costs which can be considered as “sunk cost” from the moment they are incurred – the marginal cost of producing an additional unit of electricity thus corresponds to fuel costs which is thus quite low even at relatively high gas prices (IEA, 2007:84-5). Besides this, it has a shorter construction time, more flexible operation and lower greenhouse-gas emissions than other conventional technologies. Growing gas-fired capacity is also compatible with an increasing share of electricity generated from renewables because gas turbines are able to quickly respond to the need for additional generation and thus can be used as a backup capacity (IEA, 2009:164).

However, a clear and important link between the functioning of gas and electricity markets exists. The prices for gas significantly affect electricity price levels, since in many countries, gas-fired power plants are responsible for setting the price level of electricity (the concept of a marginal plant setting the price – see Figure 6), in particular during peak hours. At the same time, volatility of natural gas price – unlike carbon or uranium price – still represents a risk factor (IEA, 2003:32) as it is still closely fixed to the price of crude oil (price is calculated on the basis of combustibles which can substitute it). It was experienced that a number of gas-fired power plants projects were not completed for this reason.

Figure 6: Concept of marginal plant setting the price



Source: European *Commission, 2007a:123.*

2.1.3. EU balance

The examples of England and Wales, Finland, Sweden and Norway, which were the first countries that liberalized their markets, show that in spite of the fact that liberalization has often (logically) been accompanied by a reduction in capacity margins, they have not generally fallen to a level that posed a danger to security of supply (Lévêque, 2006:46).

According to the Second Strategic Energy Review, the overall EU power capacity grew at an average rate of 1.7% whereas electricity consumption has grown at an average annual rate of 1.8% from 2000 to 2005 (European Commission, 2008a:39). Europe as a whole was reported to have a relatively constant generation margins keeping pace with steadily growing demand, even though significant shares of new generation are from strong growth in wind power, which effectively decreases margins due to its low availability (IEA, 2007:11-12). But despite the remaining capacities appearing as sufficient[29] in the short and, for certain parts of the EU, medium-term, new capacities will have to come on stream from 2015 onwards, and even earlier in some parts of the EU, in particular in central Europe and the Baltic countries, primarily as a result of the planned decommissioning of nuclear power plants, e.g. Ignalina (UCTE, 2008). Some concerns have been raised as to the market's capability of ensuring sufficient peaking (reserve) capacity which runs up to a maximum of a few hundred hours per year and is necessary to ensure the fine-tuning of security of electricity supply, linger also in the EU (EURELECTRIC, 2006:7). Interestingly though, it needs to be mentioned that the notion of optimal margin size has altered: whereas margins between 18% and 25% of the total generating capacities were considered as acceptable in the past, 15% seems to be accepted as the bare minimum nowadays (European Commission, 2008a:43). The current overall EU-27 production capacity encompasses almost 800GW (for details see Appendix 1).

As regards the *regulatory issues*, despite relying on the logic of market to ensure generation investments by stating that *"competitive wholesale markets provide price signals for both demand and supply and, for example, encourage new investment when necessary and give the signals to potential investors on the type of investment (e.g. base-load or peak) or*

[29] Also the last analysis indicates that generation-load balances in most countries are generally regarded as adequate for secure system operations under normal conditions (European Commission, 2010b).

choice of technology that is most required in the market", the Energy Sector Inquiry (European Commission, 2007a) admits the shortcoming of the EU internal electricity market which bear features of the above mentioned imperfect market design being detrimental to generation investment signals. The following were reported:

- *Regulated tariffs* which are still used in some countries (e.g. Portugal, France, Italy, Spain, Hungary, Poland) and in case of some countries, particularly France and Spain, it was complained about the level of regulated tariffs being too low and the effects of low wholesale markets (European Commission, 2007a:203). The Commission thus launched several infringement procedures with respect to price regulation (Delvaux, Hunt & Talus, 2008:185) (see Chapter 3.1).
- *Lack of information – transparency* on technical availability of interconnectors and TSO networks, on generation, balancing and reserve power and load which undermines the trust in the wholesale markets and with it its price signals as a reliable benchmark (European Commission, 2007a:188).
- *Concentration in the market power* which can lead to withdrawing capacity and in that way support risk-averse behaviour which discourages investments – it reports increased load factors of generation units in Spain and France but at the same time states that evidences of withdrawn capacity could not be presented since the limited data which the report had at its disposal had to take into account maintenance schedules of the plants (European Commission, 2007a:147). For more details on degree of concentration in EU market, see Appendix 2.
- *Lack of unbundling* has close connection to market concentration. It leads to worse conditions for new entrants since the lack of transparency in vertically integrated companies where TSOs favour their affiliated supply branch provide low insight to the causes of this congestion (allegations made against German and Benelux TSOs) network operators can only refuse access to their networks if no or insufficient capacity exists (European Commission, 2007a:161-2).
- *Lack of liquidity on the market* can lead to high volatility of prices and thus reduced reliability of the price signal and create higher barriers to entry which are further increased by vertical integration of generation and retail. Incumbents' market shares remain high.

The impact of *climate policy* cannot be neglected either. The fact that the old scheme is running only till 2012 and the uncertainty resulting from the lack of visibility on the long term for the EU Emissions Trading System (ETS) mechanism was criticised a lot as contributing to lack of investments by market participants (European Commission, 2007a:134), before EU ETS re-negotiation. However, it is probably more important that during the first and second European ETS trading periods (2005-2012) it was decided to give most of the CO2 permits to power plants and energy-intensive industries for free (IEA, 2007:42) and generators started to factor in the value of CO2 allowances in their pricing decisions as an additional factor of production claiming that the value of CO2 allowances is an opportunity cost, which can be factored in legitimately (European Commission, 2007a:199). These high "windfall profits" of the electricity supply industry (Eikeland, 2008:40) logically got reflected in increase in electricity prices. Energy sector inquiry underlined that it needs to be ensured that the ETS does not amount to an entry barrier for companies, claiming that the allowance allocations contain new entrants' reserves. But some new entrants argued that insecurity about allocation methods and attributed sums existed (European Commission, 2007a:605-6).

The ETS was revised by the so-called climate package[30]. However, the original plan saying that from 2013 enterprises would have to buy all their permits at auction was opposed by industrial lobbies and countries which largely rely on coal (e.g. Poland) arguing that the extra cost of buying permits would mean an unacceptable rise in electricity prices and many concessions have been made. And even though the future got clearer shape, industry argues that ETS in its current form is insufficient to drive an energy transition and change the fuel mix in Europe and complementary policies are needed, such as a system of Emission Performance Standards (EPS) (De Jong, 2010:8).

But also other environmental policy measures contributed e.g. to a number of postponements to new coal-fired power plants in recent past. In the Netherlands, plans to build three new coal plants have been shelved for approximately 18 months while an

[30] It is treated by Decision 406/2009/EC and Directive 2009/29/EC.

interpretation of EU rules on emissions of oxides of nitrogen and sulphur dioxide is handed down (IEA, 2009:159). Another example represents Water Framework directive whose implementation at Member States level has had negative impact on investments in small hydropower (ESHA, 2010).

As far as fuel is concerned, since 28 % of *natural gas* is used for electricity generation (Eurogas, 2010) and a considerable and increasing quantity of gas is used in thermal power plants, the gas prices influence wholesale electricity prices and the connection to the internal market in natural gas is very close. If natural gas prices increase by the liberalisation of the natural gas market it will also have an impact on the price of electricity and as well as generation portfolio.

And dependence on imports is increasing. The European Union is expected to require the highest increase in import volumes due to declining indigenous production, particularly in the Netherlands and the United Kingdom, coupled with a modest increase in demand. By 2030, imports into the European Union meet 83% of its gas needs, compared with 59% at present (IEA, 2009:120). Therefore, so-called "Gazprom clause" as a part of third liberalization package was adopted as an apparent response to fears that ownership unbundling could lead to the indiscriminate acquisition of EU energy grids by third countries. But since it is not completely possible to be less dependent on imports – and the EU does not even aim at it – the main measure must be diversification. Nevertheless, world gas reserves as such (both conventional and non-conventional) rise at much faster pace than oil reserves (Furfari, 2007a).

To sum it up, this part confirms the axiom that adequate generation capacity investment is compatible with market principles. Therefore, mostly the policy elements and various other factors which might have negative impact on functioning of the market are detrimental to it as well.

2.2. Inadequacy of network capacity

Investment generation challenge is closely related to the challenge of network investments as larger inter-connected market would make part of the excess capacity redundant. And for years to come, building of adequate transmission infrastructure including cross-border interconnections appears to be the knottiest problem in the liberalization process (Stoft, 2006:127; Zachmann, 2010:3-4). The present infrastructure was put in place during the post-second world war economic expansion of the 1950s to 1960s and planned solely on the national level because self-sufficiency was considered as a priority. Nevertheless, many of the components are reaching the end of their design lifetimes (Silvast & Kaplinski, 2007:22).

As far as transnational exchanges of electricity are concerned, first limited ones in Western Europe took place between 1907 and 1910. For example between years 1937-39, France covered part of its electricity need by imports from Belgium, Germany and Switzerland (Derdevet, 2009:109). In 1951, association UCPTE (in 2001 re-named UCTE) was founded by 8 countries (Austria, Belgium, Federal Republic of Germany, France, Italy, Luxembourg, Netherlands and Switzerland) as considerable exchange of information in terms of synchronous system (meaning that the whole system works on the same 50 Hz frequency) was already desirable at that time (Frédérick, 1995:40).[31]

Nevertheless, preceding market opening, the interconnections between European countries were built in order to satisfy cases of emergency – international interconnection enabled to enhance the security of supply when balancing of the grid required it; and economic necessities – international interconnection enabled to decrease margins (although in a very limited way because the national independence in energy policy was still considered as crucial) motivations, in uncoordinated way (Frédérick, 1995:38-9). In vertically integrated systems, decisions to build any line (both intra- and inter- state) were adopted centrally in

[31] UCPTE synchronous zone (as well as association' membership) further expanded until covering the whole continental Europe (e.g. in 1995, synchronous connection with association CENTREL (Czech Republic, Hungary, Poland & Slovakia) was completed. Besides UCTE having 22 (also non-EU) members, four other synchronous zones exist in Europe: NORDEL (Scandinavia), UK TSO (Great Britain), TSOI (Ireland) and IPS/UPS (Baltic countries). The association was formally substituted by ENTSO-E in 2008.

coordination with generation investments – and similarly as in case of generation, the overinvestment did not matter.

With market liberalization, the wholesale power trading has been growing and thus also utilization of these interconnections as well as intra-state power lines for transmission on long distances. Similarly, rising concentrations of wind power in remote areas require large transmission capacities to distribute power production across larger areas when the wind blows and to import alternatively generated power as a back-up for balancing when the wind dies down, e.g. in form of hydro power (see chapter 2.3.1). Both intra- and inter- TSO transmission congestion (lack of capacity at the line at given time) often becomes a growing problem in liberalizing markets. Cross-border congestion limits the geographic expanse of competition hindering market integration as well as opportunities to fully exploit generating capacity at the lowest operating costs (Joskow, 2006b:132).

2.2.1. Recognized market failure

Unlike generation, transmission networks are and due to its character of natural monopoly will remain largely regulated area. However, incentives for investments remain a highly contested subject of discussion between regulators. Economists recognize that even incentive regulation might prove inaccurate and difficult to design. Planning solution might thus be preferable, at least until wholesale power markets are functioning efficiently and the generation-investment problem has been solved (Stoft, 2006:87).

In ideal market, transmission and generation would be planned together since market would induce generators for timely investments and transmission planners would rely on it. But since there is not static model of generation, transmission planners need to take into account different generation strategies. The fact that generation investors react to transmission policy at the same time creates chicken-and-egg problem (Stoft, 2006:102). Scale of embarrassment about building a line into nowhere creates first mover advantage on side of generation in the optimalization game. As a result of that, transmission side will not predict optimal generation as it theoretically should but rather extend the existing infrastructure or build infrastructure for the anticipated or planned generation. Transmission system operator as the main developers predict electricity consumption and capacity needs several years ahead, including interconnections in their plans (by using load flow scenarios) (Silvast & Kaplinski, 2007:16).

So even though theoretically, there are two motivations for transmission investment – reliability and economic – these two are hardly divisible in practice. Or more precisely, transmission investment activity is almost entirely driven by reliability criteria which are confirmed by the fact that in terms of the transmission system operator the department of development which is in charge of this task barely consults the issue with department of trade.

2.2.2. Regulatory and political risks

Accepting that allocation of investments by a free market is not efficient in this case, we have to reconcile with planning. Nevertheless, a precondition for sufficient investments – interconnector capacity in particular – is that proper regulatory incentives are set for "regulated lines" which are build by national TSOs (which still largely prevail) or as public-private partnerships (PPPs), as well as "merchant lines". According to the Commission Energy Sector Inquiry, these incentives may arise from estimated future revenues primarily reflecting the absolute price differences between adjacent geographical wholesale markets (European Commission, 2007a:178).

But besides creation of social welfare through increased reliability and indispensability of strengthening interconnections in order to increase competition between prevailingly national wholesale markets (Domanico, 2006:5065), cross-border capacity logically brings negative externality to domestic market players. Bottlenecks lead to increase in market power on the local generation market which makes the pressure for underinvestment even stronger. Energy suppliers are known to lobby government bodies in an attempt to block transmission investment which is not in their interest (Stoft, 2006:127). At the same time, politicians are motivated to keep the electricity tariffs low (Buijs, Meeus & Belmans, 2007:19). Last but not least, the investment needs approval from "the losing side" – side of the border where the price might increase (Buijs et al., 2007:6).

Situation when investments in transmission lines including interconnections become more problematic in conditions of liberalised internal market and at the same time lack of infrastructure, particularly interconnections, represents one of the main obstacles for its completion (Zachmann, 2010:5) creates a vicious circle. Finding incentives for network development is treated as a panacea for shortcomings of the internal market (Nies, 2010:9) and stepping out of it. But besides regulatory framework (and financial risk of the investment) also other factors come into play.

To be successful, not only the construction of interconnectors but all power lines requires the full support of both electricity market participants and governmental and local authorities (EURELECTRIC, 2003:5). Recent experience shows that investment in networks can be also substantially delayed by lengthy authorization procedures (requiring accomplishment of Environmental Impact Assessment etc.) which are even aggravated by local opposition, usually on environmental grounds (Ranci, 2007:9), or simply their visual impact. At the top of that, fall in value of impacted land estates is undisputable. All that increases the time for building lines and sometimes they cannot even be built at all (Rious, Glachant & Dessante, 2010:9). Everyone uses electricity, but local populations are unwilling to bear the costs connected with both energy production (including renewable) and power lines. These syndromes are often referred to as NIMBY - *"Not In My Backyard"* - or BANANA - *"Build Absolutely Nothing Anywhere Near Anything"*.

As a result of that, there is often a disproportion between the time of building line connection and generator connection, particularly in case of renewables which can be built in a very short time whereas the grid upgrade takes on average seven to ten years in Europe (construction itself takes though only up to two years). Congestion can emerge while the generator is connected and the network has not been upgraded yet.

Problems with local opposition regarding building renewable resources (particularly wind farms) were often solved through establishing cooperatives where the locals got involved and benefited out of the project financially (Van den Bergh & Bruinsma, 2008:369).

Regarding power lines, probably the only way to achieve progress might be higher financial compensations of citizens for right of user (or compulsory purchase) for the estate because of the inviolability of the right of ownership.

2.2.3. EU balance

As indicated above, lack of infrastructure investments is also the case of the EU. In spite of the fact that Barcelona Council 2002 set a broad target for (import) interconnector capacity of at least 10% of production capacity per Member State by 2005 (regardless of the level of congestion at that time), it needs to be taken into account that meeting this target does not necessarily result in resolving congestion and concentration in generation. It is also important to remember that for a link to be secure and economical its exploitation must not permanently exceed a 50% level of its physical capacity (Nies, 2010:11). That just confirms the well-known fact that the 10 % axiom was set just symbolically, which means randomly (Nies, 2010:69; Silvast & Kaplinski, 2007). Many interconnectors remain congested though their capacity exceeds the required limit and in fact, congestion has increased on most borders (European Commission, 2007a:172-5). For details on when the requested capacity exceeded the available capacity of individual interconnectors see Appendix 3. It also needs to be underlined that the intrastate congestion, which also poses serious challenges, is rarely watched at all (as chapter 3.3 confirms).

Whereas it is likely that persistent price differences between Member States markets are amongst the main causes for congestions, the sector inquiry identifies insufficient interconnecting infrastructure between national electricity systems and insufficient incentives to improve cross-border infrastructure among the main causes of insufficient market integration (European Commission, 2007a:171). The fact that there are several highly concentrated regional or even national markets, many out of them not having sufficient liquidity, instead of one “European market” speaks for all (for illustration see Appendix 4). Concurrently, only about one quarter of acquired congestion revenues is invested into interconnectors (European Commission, 2007a:179, see Appendix 5). Similarly, the Commission in its Priority Interconnection Plan observes the amounts invested in cross-border infrastructure (only about €200 million yearly) represent only 5%

of total annual investment for electricity grids in the EU, Norway, Switzerland and Turkey (European Commission, 2007b:5).

At the same time, the Commission report confirms that *"planning procedures for building new interconnectors are complicated, not least due to local resistance as regards visual impact and fears of electro-magnetic fields"* (European Commission, 2007a:179).

It thus appears clear that a regulatory framework incentivizing network investments, particularly in interconnectors, is needed as well as European-wide solution to tackle the authorization procedures concern.

2.3. Violation of operational security standards

Electricity interruptions can have serious consequences for economy as well as people's welfare and health. It is estimated that costs of such outages are approximately 1-3 decades higher than electricity price (Silvast & Kaplinski, 2007). There can be various causes of unplanned supply disruptions[32], colloquially referred to as blackouts, situations occurring when electricity supply and demand are not balanced and co-ordination across the grid without which the system can no longer operate is lost. As the N-1 security principle has to be respected, they usually comprise combination of at least two of the following factors – majority out which can be hardly completely excluded or prevented by policy measures: component failures, lightning strikes, excavation activities, human failures such as incorrect switching actions, lack of coordination, improper tree trimming etc. (CEER, 2008; IEA, 2005a).

2.3.1. Technical risks stemming from RES-E integration and cross-border trading

Nevertheless, it has turned out that internal electricity market policies and promotion of clean technologies as a part of climate policy pose new challenges to operational security via enhanced intensity of cross-border flows and integration of intermittent renewable energy sources into power systems.

[32] Contrarily, planned interruptions are scheduled in order to maintenance work, refurbishment etc.

As mentioned earlier, market opening and higher intensity of cross-border trading incurs changes in the philosophy of interconnections and operation of the large international power system including European, making the system operators more exposed to potential failures outside their control area and thus making day-to-day grid operation much more challenging. Decentralized decision-making reduces the capacity to manage system security through coordinated actions across the value chain and lowered margins lead to operation near capacity limits (IEA, 2005a:12), which is in combination with unanticipated interrelated faults often behind large disturbances (Silvast & Kaplinski, 2007:4). This issue thus also partly relates to network adequacy challenge (see chapter 2.2) – taking into account the fact that building new lines takes at least twice to three times as long as constructing RES-E.

Previously stable and relatively predictable patterns have been replaced with less predictable usage, more volatile flows and greater use of long-distance transportation not only due to international market operation, but also often unpredictable power flows caused by intermittent and variable energy sources throughout the European power system. RES are often claimed to play a major role in achieving security of supply (e.g. Collier, 2002:184) as they are deemed to ensure long term security of production, bringing opportunities of portfolio diversification and decrease in conventional energy sources import dependency. Nevertheless, it is less known that heavily subsidised renewable energy sources can complicate and even damage grid operation and the functioning of the market (De Jong et al., 2010:4; Glachant et al., 2010:3). The policy design often (and as we will see further on also on the case of the EU) simply does not reflect increased stresses on the power grid which intermittent RES incur (Silvast & Kaplinski, 2007:7).

Notably large wind farms (both onshore and offshore) can have vast implications for real-time operation and balancing of the electricity system, as well as the total costs and the long-term development of the generation portfolio and the transmission system. Installed wind capacity generates considerably less energy per unit on annual basis than most other technologies. Depending on the conditions in given location and technology, its average efficiency ranges from 20 to 25 % (might be higher e.g. in case of off-shore). Its intermittency results in the limited availability of this source – the fact that it cannot be counted on when it is most needed during peak load (IEA, 2007:105) – and thus requires back up generation capacity and occupies a lot of network capacity. Secondly and from the reliable grid operation point of view even more importantly, in spite of the fact that the prediction methods have improved a lot during the last couple of years, the limited predictability of short-term variations in the operational phase requires compensation for lack of control in form of reserve capacity that it is possible to quickly deploy (spinning and idle reserves). Costs of these measures are difficult to enumerate because they are highly specific to each electricity system and the share of wind power (IEA, 2007:106).

Concentration of large wind power in remote areas can also cause large load flows through neighbouring transmission systems, historic power flow direction often being reversed in some parts of the network (Kabouris, 2006). Power flows follow physical laws and for that reason are not completely controllable. They are like a set of connected water pipes without valves between them, pushing water from one point to another affects the flow in almost every pipe (Stoft, 2006:109). When strong production in geographically concentrated areas occurs, it can lead to unintended *loop flows* – power flows on control zone or zones caused by transaction on which this control zone does not participate in. This phenomenon causes huge discrepancy between scheduled power exchanges and actual power flows. Both trading capacities and security margins are reduced.

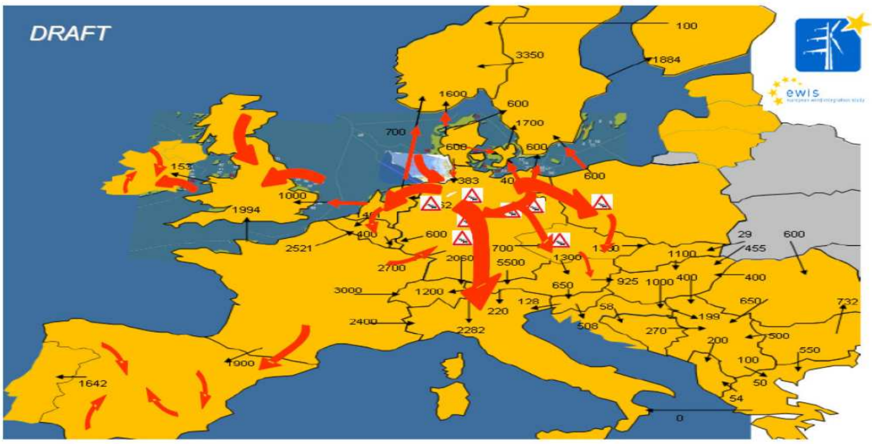
2.3.2. EU balance

In spite of the fact that according to the report on quality of electricity supply in the EU completed by CEER both duration and of unplanned interruptions showed for most countries a downward trend (CEER, 2008:11; see also Appendix 6), impact of large-scale RES installations has been already evident. Large capacities of wind generation have been already installed in Germany and Spain, 26GW and 16GW respectively, significant capacities in terms of proportion to system size were also installed in Denmark (3.3GW), the All Island Power System of Ireland and Northern Ireland (1.5GW), and Portugal (3.4GW). The total currently installed capacity in Europe of 68GW should double by 2015 and may further increase up to 200GW by 2020 (ENTSO-E, 2010a:3). European offshore wind capacity could increase to 40GW by 2020, predicts the European Wind Energy Association (EWEA) (Euractiv, 04/06/2010).

A good example of how excess capacity and lack of operational flexibility in wind power can create additional costs provides the case of Denmark.[33] And when the share of wind power production in Denmark increases to higher levels it poses challenge to system reliability which is manageable (within a reasonable cost range) only because of the strong interconnections with Germany, Norway and Sweden (total import capacity of 2600 MW) (IEA, 2007:109-10) – the Norwegian and Swedish hydro-plants where the excessive power can be stored, in particular. But it is not solely national issue.

For example, wind parks in Northern Germany cause problems on a periodical basis. In the last few years, substantial loop flows to the east (through Poland, the Czech Republic, Austria and Slovenia), to the south (Switzerland) and to the west (through the Netherlands to Belgium) occur on a regular basis[34] which often leads to violation of N-1 criterion (see Figure 7).

Figure 7: Power Flows in Europe – Impact of High Wind Generation



Source: Presentation of Klaus Kleinekorte, Amprion GmbH, Zurich, 13.11.2009

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[33] As a result of that, electricity prices in this country are very volatile – depending on the actual level of supply and demand. Not even speaking about costs of balancing power into the system, zero prices are nothing exceptional during periods with low load and high overproduction in cold and windy weather. In November 2009, Nordpool even enabled negative price down to -200 € in order to increase the effectiveness of the market (Archer Energy, 2009).

[34] For example, up to 1300MW flowed to the Czech system from Germany instead of planned export of 130MW to Germany (Vattenfall) in November 2009 (ČEPS, 2009).

It was also reported that wind power paradoxically added fuel to the flames during the blackout in November 2006 which caused supply disruption to more than 15 million households in France, Germany, Belgium, Netherlands, Italy and Spain. The original cause of the failure was non fulfilment of N-1 criterion as a result of demanded disconnection of a high voltage line for a transfer of a ship and insufficiently swift inter-TSO co-ordination (IEA, 2007:54). Nevertheless, UCTE report, apart from addressing much more challenging day-to-day grid operation as a result of market development, claimed *"the role of wind generation during the events was "evidently negative"* arguing that a state when *"there is frequency deviation in the grid as in the case of November 4th, wind generation disconnects more easily from the grid than generation connected to the transmission system"* further contributed to the power imbalance (cited in Silvast & Kaplinski, 2007:35-38).

According to the results of European Wind Integration Study (EWIS), released in April 2010, which was financed by the European Commission, by 2015 until when the study is modelled, flows could exceed line capacities even with all circuits in service, risking network failure without initiating fault event on the German-Czech Republic border. On the German-Poland border, flows reach line limits with all circuits in service, risking network disruption in the event of a fault. Unless other risk measures are instigated, the conditions would suggest that the transmission capacity that could be offered to the market will need to be substantially reduced (ENTSO-E, 2010a:10).

Massive RES deployment already puts strong pressure not only on the rest of the EU energy markets, but also on the security of electricity supplies today, such a situation will be exacerbated if not adequately dealt with. In principle, the author agrees with the argument that the only way out of this blind passage is higher coordination between national network operators in terms of technical standards, information exchange and training etc. (Silvast & Kaplinski, 2007; European Commission, 2007b). At the same time, certain degree of coordination in investment planning at least at regional levels is needed.

To sum this part up, bringing competition into the market naturally leads to the shortening of margins and posing investment challenges, but while the generation challenge is not that urgent in the EU and the ways to address deficiencies are to a large extent compatible with recipes for tackling internal market imperfections (regulatory measures etc.), this is more problematic in other two cases. Network investment with emphasis on interconnections needed for the completion of an internal market in electricity as well for ensuring security of supply, will require additional incentives. Besides this, operational security issues show that not only investment as such, but also coordinated infrastructures planning (probably involving European-wide approach towards the lengthy authorization procedures issue) as well as coordinated system operation might be necessary.

3. EU policy solutions and their adoption

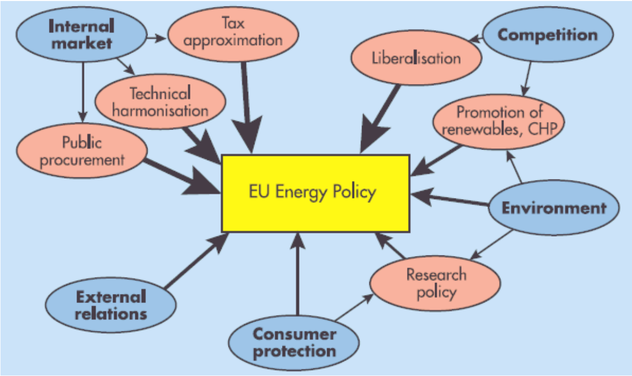
This part of the paper looks at which measures the European Union has really taken in its attempts to promote security of electricity supplies with emphasis on responses to the above outlined challenges, apart from political proclamations of necessity to ensure security of supply – in other words, the role of the EU as a risk manager. At the same time, it is investigated whether any steps proclaimed to strengthen it had the opposite effect.

As outlined above, only very limited provisions with impact on security of electricity (and energy as such) supply were adopted independently of the two main drivers of the EU energy policy – internal energy market and climate policy. One of the few examples is historical state aid to coal which was historically regulated by special provisions in the ECSC Treaty (a measure for ensuring generation adequacy). Even though it was curtailed as well as the subsidies structure changed during the 1990s, after expiry of the ECSC Treaty in 2002, a new council regulation[35] was adopted which kept state aid to coal decisions outside the realms of general competition rules – denting political legitimacy of Commission to remove coal subsidies by energy security arguments (Eikeland, 2004:15-16). Nevertheless, Directorate General for Competition (hereafter DG COMP) continues pressing phasing out of the subsidies.[36]

As indicated in chapter 1, the internal energy market and climate policies are scattered in many European policies (common as well as coordinated) – such as the internal market provisions (e.g. technical harmonisation, tax approximation or public procurement), competition policy, increasingly the environment and marginally, regional and research policy and Trans-European Networks (TENs) and consumer protection – see Figure 8 (Egenhofer, 2001:41). Therefore, many internal as well as external policy actors and stakeholders come into play in the process of their formulation.

[35] Council Regulation (EC) No 1407/2002 of 23 July 2002 on State aid to the coal industry.
[36] Lately, it presented a proposal for a new regulation which that would allow member states to grant operating aid to coal mines only if the plans to close them by mid-October 2014 are presented (Euractiv, 21/07/2010).

Figure 8: EU energy policy competencies (as derived from TEC)



Source: Egenhofer, 2001:41.

On the following pages, the paper looks at the impact of the provisions adopted in terms of those policies on security of electricity supply – showing that provisions favouring security of electricity supplies interfered to internal market measures, thus providing it certain backing even though not always adequate. In case of legislation promoting renewable energy sources, we will see that not only does not provide any additional safeguards but that consequences of its implementation contribute to deterioration of the challenges addressed. Focusing on available positions of actors participating at the policy process on individual issues, we also attempt to analyze major causes of the imperfections and inconsistencies.

3.1. Internal market policy & security of electricity supply

While analyzing this policy area, it needs to be taken into account that policy steps towards internal market in electricity comprise both *ex ante* and *ex post* regulation, the former being represented by legislation formulating the rules of the internal market (liberalization packages in particular) and the latter by antitrust measures stemming from EU competition policy (Hancher & de Hauteclocque, 2010).

Competition policy is hard to isolate as a stand-alone policy when applied to network industries. Commission's powers in this area rest mainly in application of articles 85 and 86 EEC which prohibit distortion of competition in the common market and the abuse of a dominant position against the utilities in order to dismantle dominant market positions or the right to initiate infringements procedures according to article 169 EEC against member states were considered in particular (Eikeland, 2008:18; Weyman-Jones, 1997:561).

But unlike network sectors, such as telecommunications where liberalization started with antitrust measures and was followed by harmonization rules at the level of ex ante regulation, the order in the energy sector was reverse. Here, the Commission could not rely on the central judgment of the Court to specify the obligation for the network-based energy (Schmidt, 1997:246). DG COMP was signalled to keep the hands off at first by the 1994 *Almelo case* judgment (see PSOs) and was thus little involved at first except via sporadic use of merger control instruments. The antitrust rules were not applied in energy until 2003 when the Commission resorted to much more determined approach following the sector inquiry, which evaluated market concentration as a likely impediment to a free and competitive market (Eikeland, 2004:29), even though the Commission had warned that it would bring forward procedures against the transport and production monopolies several times before (Schmidt, 1997:262). The use of rules on cartel and most importantly, abuse of dominance intensified though which is regarded as an important change in the dynamics of European regulatory practice (Hancher & de Hauteclocque, 2010:2-8).

Major initiatives were thus led by the developed by Directorate General for Energy and Transport (hereafter DG TREN). In spite of the fact that the EU legislation in this area relies on market approach trusting investments signals, having learnt from experiences from other countries, it has remembered on what we can call insurance policy measures which we look at in more detail. At the same time, we analyze provisions introduced by Third Legislative Package which aim at mitigating some of the prevailing market deficiencies identified by the preceding sector inquiry (European Commission, 2007a) as well as addressing the networks investment issue. But yet the Council decision 96/391/EC identified major bottlenecks in the European energy infrastructure. Investments issue was seen as pivotal for internal market completion as such and trans-European networks policy was launched for this purpose, its foundation having been laid down in the TEU (Art. 154). I thus also devote attention to outcomes of TEN-E policy.

3.1.1. Toolbox for security of electricity supply

The EU has adopted the way of mitigating the regulatory uncertainty and the above mentioned risk through market-based solutions. The market packages (Directive 96/92/EC and Directive 2003/54/EC – hereafter IEM (Internal Electricity Market) Directive[37]– provide member states as actors responsible for assuring generation and network adequacy, a toolbox to ensure adequate investments in case the electricity market fails as well as to deal with exceptional system situations jeopardizing security of supply (for overview, see Figure 9). At the top of that, the Commission presented a proposal of directive which was supposed to add checks, balances and safeguards for concerns regarding investment adequacy (even though the blackouts were not caused by it) in swift reaction to large outages in 2003. Nevertheless, the approved Directive 2005/89/EC[38] – hereafter SoS (Security of Electricity Supply) Directive – mainly backs and reinforces the main principles outlined in the IEM Directive – the fact that well-functioning market will be able to deliver the necessary investments (IEA, 2007:41; EURELECTRIC, 2006). The need for reconciliation between liberalization and security of supply is thus apparent.

Figure 9: 'Toolbox for security of electricity supply' in brief

In red – measures repealed or upgraded by the following legislation
In black – measures which were preserved in the following legislation

	Generation adequacy	Network adequacy	Operational security
First liberalization package *(96/92/EC Directive)*	Tendering as one of the options to choose from when constructing generation capacity Estimate of generation and transmission capacity including need for new interconnectors at least every 2 years (under state supervision) PSOs on undertakings operating in the electricity sector which may relate to security of supply, regularity, quality and price of supplies and environmental protection (enable implementation of long term planning)		Safeguard measures in case of crises of the energy market or physical safety of persons Priority to indigenous sources dispatch not exceeding in any calendar year 15 % of the overall primary energy necessary to produce the electricity consumed in the Member State TSOs to responsible for ensuring a secure, reliable and efficient electricity system and, in that context, for ensuring the availability of all necessary

[37] The third liberalization package assumes them.
[38] Directive 2005/89/EC concerning measures to safeguard the security of electricity supply and infrastructure investment was fully transposed to national legislations by the end of 2009.

			ancillary services
Second liberalization package *(2003/54/EC Directive referred to as "IEM Directive" & Regulation (EC) No 1228/2003)*	Regular report covering balance of supply and demand to be forwarded to the Commission every two years Tendering procedure just when other measures (authorization procedure) appear insufficient	TPA Exemption procedure Congestion revenues to be used for guaranteeing availability of allocating capacity and maintaining or increasing interconnecting capacities – but also income taken into account by NRAs when calculating network tariffs Transparency – TSOs must publish estimates of available transfer capacity for each day Operational and planning programmes need to be made public Monitoring of imports of electricity to the Commission every three months	
"Security of supply directive" *(2005/89/EC Directive)*	Reporting to the Commission enhanced – overall adequacy of the electricity system to supply current and projected demands for electricity Obligation to define and publish security of supply policies – prospects for 15 years		National TSOs obliged to set the minimum operational rules and obligations on network security TSOs to ensure appropriate level of reserve capacity for balancing (only specifies liberalization packages provisions)

Source: Author

These tools comprise: safeguard measures, monitoring & reporting, third party access (TPA) exemptions for building of new lines, tendering and public service obligations.[39]

The first market package involved also a measure saying that for reasons of security of supply, member states may direct that priority be given to the dispatch of generating installations using indigenous primary energy fuel sources, to an extent not exceeding in any calendar year 15 % of the overall primary energy necessary to produce the electricity consumed in the member state concerned (96/92/EC, Art. 96/4). Nevertheless, this measure was revoked (probably in order to incite further market opening).

[39] For sequence of steps when applying these instruments to ensure security of electricity supply proposed by EURELECTRIC see Appendix 7.

Safeguard measures

The right to temporarily undertake necessary safeguard measures (while taking the least possible disturbance to functioning of the internal market (already since Directive 96/92/EC, Art. 22) was part of the legislation from the very beginning. It can be interpreted like that member states may suspend third party access to the networks to safeguard security of supply (European Commission, 2000) or in other words, to close down interconnectors temporarily in an emergency.

In the last resort, this measure could be applied to tackle the challenge of loop flows for short time as a "sudden crises". However, this phenomenon usually last for more days though and with the rising level of installed capacity in wind it will become more and more frequent. The costs of these measures thus might be exorbitant.

Monitoring, reporting & definition of security of supply policies

As far as the monitoring of security of supply is concerned, IEM Directive says that the report to be forwarded to the Commission every two years should cover the balance of supply and demand on the national market, level of expected future demand, envisaged additional capacity etc. (Art. 4 in both).[40] As a part of its monitoring exercise, the Electricity Cross-border Committee (a comitology committee set up by Art. 13, Regulation (EC) No 1228/2003) discusses short term adequacy of electricity supply.

The SoS Directive further develops the monitoring obligation referred to by IEM Directive, specifying the above-mentioned needs to comprise: operational network security, the projected balance of supply and demand for next 5 years, prospects for security of electricity supply for the period between five and 15 years from the date of the report, the investment intentions including interconnector investments etc. (2005/89/EC, Art. 7). At the same time, it requires Member States to define and publish security of electricity supply policies, with roles and responsibilities of all relevant market actors. But it is less specific

[40] This measure strengthened the first package measure, substituting *„a regular estimate of the generating and transmission capacity which is likely to be connected to the system, of the need for interconnectors with other systems"* which was supposed to be published every two years but under state supervision and covering a period defined by each member state (Art. 6/1-2, 96/92/EC).

about how these roles and responsibilities should be defined (Delvaux, Hunt & Talus, 2008:179). Member states reporting obligations on aspects of transmission and generation adequacy are thus considered to be the strongest provisions introduced by the directive (Ibid. 188).

Besides that, the directive addresses operational security as it requires TSOs to *"set the minimum operational rules and obligations on network security"* (2005/89/EC, Art. 4) and *"to ensure that an appropriate level of generation reserve capacity is available for balancing purposes and/or to adopt equivalent market based measures"* (2005/89/EC, Art. 5(b)). This provision developing the one already included in market packages[41] must be considered ambiguous regarding the entitlement of TSOs to directly engage in the operation of reserve capacity generation. In most Member States, TSOs were not allowed to own generation capacity for balancing and they have to purchase it on the market in form of so-called ancillary services. Nevertheless, there are exceptions – such as Norway (which is as a member of the European Economic Area bound by EU legislation in this policy area) where the TSO has been authorised to build gas plants which can be though put into operation only in the absence of normal production and with approval of regulator (Delvaux, Hunt & Talus, 2008:181).

The European Parliament (hereafter the EP) voted for strengthening national regulatory authorities to be able to impose economic sanctions on network managers should they fail to complete interconnection projects on time. But the Energy Council finally adopted a compromise proposal which would limit the Commission's and the regulatory authorities' role in the construction of electricity interconnectors between EU member states (Euractiv, 2006).

As far as other actors are concerned, EURELECTRIC as well as the other representatives of the electricity industry welcomed the requirements brought by SoS directive for a long time, arguing that it would contribute to creating a clearer and better-defined situation in

[41] Art. 7/3-5 in 96/92/EC substituted by wording *"the transmission system operator shall be responsible for ensuring a secure, reliable and efficient electricity system and, in that context, for ensuring the availability of all necessary ancillary services insofar as this availability is independent from any other transmission system with which its system is interconnected"* (Art.9 (c) in IEM directive/ Art. 12(d) in 2009/72/EC).

most countries, at the same time admitting that *"the actual effect on markets will largely depend on the roles and responsibilities defined in each country, and also partly to what extent these roles and responsibilities will be compatible at a European (or at least "relevant market") level"* (EURELECTRIC, 2006:33).

On the other hand, environmentalists called for alternative ways to address security of electricity supply such as decentralized power supply, increasing efficiency and promoting RES production, maintaining that the proposed measures were costly and biased towards the interests of big electricity companies. Renewables associations EUFORES and EREC, environment agencies federation FEDARENE and cogeneration association COGEN Europe also argued that decentralised and diversified systems would reduce transport needs and would be less vulnerable to accidents (Euractiv, 2006).

All in all, even though it was assessed as beneficial at that time, the SoS Directive does not go beyond the national conception as addressing situations when more coordination is needed such as large-scale RES deployment and higher cross-border exchanges requires. However, ineffective coordination between system operators were identified among causes of Italian blackout in 2003 (Silvast & Kaplinski, 2007:39). Similarly, it had hardly any concrete effect on investment (Hauteclocque & Rious, 2009).

In the proposal for the third legislative package, the Commission proposed further strengthening of these measures by creating a European Energy Supply Observatory to monitor the energy market, identify potential shortfalls and facilitate new generation investment. The idea was that it would work in terms of DG TREN and enhance transparency *"via benchmarking and the exchange of best practice, the success of Member States in ensuring that their energy mix evolves in a manner that contributes effectively to the EU's energy goals"* (European Commission, 2007c). But the proposal was rejected by the Energy Council already in June 2007 as it was perceived as a threat to Member States exclusive rights to decide on their energy mix (Eikeland, 2008:15).

Exemption from Third Party Access

The exemption procedure from TPA to in order to stimulate investment was also adopted as a part of second package (Regulation 1228/2003/EC, Art. 7)[42] at the moment when the EU realized the lack of interconnection capacity (Nies, 2010:42). Under this procedure, merchant (private) investors do not have to follow the rules on capacity allocation on interconnectors (but non-discriminatory and market-based allocation mechanisms should be applied), congestion revenues being untouchable for the regulator. They recover their costs by buying power at one end and selling it at the other one (Joskow, 2006b:155). Following Australian and U.S. patterns, it was envisaged as an exception needing approval from national regulators and the Commission. Derogation from the rules on capacity allocation on interconnectors provided is a great asset going beyond "standard" merchant models only relying on congestion revenues as it provides merchant investors with an extra investment incentive, long-term contracts solving the problem of a long payback period (Buijs, Meeus & Belmans, 2007:5-18). Nevertheless, only the following projects were exempted under this provision: Estlink cable (linking Estonia and Finland), East-West cable (linking GB and Ireland) and BritNed interconnector[43] – with different investors participating and different allocation mechanisms being used, from no to 100 % priority access (Buijs, Meeus & Belmans, 2007:12).

Apart from the economic hurdles causing market failure (such as low motivation of national actors including regulators to invest in cross-border links), Hauteclocque and Rious (2009) address the issue of incumbent (dominant) generators to be excluded from the exemption process, with the exception of Estlink project restricting it only to incumbent and new entrant TSOs. Even though this exclusion or contrarily clear identification of the exemption recipients does not flow automatically from Regulation 1228/2003 or the new Regulation 714/2009 on cross-border exchanges, already DG TREN's interpretative note of

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[42] In 1228/2003 stands that the investment must enhance competition in electricity supply; the level of risk attached to the investment is such that the investment would not take place unless an exemption is granted (Art. 7/1(a-b).

[43] Prior to 2003 and on only one instance, the *Viking Cable* between Norway and Germany had already obtained and exemption from TPA by the European Commission under the Merger Regulation (Hauteclocque & Rious, 2009).

2004 states that the exemptions cannot apply where an existing dominant position would be reinforced or the scope for diluting existing dominant positions reduced.

The reason for that is a clash with competition policy. Regarding the existing amortized interconnections, DG COMP and the European Court of Justice (ECJ) have been particularly rigid with dominant operators. They systemically deemed long-term priority access rights signed before liberalization to be abuse of a dominant position and required that 100% of capacities be freed up. The European Court of Justice ruled the priority access of on the UK-French submarine interconnector, Dutch-German interconnector, and Norway-Denmark and Denmark-Germany interconnectors following the merger *VEBA/VIAG*) and the Dutch generator SEP on the Belgium-France and the Belgium-Netherlands interconnector (Buijs, Meeus & Belmans, 2007:11; Hauteclocque & Rious, 2009).

As regards the third package, Commission wanted Agency for the Cooperation of Energy Regulators (ACER) to have decision-making power over merchant lines (TPA) exemption. Even though the final proposal watered it down making the powers severely limited, it might be still its strongest decision power (Hauteclocque & Rious, 2009:9). Regulation 714/2009 modifies the former procedure in this way: NRAs still remain in charge of examination of the applications for exemptions even though they can delegate this power to ACER as an additional forum for settlement of disputes. But the major innovation lies in the fact that ACER is to take a final decision in case of sustained disagreement between the national regulatory authorities involved (after 6 months). Nevertheless, national governments can still submit their opinion on the application and the final decision is thus retained to them (Hauteclocque & Rious, 2009).

Whether market-driven transmission investment will be used only as a complement to regulated transmission investment but most of investment projects will be still developed by regulated entities (Joskow, 2006b:181) or the future regulatory framework should be more favourable towards merchant lines (Buijs, Meeus & Belmans, 2007:2) is still debatable. Hauteclocque and Rious (2009) argue for allowing merchant transmission investments by dominant generators and implementing an enforcement regime based on a clear demarcation between transparency monitoring by ACER and antitrust enforcement by the European Commission while employing so-called UIOLI provision working on the principle that when the owner of the merchant line does not use it, he has to release the capacity to a competitor (p. 15-25).

Public service obligations

Another step towards more competition at the expense of security of supply can be observed on tendering. The first market package gave the same weight to tendering and authorization procedures, enabling to choose between them (Art. 4, 96/92/EC). Stepping further towards liberalization, the subsequent directives provide a recourse to tendering procedure only if the generating capacity (built on the basis of the authorisation procedure or the energy efficiency/demand-side management being taken into account) are not sufficient to ensure security of supply (IEM Directive, Art. 7/2009/72/EC, Art. 8) – in other words, if the price signals do not work correctly. For example, Ireland and Greece organised tendering procedures so as to ensure the availability of generating capacities (EURELECTRIC, 2006:38). In NORDEL, there have been concerns about market players not being able to provide sufficient peak load resources on commercial basis. Therefore, a clear peak load arrangement was established in Sweden - Svenska Kraftnät (the Swedish grid company and TSO) has been appointed to take responsibility for acquiring peak load resources (transitional period was extended to 2008) (EURELECTRIC, 2006:51). Adequately, auctioning for reserve capacity should be possible by system operator if the reserve capacity market appears to be unfeasible.

While being a market-based capacity mechanism, tendering is one of the ways to secure customer protection which involves also ensuring security of supplies through public service obligations (PSOs), even though it can be argued that PSO can also be entrusted by authorities without a tender. PSOs have been included in the liberalization packages from the very beginning. Nevertheless, the legal text is very quiet on the issues of how PSOs must or can be financed (Delvaux, Hunt & Talus, 2008:49) That might reflect regulatory difficulties involved in drawing a clear line between public facilitation of a stable investment climate and market intervention in the interests of ensuring the security of supply (Delvaux, Hunt & Talus, 2008:186). When PSOs constitute state aid, there is an obligation to notify the Commission (IEM Directive, Art. 3). Member States can also introduce the implementation of long term planning while taking into account the possibility of third parties seeking access to the system as well as appoint supplier of the last resort (Ibid.).

First liberalization package says that *"Member States may impose on undertakings operating in the electricity sector, in the general economic interest, public service obligations which may relate to security, including security of supply, regularity, quality and price of supplies and to environmental protection. Such obligations must be clearly defined, transparent, non-discriminatory and verifiable"* (96/92/EC, Art. 3). IEM Directive establishes so-called supplier of last resort (IEM Directive, Art. 3/3) – developing the provision of the first package saying that member states may impose on distribution companies an obligation to supply customers located in a given area. The tariff for such supplies may be regulated, for instance to ensure equal treatment of the customers concerned (96/92/EC, Art. 10/1).

However, already the first package also allows the member states to impose public service obligations on market operators in order to promote RES-E in the liberalised electricity market – so-called environmental restructuring obligations (Lovinfosse, 2008:63). Moreover, second package states that system operators may be required, when dispatching generating installations, to give priority to generating installations using renewable energy sources etc. (2003/54/EC, Art. 8/3). Having regard to large-scale RES integration which can lead to loop flows, consequences of this measure paradoxically contribute to vulnerability of the system under certain circumstances.

PSOs in network industries have strong foundation in the EU legislation. Principally, the Treaty of the European Union (Art. 86/2 of TEU) makes the subjection of network industries to treaty competition rules conditional (enables derogation to protect public service function). This made existence of public monopolies in this area untouchable for a long time. But with arrival of liberalization, PSOs which were previously taken for granted as a justification are nowadays only accepted if it can be shown that competition would hinder or make more costly the public service objectives (Pelkmans, 2001:439).

Similarly, in electricity market liberalization legislation, PSOs were in place de facto from the very beginning. Whereas the Commission and some states (with GB at the front) advanced pure competitive model (complete market liberalisation); opposition with France as front-runner presented sector's mission of public service. In 1994, the European Court of Justice formalised lesser role of DG COMP with its rulings in the so-called *Almelo* case of Dutch electricity distributers asking for dismantling the exclusive import and export rights granted to the generators finding that Articles 85 and 86 of EU competition rules had been breached, but that articles 90-2 provided the companies with opportunities for derogation if operating under public service obligations. At the same time, no judgement on whether the obligations necessitated monopolistic behaviour in the specific case was made (Eikeland, 2008:18). Already during the first liberalization package debate, France justified the "single buyer" model[44] by the need for governments to induce PSOs on their national firms (Eikeland, 2008:44).

The first Commission proposal of the second package called for environmental and consumer protection provisions to be left out of the directive text was rejected and responded by strengthening PSOs (by establishing supplier of last resort etc.) (Eikeland, 2004:28). After the pressure of the European Parliament (PSE left-wing fraction in particular) and the Council that had insisted on the inclusion of a provision giving member states right to derogations if opting to instruct their national industries to take on public service obligations, compromise including the PSOs in the draft was reached (Derdevet, 2009:114).

In the third liberalization package proposal, the Commission presented an Energy Customers' Charter to ensure PSOs via establishing schemes to help most vulnerable

[44] A model adopted by first liberalization package as a third option to negotiated and regulated TPA. In single-buyer model, the producer could act as the buyer of all the electricity purchased by its consumers from other sources, using published tariffs, with the purchaser pocketing any profit between the price it paid to source the electricity, and the sell-on price to single buyer (Greenwood, 2002:273).

citizens deal with increases in energy prices, improving level of information to citizens and protect them from unfair practices (European Commission, 2007c).

3.1.2. Third liberalization package – to mitigate identified imperfections?

The Third Liberalization Package adopted during the Czech presidency of the European Council (June 2009)[45] sticks to the principle that market prices should give the right incentives for the development of the network and for investing in new electricity generation but, at the same time, it is aware of the identified deficiencies: a lack of liquidity and transparency that hinders the efficient allocation of resources, risk hedging and new entry – which were also identified as detrimental to generation investments. Having been rather overseen in the previous debate, another issue which finds more prominent place here than before, is the quality of interconnections (Nies, 2010:72).

There new are provisions for achieving non-discriminatory connection to new entrants – TSOs cannot refuse connection of new power plant on the grounds of possible future limitations to available network capacities or on the grounds that it will lead to additional costs (Art. 23, 2009/72/EC) and harmonized standards regarding companies access to grids should be developed by European Network of Transmission System Operators of Electricity (ENTSO-E) (see further).

Congestion revenues

European legislation regarding the internal market provides only limited set of tools. Besides public service obligations, second liberalization package (Regulation (EC) No 1228/2003) provides the TSOs with the possibility to allocate the congestion revenues[46] either to guarantee the actual availability of the allocated capacity and/or to network investments for maintaining or increasing the capacity of interconnectors and/or as an income to be taken into account by regulatory authorities when approving the methodology for calculating network tariffs (Art. 6). As mentioned before, only one fourth of congestion revenues were reinvested in interconnectors. To incite priority use of congestion rents for

[45] Whereas the Regulation (EC) 714/2009 entered immediately into force at 13 July 2009, in case of the Directive 2009/72/EC Member States shall transpose its provisions into national law by 3 March 2011.
[46] Before liberalization, priority access was common – replaced by market-based mechanisms in form of explicit and implicit auctions which guarantee third party access.

maintaining or increasing interconnection capacities, the third package allows using the third option only if the first two cannot be used and it is approved by national regulator (Regulation 714/2009, Art.16). Nevertheless, it has to be noted that the Energy sector inquiry puts the blame on the TSOs while neglecting the role of the regulators in determining the use of congestion revenues (Buijs, Meeus & Belmans, 2007:5). Therefore, this measure might not fall on the fertile ground.

Inter-TSO Compensation

Similarly, there are no high expectations from Inter-TSO Compensation (ITC) scheme for substantial financial contribution for network investment. It is mentioned already in the second package (Regulation (EC) No1228/2003, Art. 3) in order to compensate TSOs whose assets are used by other TSOs which do not contribute to their financing but since the countries were not able to find an effective remedy mechanism acceptable for all parties involved, it worked under interim yearly-adjusted schemes by now. Following adoption of the third package, the guidelines, establishing compensations including contributions to networks through ITC Fund were finally adopted in the comitology process in March 2010. However, the compensations should not be only for new infrastructure, but also for the one which had been build in the past and amortized. In other words, with the fund having a budget of € 100 million, real contribution to tackling the interconnection investment issues cannot be expected in this case.

Unbundling

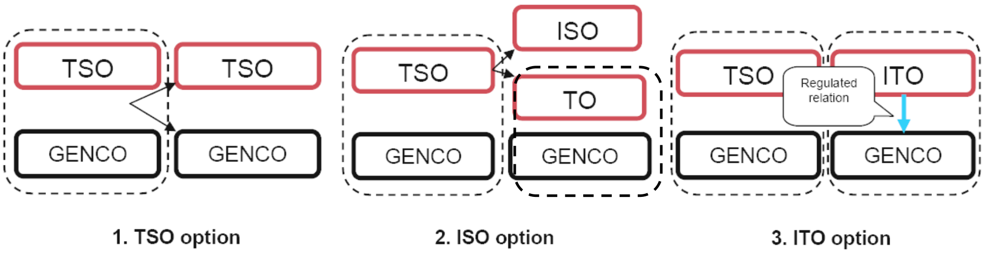
One of the main issues identified as being detrimental to network investment as well as operational decisions was lack of unbundling (Eikeland, 2007:2). In vertically integrated companies, network operator has not incentives to make attractive offers for building network extensions and reinforcements that will serve its competitors and remove bottlenecks at cross-border points when it would result in bringing in competition to its supply branch. Legal unbundling addressed by the second package not only insufficiently enforces independent transmission services because it does not entirely prevent conflicts of interest but also does not create sufficient incentives for investments (Buijs, Meeus & Belmans, 2007:4; Joskow, 2006b). Based on these arguments, the Sector Inquiry concludes that *"through ownership unbundling, independent network operators would indeed have* *greater incentives to maximise the use of their infrastructure and to invest into further expansions"* (European Commission, 2007a:168). But eventually, three options of unbundling to choose from were adopted (see Figure 9):

- Full ownership unbundling through creation of *transmission system operator* (TSO) which is a monopoly that owns the whole transmission network and takes on the obligation to provide unlimited service, being responsible for planning grid augmentation. It is thus fully prevented from being active in generation and supply at the same time. From the beginning, this option was preferred by the Commission as well as ERGEG or ETSO (Torriti, 2008:4; Buchan, 2009:54). Denmark, Belgium, Finland, the Netherlands, Romania, Spain, Sweden and the UK for and wrote a letter to the Commission supporting this option in June 2007.
- Creation of a residual provider of services, so-called *independent system operator* (ISO) preferred in the US (IEA, 2001:114) was considered as the second best option by the Commission from the beginning (referred to as a derogation from full OU at the beginning). ISO is not the owner of the network and allows market participants to trade transmission rights and invest into transmission assets. Companies keep their assets but do not manage investment decisions – those are designated to ISO through national governments.
- Model of *independent transmission operator* (ITO) emerged as a "third way" in the reaction on the anti-letter sent by France[47] and Germany and a few smaller states, including Latvia, Austria Bulgaria, Cyprus, Greece, Luxembourg and Slovakia from July 2007, questioning the contribution of OU to lowering prices and raising investments (Buchan, 2009:72-3). Like the ISO option, allows integrated companies to retain not only ownership of their gas and electricity grids but also commercial and investment decisions on condition a framework for ensuring the independent operation of the transmission network is set up.

[47] Even though it was paradoxically France who helped to introduce first Commission's proposals on market liberalization by lodging a formal complaint with the Commission about German coal subsidies in the 1990s (Schmidt 1997:246).

Regulators must authorize investment plans and can force changes in them (Buchan, 2009:78). They will also have to give up daily management of the grids to an independent transmission operator. Its characteristics are thus very similar to legal unbundling.

Figure 9: Unbundling options according to the "third package"



GENCO = generation company
TO = transmission (network) owner
Source: Author according to De Jong, 2009.

On the last minute, a reciprocity clause (the above re was introduced at the same time – specified that ownership unbundling also applied for third country companies (Eikeland, 2008). It was Dutch and Spanish ministers in particular who insisted that ownership unbundled states should be allowed safeguard measures to ensure a level playing field requiring to conform to EU single market rules and be justified on energy supply grounds (Buchan, 2009:63).

From other non-state actors, ERGEG fiercely promoted TSO, citing an interesting example of Portugal linking rise in power transmission investment from 1994 to 2006, spanning from vertical integration through legal unbundling to ownership unbundling (Buchan 2009:54). European Renewable Energy Council (EREC) as well as energy consumers industry associations were clearly in favour of "ownership unbundling" option which would create a level playground for investments in all sources, including renewables (Eikeland, 2008:22).

EURELECTRIC argued for market integration as a priority saying that it is necessary to encouraging the idea of regional independent operators (RIOs) – TSOs should, no matter what their ownership structure is, link their activities across borders so as to act seamlessly and that market integration should not be reduced only to the issue of divestment in form of ownership unbundling (Buchan, 2009:67).

From the Member States, it was only France, Germany and Austria who contented with legal unbundling whereas majority of the new Member States already chose complete splitting of the three activities (Derdevet, 2009:144).

Apart from other, DG COMP played an important role in this, having launched its activities in the infringement process without waiting for the ex post regulation to take the lead any more in line with José Manuel Barosso's promise (leading the Commission appointed in 2005) promised more pro-active approach towards application of competition policy and the internal energy market was chosen as one of the pilot cases. Both DG COMP and DG TREN co-operated at drafting of the third package legislation which was seen as something particular in the life of the Commission, DG COMP pushing hard of the "ownership unbundling" option even in the situation in spite of the threat of blocking minority, not leaving it as a preferred option even in its September 2007 proposal which introduced ISO as a fall-back option (Eikeland, 2008:19). The arguments that the proposal would not be by far that radical if only DG TREN was involved in drafting (Eikeland, 2008; Buchan, 2009:50) seem to be well-founded. It is argued that thanks pressure of DG COMP, the member states realized that they could either negotiate or face DG which they would not control (Buchan, 2009:27).

The reason for doing so is that many features of market structures and conduct are beyond the scope of liberalization packages. In particular, so-called *"commitment procedure"*[48] has been developed as a tool to build markets, with regard to behavioural antitrust rules or quasi-regulatory structural measures (forced divestitures, ownership unbundling etc.). Thanks to those, the Commission can bargain directly with the incumbent without going through the interface of national regulatory authorities (NRAs) and Member States. At the same time, the Commission is empowered to accept and make legally binding commitments offered by defendants when it judges that they sufficiently address the

[48] Art. 9 of Regulation 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in article 81 and 82 of the Treaty.

underlying competition problem (Hancher & de Hauteclocque, 2010:9). This procedure was made use of e.g. in the following cases: EDP (Energia de Portugal) versus Commision case, EDF/EnBW and GDF/Suez merger cases (Ibid.).

Similarly, the European Commission is using its power under EC antitrust law to force dominant incumbents to divest their transmission arms. In the context of Art. 82 (TEU), both E.ON and RWE in Germany committed to divestitures to avoid further antitrust scrutiny already in 2008 (Hauteclocque & Rious, 2009; Buchan, 2010:31) in spite of the fact that German government officially opposed the “ownership unbundling” option during third package negotiations, stirring up ire of German Chancellor Angela Merkel (Derdevet, 2009:106). All in all, the role of the Commission as supranational actor having powers to circumvent member states based on its powers in this policy area must be respected.

As far as the effect of different forms of unbundling on network investments is concerned, Impact Assessment of the European Commission 2007 concluded that TSO would have better effects on investment, competition, behaviour of the companies (non-discrimination) than ISO.[49] And even though both would have effects on security of supply, TSO comes out of the assessment as a clear option number one (Lévêque et al, 2009). It also argues for a clear link between OU and investment to be found in relative use of congestion auction revenue to try to remove bottlenecks compared to bundled states (European Commission, 2007d). Academics agree that the advantage of transaction costs savings and possibility of incentive regulation (PBR) favours TSO. System operator and transmission operator separation brings whole range of inefficiencies from this point of view (Joskow, 2006b:148).

However, they indicate that the balance is not so clear when we take into account other factors. In particular, the Commission was accused of over-stating the causal link between unbundling and investment in cross-border networks in particular (Buchan, 2009:51). Even fully unbundled TSOs may not have the right incentives to invest in interconnection (Hauteclocque & Rious, 2009:7). Failing regulatory framework, which takes away

[49] ITO was not evaluated as it was not considered as an option at that time.

incentives to invest in interconnectors as a result of “conflict of interest” between TSO’s roles as transmission owner and system operator is criticized a lot. Inherently, TSOs are pushed to invest less in expensive long-term investments or delay investments in system expansion even if it causes congestion as this would raise the asset base on which most tariffs are calculated, even if these investments would yield greater benefits in the long-run (Buijs, Meeus & Belmans, 2007:2-4; Moselle, 2008:10).

Apart from that, in a system where cross-border externalities and cross-border competition play bigger role than ever before, TSO is not necessary the best option with regard to benefits from regional cooperation. It is easier to coordinate ISOs across borders because they are non-profit organizations, which have no incentive to distort coordination because they have no incentive to lower transmission costs. Moreover, this arrangement facilitates mergers of transmission operators[50] and may capture the benefits from regional integration and geographic expansion of markets and networks in that way (Lévêque et al., 2009:5-6). On the other hand, conflicts between transmission operation and generation were criticized in reference to Scotland where regional ISOs exist (Rious, Glachant & Dessante, 2010).

All in all, by the Commission favoured TSO might be more suitable in many aspects but in focus on the infrastructure investment, we can hardly treat it as a panacea. Even if new investments in networks necessary to enable diversification of routes and sources were triggered by unbundling, it tackles only a part of the problem. The extension of electricity grids is still jointly decided by national TSOs and regulators on the basis of mainly technical criteria, with effects of these national investments (both positive and negative) on other countries investments not being taken into account. And there are no incentives to build lines which would increase cross-border transfers, because the current regulation does not take into account welfare gains in other zones, just in its own (Zachmann, 2010:5).

[50] However, first creations of “cross-border TSOs” in electricity were not mergers of ISOs but ITOs which then changed their structure: E.ON sold its high-voltage transmission network (transpower) to the Dutch state-owned TSO (TenneT) in 2009 and Vattenfall sold 50Hertz to Belgium TSO Elia and company Industry Funds Managament (IFM).

ENTSO-E and ACER – insufficient tools for coordination?

Whereas on the one hand, unbundling aims at more efficient splitting of TSOs from the companies, on the other hand, the regulatory agency ACER is to be set up (by March 2011) and the integration within a common organization encouraged (Nies, 2010:73).

Already the SoS Directive obliges member states to ensure that decisions on investments in interconnection are taken in close cooperation between relevant transmission system operators (2005/89/EC, Art. 6/2) and that TSOs cooperate with neighbouring TSOs to which they are interconnected on the development of operational network security rules (2005/89/EC, Art. 4/1). Nevertheless, the Commission acknowledged that different sizes and responsibilities of the national regulators and TSOs constitute a serious handicap to any further cross-border cooperation, coming up with the idea of a European regulator which would contribute to integration of national electricity markets already in 2003 for the first time (Nies, 2010:73). In line with that, in the Commission's strategy *"Energy policy for Europe"* appeared the idea of a European grid with common rules and standards for cross-border trade to give suppliers harmonised access to national grids. *"These common rules should have be drawn up in cooperation with grid operators and, if necessary, with a European energy regulator"* (European Commission, 2007c).

Similarly, the EP and European Regulators' Group for Electricity and Gas (ERGEG) called for strong powers of the regulator. Even though EU member states governments firstly mouthed support for regulators to have stronger national and EU powers (Buchan, 2009:46), they were much more reluctant to endorse the initiative for the European regulator. At the end, the Commission yielded stating that *"the option of setting up a single European regulator is premature at this stage and is likely to encounter strong resistance from a number of Member States and stakeholders"* (Euractiv, 2008).

Eventually, apart from NRAs powers being strengthened[51], the Agency for the Cooperation of Energy Regulators (ACER) was established by the third liberalization package. It will replace ERGEG which was founded by the European Commission in 2003 as its official

[51] NRAs will be newly in charge of reviewing TSO's investment plans, monitoring of network security and reliability and allowed to take initiative on infrastructure plans.

advisory group on energy issues, but still representing NRAs (Nies, 2010).[52] However, ACER is defined in the way that does not allow it to act too much. It will monitor cooperation between TSOs and execution of European Network of Transmission System Operators of Electricity's (ENTSO-E) tasks, progress as regards the implementation of projects to create new interconnector capacity and the implementation of the Community-wide network-development plans. It will be also able to intervene in cases of an arbitrage between national regulators, but it can only issue opinions and recommendations to TSOs and regulatory authorities (Regulation 713/2009, Art. 6).

ENTSO-E, with assistance of the Commission and European Regulators' Group for Electricity and Gas (ERGEG), has been given the task of elaboration of European Ten-Year Network Development Plan (TYNDP) which should be published every two years, based on a combination of bottom-up (underpinning national investment plans) and top-down approach (20-20-20 targets). The need of EU-level electricity network design is acknowledged in its essence (Regulation 714/2009, Art. 8; Zachmann, 2010:7).[53] ENTSO-E will also elaborate common network operation tools which should contribute to coordination of network operation and network codes involving data exchange and settlement rules as well as operational procedures for cases of an emergency (Regulation 714/2009, Art. 3). ACER can participate in the development of network codes but plays as limited role as in planning.

In spite of the fact that TYNDP represents a first little step towards coordinated planning, it has only non-binding character (the investment still depends on the decision of the national TSOs). Also the other provisions rely too much on the voluntary efforts by TSOs and provide little leverage to regulators and no obligation on TSOs to take part in self-standing institutional structures at the regional level needed to overcome barriers to operational harmonization and market integration (Moselle, 2008:13-14).

[52] ERGEG largely overlaps with CEER which is though based on a voluntary agreement among the regulators themselves.

[53] 2009/72/EC also obliges TSOs to submit a ten-year development plan to the regulatory authority on yearly basis and may require the TSO to execute the investment in question, to organize a tender procedure or to oblige the TSO to accept a capital increase to finance the necessary investments (Art. 22).

At the same time, it is acknowledged that the role of ACER will be largely symbolic, not having any real decision powers (Nies, 2010) or even more strongly, debated whether it does not represent duplication of tasks and strengthening of European bureaucracy without any outcomes – since also the effectiveness of ENTSO-E in investment is dependent on the credibility of ACER (De Joode & Van Oostvoorn).

3.1.3. Trans-European Energy Networks

The establishment of Trans-European networks in the energy sector (TEN-E) as an instrument supportive to internal energy market completion is rooted already the Maastricht Treaty (Art. 129/154 of TEU). TEN-E, managed by DG TREN (now DG Energy) is one of the main policy instruments that the EU has been using in its endeavours to promote building of interconnections. First guidelines were adopted in 1996 and revised in 2006 to reflect new initiatives and developments in the Community (Gallagher, 2010:6-7).

Nevertheless, the Trans-European Energy Networks programme (TEN-E) with a yearly budget of about 20-25 M€ provides very limited aid as it finances only feasibility studies of some projects and in a few cases also a small part of the investment costs. Even projects of European interest are still financed mainly by the countries that they interconnect.[54]

Looking at TEN-E also reveals that most bottlenecks identified at its start in 1996 still exist today (Buijs, Meeus & Belmans, 2007) – with about 60 % of the electricity network projects being noted as being behind the schedules. The Priority Interconnection Plan recalls that whereas e.g. in 2006, only € 200 million were invested in electricity interconnection as compared to € 3.5 billion investment in the whole grid, by 2013, € 6 billion should be invested to relieve cross-border to relieve cross-border congestions and enable inclusion of a substantial amount of electricity generated from renewable energy sources (European Commission, 2007b). To achieve this goal and address the deficiencies, it sets out five main priorities including appointing European coordinators to pursue the most, important priority projects; agreeing a maximum of five years within which planning

[54] Decision 1364/2006/EC lists projects eligible for Community assistance under Regulation (EC) No 2236/95 and ranks them in three categories: projects of common interest, priority projects and projects of European interest.

and approval procedures must be completed for projects that are defined as being ‘of European interest’ under the TEN-E guidelines, examining the need to increase funding for the trans-European energy networks and establishing a new mechanism and structure TSOs, responsible for coordinated network planning (Ibid.).

In spite of the fact that TEN-E policy aimed at streamlining national planning and authorisation procedures which would mitigate the problems to a certain degree, there has been a very little support for harmonizing cross-border planning process in the EU (Gallagher, 2010:13). The third liberalization package does not touch on this issue either. In November 2010, new “infrastructure package” should be released which should address revision of current TEN-E guidelines, integration of RES into the grid as well as notified “new energy instrument” which is presented as to be tackling this issue.

3.2. RES policy

The principle of subsidiarity in environmental legislation settled by the Single European Act (1987) allowed member states to implement stricter environmental standards. This led to limitation of Commission’s power to ensure harmonization and similar conditions for member countries industrial sector (Eikeland, 2004:29). Because the member states have the right of choice between different energy sources and the general structure of its energy supply (TEU, Art. 175/TFEU, Art. 192), which energy sources to choose and how to tax energy, the national targets model was chosen. But it was a tricky task to set the national targets in a way that imbalances could be avoided. Therefore, the will to design a system of renewable certificates in the spirit of liberalised market prevailed on the Commission side when drafting both of the directives.

Already in preparation of the 2001 directive, the Commission tried to introduce harmonization through some form of tradable green certificates (TGC) scheme and imposing quota obligations on suppliers to source a certain percentage of their electricity from renewable resources, in order to easily adapt it to cross-border trade. Nevertheless, it met with considerable resistance in sections of the Council, particularly from Germany, Denmark and Spain, three countries with most developed wind industry, who strongly supported feed-in tariffs (FITs), as well as the EP which finally forced the Commission to alter its stance and renounce European-wide TGC scheme – the approved Directive opened the possibility of governmental support schemes, thus favouring environmental concerns in order to promote sustainable development over regulation of governmental intervention in the market (Lafferty & Ruud, 2008:10-11). Similar debate accompanied the RES Directive proposal, resulting in similar outcome – national support schemes being preserved.

As regards the grid, the reports of the Commission highlighted that not enough is being done to improve the system of grid management. Therefore, Directive 2009/28/EC lays member states the duty of developing transmission and distribution grid infrastructure and any other equipment needed to secure operation of the electricity system. In order to accommodate further development of electricity production from RES, they are obliged to ensure interconnections, as well as to take appropriate steps to accelerate authorization procedures for grid infrastructure projects. At the same time, priority or guaranteed access to the grid-system of electricity produced from renewable energy sources is provided as well as priority dispatch of generating installations using renewable energy sources in so far as the secure operation of the national electricity system permits and based on transparent and non-discriminatory criteria (Art. 16/1-2; Art 14/4 2nd package; Art 25/4 3rd package). Generators can thus sell and transmit the electricity whenever the source becomes available.

The RES policy thus rather creates new commitments which might exert pressure on system adequacy as well as operational security without providing any safeguards. As regards the technical challenges such as loopflows, one of the high DG Energy officials admitted to me that the Commission did not pay attention to academics who kept repeating that the technical challenges might arise, equating the current situation to *"the revenge of Kirchhoff"*. *"When you introduce competition to a market, you look at lawyers, not at engineers..."* he added.

As regards infrastructure, it has been already mentioned above that the approach of the renewable lobby towards infrastructure investment was even negative at the beginning.

When Loyola de Palacio[55] proposed a legislative package to promote investment in the European energy sector (among others, including the above-mentioned security of electricity supply directive and revision of TEN-E guidelines) in 2003, MEP Mr Turmes from the Green Party complained that building the necessary extra-capacity and upgrading grid systems would be fantastically expensive. He even called for declaring a moratorium on new EU-sponsored transmission lines and focusing on regional markets and promotion of decentralized generation to ensure security of supply and achievement of EU climate goals instead (Eikeland, 2004:26).

To sum up, attention and support were drawn mainly to the generation side of the electricity chain for a long time. Nevertheless, this position has been changing. RES are no longer regarded as solely distributed sources – on the other hand, their large scale deployment (particularly in offshore wind) is promoted as a recipe for future.[56]

3.3. Main defficiencies

All in all, several deficiencies of the EU-approach towards security of electricity supply were identified:

- Imperfections of the regulatory framework, which might not favour the generation of investments, are more or less equivalent to obstacles to IEM completion (but might be partially tackled by the third package, as time will show).
- Hitherto RES promotion policy, while distorting the market, deals only with the generation side, solely imposing obligations on other segments of the electricity chain. Meeting those obligations under existing conditions is either often impossible (on-time grid construction – because of long authorization procedures and local resistance) or might even accentuate the ignored challenge of loop flows. PSOs, otherwise regarded as a part of the security of supply toolbox, become double-edged sword when employed for RES promotion.

[55] At that time Vice-President of the Commission, in charge of DG TREN.
[56] The fact that EWEA already prepares 'its own' 20 Years Network Development Plan, whereas the official Ten Years Network Development Plan assigned to ENTSO-E by the third liberalisation package was just released in February this year, is clearly aimed at inspiring the Commission working on the new 'infrastructure package'.

- Policy measures at the EU-level are absent or inadequate in areas where the national approach does not lead to optimal outcomes for security of supply (as well as internal market). Among the problems are lengthy consent procedures, coordination in investment planning and operation which will be addressed on the next pages, as well as a general lack of infrastructure.

In absence of European approach, action is often taken at national or regional level. However, the following pages confirm that unharmonized measures represent a real concern for future.

Incentivized investment and coordinated network planning

As outlined in chapter 2.2, unlike generation as a sector of competitive nature, networks as a specific natural monopoly cannot rely purely on price signals and regulatory incentives for their construction are thus difficult to design.

The same is valid for further integration of national markets into larger regional ones. Network investment faces many obstacles and, as we have observed, EU legislation puts no binding obligations of grid planning coordination. At the same time, weak incentives for RES producers are provided to consider both costs of integrating new technologies into the larger electricity system (IEA, 2007:16-17) as well as coordinated planning of infrastructure and subsidized renewable generation development. Many academics argue that a common approach in form of a co-ordinated regional investment planning by synchronously interconnected TSOs with clear rules for achieving defined reliability and economic goals is necessary (Nies, 2010:19; Moselle, 2008:10-11). Similarly, synchronization of RES expansion is needed (Van Hertem, 2009). Since the cost of the infrastructure is just the fraction of what the investors into wind pay, tariffs on infrastructure building might be also considered as an option.

Regulatory gap between national policy and legislation and promotion of national versus European interests, respectively, causes lack of regulated investments in interconnections (Buijs, Meeus & Belmans, 2007:3). Besides that, it turns out that decisions adopted in isolation from other investments decisions in the region can lead to sub-optimal solutions.

This argument can be well-illustrated on the loopflows issue in Central Europe (addressed in chapter 2.3.2).

Besides increasing capacity of the interconnection, North-East German 50Hertz and Polish PSE Operator S.A. have already agreed on solution. They will install so-called Phase Shifter Transformers (PSTs) in substations Krajnik and Mikułowa until 2013/14 (PSE-Operator, 2010). PSTs are a type of power flow controlling devices which are considered to provide a partial solution to the above mentioned issues while enabling additional degrees of control to the system operators by altering the natural flows in the system and operating the system close to its limits. However, besides altering the flow patterns in their control zone, the operation of these devices also has an impact on the system outside their zone and can have detrimental effects on the operation of that neighbouring system (Van Hertem, 2009:174). This could happen also in the case of Polish PSTs – which are even expected to exacerbate the already expected critical situation on the Czech power line no. V412 Řeporyje – Hradec Východ. The Czechs have two options: to move the problem back to Germany (by installing PSTs on the profile with Germany or switching off the automatic circuit breakers) or to wait for a problem in their own grid which is generally strong fulfils in interconnection level of 10%.

It needs to be noted that the Polish decision to install PSTs does not contradict the Decision 1364/2006/EC laying down guidelines for the trans-European networks that define increase of transmission capacity over interconnections between Germany and Poland, as a priority project in Europe and no European legislation forbids PSTs. On the other hand, the planned upgrade of the interconnector should serve the European goal of integrating more renewable energy into the grid and at the same time of increasing the security of supply in Central Europe as claimed. The fact that phase shifters in Belgium were identified as projects of common interest (1364/2006/EC, Annex III/3.58) confirms this. Several of them are already in operation in the EU and more measures of similar kind are planned to be installed or recommended for the future, e.g. on the profiles Slovenia-Italy, Austria-Italy, Germany-Denmark, in Spain (ENTSO-E, 2010a:11) – for planned grid enforcement see Appendix 9.

The situation clearly demonstrates that, for the time being, the loop flows have been tackled only as a national problem, which is moved behind the borders. The integration of concentrated wind generation into electricity systems, dynamic cooperation between systems with large shares of wind and cross-border trade have been devoted little attention (IEA, 2007:110). PSTs represent a medium term solution in order to mitigate emerging needs. The control of PSTs is an optimization problem with multiple players involved which enhances the need for international cooperation and coordination (Van Hertem, 2009:176). EWIS study comes to the same conclusion: coordinating the operation of flow controlling devices (phase shifting transformers, series compensation and HVDC links) across Europe is necessary (ENTSO-E, 2010a:15).

Permanent lack of investment in cross-border interconnections raises the question of whether a regulatory body at the European level with higher powers than ACER adopted by the Third Legislative Package will not be needed to tackle this issue. as well as the transfer of harmonization and regulatory responsibility for all transmission service to federal authorities would be very desirable (Joskow, 2006b:135).

Coordinated operation

Similarly, coordination is the only option in search for operational security. The cooperation of TSOs and the harmonisation of electricity flow procedures need to be ensured also on the operational level (Delvaux, Hunt & Talus, 2008:174).

There have been already attempts for regional cooperation motivated by the need to manage the expanding operations of TSOs due to integration of wind energy and handling intensifying cross-border trading such as TSC or coreso projects. They treat the need of contingency planning and emergency responses to be undertaken from the whole-of-system, reflecting the shared value of the responsibility (IEA, 2005a:16). In Nordic countries, simulations and plans are not only made inside the member states, but also exchanged between them within Nordel, a body for co-operation between the transmission system operators in this region (Silvast & Kaplinski, 2007:16).

However, there are arguments that regional cooperation may not be particularly appealing to national TSOs. This is because it might imply domination by larger TSOs in those arrangements and lead to maintaining of control, *"out of concern that dispatch should favour national interests (e.g., by ''exporting congestion to the border'')*. Other reasons could be that regional arrangements might endanger security of supply*"* (Moselle, 2008:12) and that in the regional initiatives providing for cooperation and discussion, progress has been slow (De Jong, 2008), which is proven by experience to date.

Regulatory challenge of providing strong incentives for effective coordination and information exchange within the value chain and across the system spanning multiple control areas reflecting the shared nature of responsibility for aspects of transmission system security (IEA, 2005a:14) thus remains valid. That makes us think again about regional transmission organizations (RTO) for whose formation organizational scheme of ISO is considered as the best point of departure or RIOs proposed by EURELECTRIC (see chapter 3.1.2).

Authorization procedures

Objections to the construction of network infrastructure are also managed nationally. Some countries, e.g. Germany, attempted to solve the situation by passing an "accelerating law" surnamed 'Enlag',[57] which would lead to the shortening of the planning and approval processes. In Germany, 24 urgent power line projects in the 380kV high-voltage transmission network were defined.[58] Thanks to these grid extensions, the accommodation of future growth in wind power should be feasible through making the pump storage plants more attractive for storing wind energy (Argus, 2009a). New provision aimed at encouraging the construction of pump storage power plants by exempting them from grid access fees for 10 years was adopted later (Argus, 2009b). Nevertheless, several doubts about functioning of this prototypic case have already been raised.

[57] The Extra High Voltage Grid Extension Acceleration Act (Gesetz zur Beschleunigung des Ausbaus der Höchstspannungsnetze) of 21 August 2009.

[58] But in some circumstances, they must be buried underground in some circumstances – less economical, has many technical disadvantages and in spite of the fact that general public often thinks the opposite, also more detrimental to the environment (due to the large volumes of soil that need to be eroded).

EU-wide approach will be probably needed also in this area even though it has not been yet touched on, because of its sensitiveness.

As becomes apparent in the analysis, security of electricity supply measures are still rooted more in national than EU-level policies, clearly lagging behind developments in the other two policy areas, IEM and climate policy. If no action is taken, this might lead to an escalation of some of the challenges, loop flows in particular. This takes place in spite of the fact that some of the challenges, such as the need for investments into interconnectors have been addressed – at least by being given political attention – since the launch of market integration process. IEM completion is impossible without it either.

Reasons for this situation might be many-fold. It appears that the need of tools to ensure adequacy of the power grid was overshadowed by too much focus on problems associated with electricity's generation, namely greenhouse emissions or fossil fuel depletion, among others (Silvast & Kaplinski, 2007:7). Critics also deplored the tendency towards a "wild" regulatory expansion in the area of environment as well as the apparent lack of coordination between environmental and other policy areas, including energy (Lenshaw, 2010:321). Another reason might be general lack of states' will to employ effective tools because it might not be advantageous for them or simply the fact that security concerns did not stand at the core or at least were not the primary motivation of policy-makers. Last but not least, technical origin of the issues (in case of loop flows) may play a role.

4. Interpretations provided by EU integration theory

Having depicted the main issues influencing security of electricity supplies in the EU as well as having outlined the major policy developments (including policy areas where development has stood still), this chapter attempts to test the interpretative value of several theories of European integration: neofunctionalism, liberal intergovernmentalism, institutionalism and multi-level governance. A common approach would be to employ one of the theories as an explanatory framework (e.g. Eikeland, 2008, adopting multi-level governance perspective), this chapter, however, adopts a different approach. The aim behind this chapter is to investigate how well are these four theoretical approaches able to explain policy outcomes in the area of ensuring security of electricity supply (as e.g. Zito, 2005, does on the environmental policy) and adjudicates between them. This is done through an analysis of task expansion and critical decisions adopted in the other two policy areas that relate to the above-described measures. How well do these four popular theories explain the scope and level of the policy of outputs – expansion and multiplication of tasks policies on the one hand, and a general ignorance of its challenges on the other?

While the first two (neofunctionalism and liberal intergovernmentalism) analytical perspectives rank among macro-theories, encompassing the broad historical trends in integration, whilst the other two are rather micro-theories showing linkage between the EU macro-structure and micro-interests within the larger society and providing insight into how the EU operates.

4.1. Neofunctionalism and liberal intergovernmentalism

It was the intention to place these macro-theories together into one chapter as they provide useful complementary perspectives.

The basic principle of task expansion in *neofunctionalism* can be encapsulated as follows: *"The integration of particular economic sectors across nations will create functional pressures for the integration of related economic sectors"* (Rosamond, 1999:51). The "functional spill-over" is described/is understood as the initial decision made by governments to place a certain sector under the central authority (e.g. on a Treaty basis). That creates pressures to extend the authority of the institutions into neighbouring policy areas, with a supranational body (referred to as a *"high authority"*) acting as a 'sponsor' of further integration (Pollack, 2010:17).

As a result of entrepreneurial activity of supranational actors (such as the Commission) and sub-national actors (interest groups and others within member states), a "political spill-over" into other policy areas occurs. Politics follows economics. This process is launched by the perception of national or sub-national actors that the location of a meaningful authority shifts towards an international organization and they seek it out as the most efficient way of fulfilling their interests. In the case of the EU, the transfer of loyalties from governments to the new centre is supported by the Commission or the European Court of Justice (ECJ) as guides of the integration process (Pollack, 2010:17). Besides changing loyalties, the groups might also "transnationalize" their form of organization. The entrepreneurial function of the Commission and supranational deliberation among member-states representatives in the Council, were later conceptualized as the so-called "community method of policy making" (Ibid.). Today, the European Parliament also exerts certain influence even though it is sometimes argued that it does not act as a neofunctional body seeking to expand the EU's role but rather as an organization seeking to enhance its own position (Zito, 2005:49). In other words, deepening economic integration creates the need for further European institutionalization, while political integration remains a side effect of economic integration (Rosamond, 1999:52).

Which policy issues are vulnerable to spill-over is a question. Zito argues that what becomes very important is the degree to which the policy issue is technical: *"The more technical and less salient the issue is to the general public, the more tenuous the linkage between the regulation and distinct national interests and the less on the national politicians to intervene"* (Zito, 2005:148).

Even though criticisms of neofunctionalism withering away state power were rejected as implausible, the approach does not by any means devote much attention to behaviour of national states.

In spite of there being a rival theory, the position of liberal intergovernmentalism fills in certain gaps. At the same time, it is obvious and recognized that liberal intergovernmentalism itself is not able to explain all EU politics and policies.

Liberal intergovernmentalism is a parsimonious theory, which perceives European integration as a set of choices made by national leaders (Schimmelfennig, 2004:78). It is based on a three-step model:

1. *Preference formation at the national level*. Preferences are mainly issue-specific and economic and fixed (Ibid.) and states act systematically to achieve them.
2. *Bargaining at the intergovernmental stage* (EU-level). The problem is not posed by integration as such but by the distribution of gains. The bargaining power of supranational actors is considered to be as low *"because they are deprived of their main bargaining resource: scarce and asymmetrically distributed ideas and information"* (Schimmelfennig, 2004:79).
3. *Model of institutional choice providing international institutions with a role in pooling or delegating sovereignty* in order to increase the credibility of their mutual commitments (Pollack, 2010:18-19). States are not willing to give institutions sufficient information but rely on them to solve second order problems of control, sanctioning etc. *"The degree to which governments favour the pooling of sovereignty and delegation to supranational institutions depends on the value they get out of it"* (Schimmelfennig, 2004:90).

Intergovernmentalists concentrate on constitutional change as an object of their research rather than dealing with day-to-day policy making. They cannot afford to allow for an independent impact of the European Parliament. They equally reject policy change reached through the Commission's strategies and the decisions of the ECJ (Zito, 2005:156) as well as any philosophical development towards less regulatory forms of intervention and thus can best serve for intergovernmental decisions under unanimity. Unlike neofunctionalism, intergovernmentalism also provides grounds for external motivations of a policy (which is in the case of electricity relevant only with regard to access to primary fuels (e.g. obligatory oil and newly also gas reserves) and bad examples such as blackout in California).

From the neofunctionalist point of view, the spill-over of liberalization to the sectors of electricity and gas, stimulated by the Commission as well as by some member states,[59] occurred and thus launched the way towards an internal energy market. As outlined in chapter 3.1, it was more of an *ex ante* electricity market related regulation. But it was provided for by the adoption of the Single European Act rather than by ECJ activity, which lacked leverage to act on this because until SEA adoption, network industries were exempted from competition in the EEC Treaty, also after the SEA adoption.

The intergovernmentalist explanation also corresponds with the adoption of intergovernmental treaty provisions and their re-negotiations as a necessary precondition for the adoption of future legislation in other than economic sectors. This can be illustrated on the case of environmental policy. The SEA already provided some legal basis for environmental regulation by enabling qualified majority voting (QMV) in the Council for some areas of environmental policy. This was further improved by the Maastricht and Amsterdam Treaty reforms (QMV in most areas etc.) (Lenshow, 2010). In spite of the resolutions from the Energy Council (1986, 1987) and consultative Green paper containing substantial liberalization plans issued by the Commission in 1988, first real steps towards IEM were also made after Maastricht – Article 100a (TEU) required a qualified majority and it enables the input of the EP with its newly-strengthened powers under co-decision (Greenwood, 2002:271).

Unlike the liberalization of the electricity market, in some areas of environmental policy, some member states eagerly endorsed the subsidiarity principle – which is something that neofunctionalism does not explain (Zito, 2005:52). A similar situation occurred during the promotion of RES. In spite of the fact that the ECJ is supposed to be one of the institutions

[59] At first, liberalization of electricity market was supported only by UK, Ireland (that later switched sides) and Portugal (because of an inadequate production capacity) (Greenwood, 2002:271).

promoting spill-over, it is not always the case. 2001 ECJ judgment rejected that feed-in-tariffs should be included in the state aid concept and DG Competition was thus restricted from applying general treaty rules.[60]

The idea of a possible spillover from an internal market in electricity (as an economic dimension) to security of electricity supplies (as a more political dimension) suggests itself. Firstly, the nature of integration as viewed by neofunctionalist logic explains, why, unlike the US where ex ante establishment of an independent regulator to set the regulatory framework was adopted as one of the first steps, the EU is acting on this issue rather late – only after other rules established by other policies were adopted. Should ACER, created by the third liberalization package, pre-empt a European regulator (as originally proposed) such as the narrowly based European Coal and Steel Community (ECSC) pre-empted the somewhat broader European Economic Community (EEC) or the common market resulting in a monetary union? (Rosamond, 1999:53). Can the attempts at fostering regional cooperation solve the problems of coordination in the planning and operation as well as market integration? Should be that fact that representatives of those regional initiatives often turn to Brussels viewed as the first step towards a shift, moving any meaningful activity towards a transnational level? As explained in chapter 3.1.2, ACER and ENTSO-E have been given only limited powers because member states were willing to agree only with strengthening of NRAs powers. Current situation thus corresponds rather to what Schmitter (cited in Rosamond, 1999:65) calls *"spill-around"* – the supranational dimension was increased only in scope while the level of authority has been more or less constant.

If the other aforementioned deficiencies such as the lack of coordination and cooperation in investment planning or a general lack of investments are addressed from neofunctionalist angle, it leads to a clear conclusion. Unless national actors including the NRAs and TSOs do not see clear economic benefit of, at the first stage regional and then supranational cooperation, they are not incentivized to pass their loyalties to the upper level.

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[60] The verdict of PreussenElektra v. Schleswag case said that the German system of fixed feed-in rates should be viewed as state aid even though it clearly did not fit the criteria of state aid used so far, was given shortly before the final proposal of 2001 Directive was submitted (Reiche, 2005:42-3).

Similarly, from the intergovernmentalist perspective, governments will not delegate their sovereignty to a supranational body if they cannot expect to get anything out of it**,** if it does not bring them any added value. Even though the Commission attempted to incorporate a new chapter on energy into the Treaty already at the beginning of the 1990s in order to co-ordinate security of supply and internal market issues, it was not successful at the time. Member states systematically undermined the Commission's efforts to assume greater power in the coordination of member state security of supply policies (Eikeland, 2004:24). It failed to be adopted by the Council; the UK, Germany, the Netherlands and others built a strong blocking alliance.

In general, security is perceived as more of a national rather than European issue and unless it becomes obvious that securing the supply of electricity could not be guaranteed without EU-level contribution, this will hardly change. A small exception is the so-called solidarity clause, which was finally included in the text of the Lisbon Treaty (Art. 122 of TFEU) represents a clear example of the external motivation.

Through intergovernmentalist optics, the policy outcome reflects the preferences of member states governments (Moravcsik, 1993). Lack of energy infrastructure can be interpreted by the scepticism of the most powerful member states coalition in the Council towards free trade and IEM (Eikeland, 2007:4). Apart from other, PSOs are also still in place for these reasons. Whilst this is the case of member state resistance, technical issues of low political salience represent a stiff test for intergovernmentalism (Zito, 2005:150) because it does not distinguish them from its optics.

The two macro-approaches are complementary and provide a general explanation for the lack of regulatory capacity in the area of security of electricity supply. Nevertheless, they don't take into account the role of the actors in defining problems and shaping agendas, or neither do they provide the details of sometimes overlapping and sometimes conflicting competencies of sub-system actors. Focussing on certain aspects is a task for mid-range theories – institutionalism and multi-level governance.

4.2. New institutionalism

The first approach which was chosen to verify its applicability on policy outcomes related to security of electricity supply institutionalism. E.g. unlike multi-level governance, it focuses on the impact of institutions over time and the ways the institutions, once established, can constrain the behaviour of actors who established them. Institutionalism is based on the premise of institutions representing formal rules, norms, procedures and standard negotiations practices that structure relations between individual political and economic units (Rosamond, 2000:115). Their role is not only the creation of sets of rules for political negotiation but also, in the broader context where the policy-process evolves. Even though primacy keeps belonging to member states, institutions have a substantial impact on political outputs because they structure both individual and collective interests. The 'new institutionalist' approach has three branches: rational-choice institutionalism, sociological institutionalism and historical institutionalism.

According to *historical institutionalism*, once established, the set of institutions can influence or constrain the behaviour of the actors who established them. Certain importance is also attached to institutions by neo-functionalists, who promoted the effect of spill-over from one to another policy area (Pierson, 1996:147). In this situation, gaps may occur in the ability of member state governments to control the subsequent developments of institutions and policies (Pollack, 2010:22). There are three sources of possible gaps: *short time horizons of decision makers* which can result in adoption of decisions which turn out to be disadvantageous for the member states; the prevalence of *unanticipated consequences* even when politicians do focus on the long-term policy-effects because of high issue density and varying access to information; and the prospect of *shifting member states policy preferences* (Pierson, 1996:137).

It also introduces the concept of *path dependency*. It subsumes that initial decisions, even suboptimal ones, can become self-enforcing over time and the fix costs of adopting alternatives increase and inhibit exit from a current policy path. Prevalence of increasing returns encourages the actors to stick with and not abandon existing institutions and policy paths, adapting them only incrementally (Pierson, 1996:145). The effects of institutions are assumed to influence only the incentives confronting the various public and private actors – actors themselves are assumed to remain unchanged in preferences and identities.

This concept originally comes from economics. When technology is in a state of flux, social, organizational and political factors are important shapers of technical change whereas later technology becomes a determining factor. Lock-in and irreversibility occur when a dynamic pattern of competing technologies ends up in a situation with one technology dominating the market (Van den Bergh, 2008:109-10). The barriers often lie not in techno-market factors themselves but in structural variables conditioning inertia – *path dependence* – which can be likened to system resistance (Lafferty & Ruud, 2008:17).[61]

However, whilst according to transaction costs economics technological lock-in can be overcome by learning and bringing competition back to the market. Pierson argues that in case of institutions, learning is not sufficient for fixing it as new obstacles arise at the same time, such as the resistance of supranational actors that have already gathered substantial political resources (Pierson, 1996:141-2).

The institutionalist approach provides a certain explanation for some security of electricity supply related policies. The thesis of unanticipated consequences – in this case of technical origin – can be applied on the promotion of renewable resources without considering their implications for secure operation and development of the electricity grid. The author will attempt to link the technical and political dimension here as they are to large extent interwoven. The phenomenon of loop flows caused mainly by large-scale wind farms operation is so far unprecedented in the world and when setting the first renewable energy policy targets (10% electricity production from RES-E by 2010), EU policy-makers could not have had the faintest idea of the long-term consequences. As we could see on the SoS directive and TEN-E debate (see chapter 3.1.1 & 3.1.3), many politicians did not even

[61] Liebowitz and Margolis (in Lafferty & Ruud) propose differentiation between three degrees of path dependence: *first degree* meaning that there is no necessary error in the system and it thus can be explained simply as recognition of durability; *second one* implying that the inferiority of a chosen path was unknowable at the time the choice was made but more efficient alternative path was recognized later; *third one* alleging existence of remediable inefficiencies at the time of decision-making, actors continuing along the path because the returns are perceived as greater than the postulated increase in efficiency to be gained by path change (2008:20).

support the building of network infrastructure in the following years. But RES-E were granted a whole range of regulatory privileges (see chapter 3.2) which, in combination with well-tuned support schemes (in form of FITs), in some countries led to an unprecedented development of wind energy in particular (for illustration see Appendix 8). These unforeseen circumstances make the EU-level approach more important for the future since current provisions address almost unconditionally only the national dimension.

The impacts were already apparent in some countries during the energy-climate package negotiations without any counter-measure being adopted. One-side regulatory support through an unharmonized system of national schemes will be difficult to deviate from, in spite of its suboptimal character (creating extra costs for some member states) because increasing returns prevail. Incentivizing only one side of the electricity chain has already created a kind of path dependency. A high Commission official contended, *"RES promotion provides quick political results"* (author's interview) – and its returns thus might still appear bigger than its drawbacks. Moreover, wind energy which probably has the greatest potential out of all RES in the EU and whose costs have been rapidly falling is at the forefront of the EU low-carbon promotion strategy. Rather than being employed as a decentralized source of energy, large off-shore wind parks being built in North and Baltic seas which will exacerbate the challenge. But while EWIS study call for fostering consistency of the unstoppable regional market development and network integration (ENTSO-E, 2010b), only incremental steps can be taken at the moment. Infrastructure will probably deserve more attention as a large offshore grid is being planned as well as a TEN-E revision, which should bring with it better financing (e.g. in terms of a prepared infrastructure package). But those will not fully tackle the security challenge because states might resist ceding their powers in this area by passing them on supranational bodies, such as the Commission or ACER.

Rational-choice institutionalism uses slightly different reasoning for the explanation of development. It argues that purely intergovernmental models of EU decision-making underestimate the causal importance of formal EU rules in shaping policy outcomes (Pollack, 2010:21). According to Fritz Scharpf, rigidity rests not simply in EU intergovernmentalism but also in rigid institutional rules – unanonymous decision-making in particular (Wiener & Diez, 2004:149). Whereas in a situation where a single issue is being negotiated between states, no agreement is possible, and the default condition changes when we move to a joint decisions system in which the exit option is foreclosed. Therefore no agreement thus assures the continuation of the existing system. That means, however, that member governments will be precluded from dealing individually with pressing problems even if the Community cannot agree on an effective solution and the overall problem-solving capacity of the system may decline.

Joint-decision systems are thus doubly vulnerable to the consequences of non-agreement: they may be incapable of reaching effective agreement, and they may lose the independent capabilities for action of their member governments (Scharpf, 1988:257-8). Even though "secession" may be invoked, it represents a certain threat for member countries and its credibility might be thus quite low – therefore, solution must be found in terms of the problem-solving framework to satisfy the requirement of unanimous agreement (Ibid. 259). All in all, the 'joint-decision trap' is *"an institutional arrangement whose policy outcomes have an inherent (non-accidental) tendency to be sub-optimal - certainly when compared to the policy potential of unitary governments of similar size and resources"* (Scharpf, 1988:272). In order to be effective, institutional change would have to be large-scale, implying the acceptance of short-term losses for many participants.

Joint-decision traps hypothesis might be employed as an explanatory tool for the unbundling debate even though QMV voting is applied in this area instead of unanimity which Scharpf counts with. Industry restructuring debate has started even before the first liberalization package and member states were thus precluded to deal with this issue individually. Greenwood summarizes the first package pre-adoption phase like this: *"Commission activism, the inevitability that some kind of agreement was likely to emerge, and some with for damage limitation as to the type of liberalization scheme that might emerge also have been a factor in acclimatization"* (2002:272). Legal unbundling was found insufficient more than one decade later. As the debate outlined in chapter 3.1.2 showed, reaching an optimal solution was a difficult process requiring some outcome. And it resulted in at minimum one obviously sub-optimal solution (ITO option) – the efficiency of expected institutional change thus being clearly diluted, even without challenging this aspect's relevance for IEM and security of electricity supply.

The new institutionalism is a suitable explanatory framework for times of institutional stability whilst it would struggle to explain sudden change (Zito, 2005:156). But while providing a quiet well-fitting account of evolution of the outcomes and providing tools for interdisciplinary analysis at the same time, institutionalism does not have at its disposal the tools for dismantling the institutional machinery (the Commission in particular). It is criticized for not covering self-acting of the institutions – unlike e.g. a so-called actor-based supranationalism that finds support in both the 'constructivist' position and in recent adoptions of neofunctionalism (Schmidt, 1997).

4.3. Multi-level governance

The independence of policy actors as well as multiple policy arenas is covered by multi-level governance (MLG) approach. This theory ranks among the governance approaches which depart from the traditional rationalist perspective theorizing the EU political process as non-hierarchical and involving deliberation and problem-solving efforts guided by both informal and formal institutions (Pollack, 2010). EU policy making is depicted as "*a system of continuous negotiations among nested governments at several territorial tiers* and *supranational, national, regional, and local governments are enmeshed in territorially overarching policy networks"* (Marks, 1993:392). In addition to permanent vertical and territorial structures, it also accepts the involvement and interdependence of horizontal levels (functional, public, private etc.) (Karr, 2007:127). But besides interconnecting multiple political arenas, it also approaches the process of governing (Jachtenfuchs & Kohler-Koch, 2004:103). The decisions enforced by states have zero-sum character, involving gains and losses for individual states (Marks, Hooghe & Blank, 1996:346).

In spite of the fact that it attaches the role of most important players in the European-arena to states, it argues that state sovereignty might be diluted by collective decision-making. States lose their grip on the mediation of domestic interest representation in international relations, in favour of other actors at different levels (Marks, Hooghe & Blank, 1996:341-3). The various levels of governance interact and their competencies overlap (Rosamond, 2000:110). As a result of that, there does not have to be one clearly determining factor of the decision – they could rest within different layers of governance and with different agents (Eikeland, 2008:6).

Peterson distinguishes three categories of policy levels (Peterson & Bomberg, 1999:5-30):
Super-systemic, at which the general direction of the policy is set by the European Council, governments in intergovernmental conferences and European Court of Justice (history-making decisions);
Systemic, at which Council and European Parliament set concrete policy lines by drafting and adopting legal provisions on the matter (policy-setting);
Sub-systemic, at which the policy-shaping decisions are formulated by the Commission before the formal legislative process even begins; Council working groups and EP committees assisting on the matter (and returning back to the game later on).

Eikeland argues that the European Union is a system of multi-level governance driven by identity politics, as well as functional and distributional pressures between the above mentioned levels. But since identity intervenes between functional pressures and regime outcomes it does not presume that jurisdictional design is efficient (2008:6). The costs of coordination during up-front decision-making and interaction bring the possibility of blocking and vetoing decisions (Karr, 2007:127).

As signals are categorization into levels, formal authority has been dispersed from central states both up to supranational institutions and down to sub national governments. At the same time, share of decision-making competencies and influence falls to non-state actors. Along the lines of individual policy fields, diverse *policy networks* of more or less stable character controlling different phases of the policy process (Karr, 2007:130). Public as well as private networks of diverse kinds have multiplied at every level from the smallest to the largest scale. Interest groups coming from various sectors (business, non-governmental, epistemic communities etc.) advance their interests at various decision-making levels as the policy-process evolves.

There are multiple channels utilized to influence the EU policy process – many of them mutually reinforcing. MLG policy-setting stage explanation admits e.g. the Commission's openness to lobbying. Due to dependence on external information, the Commission establishes networks of stakeholders, inviting them to various expert and consultation committees – drawn from national civil servants, officials, and non-governmental and private actors. Apart from seeking out expertise, institutions in some cases even provide funding to interest groups and ad-hoc alliances (Coen, 2009:152). Energy policy is one of the highly regulatory areas where technical policy input defines political legitimacy of the output – DG Energy and Environment directorates ranking on the third and second position, respectively, in this regard (Ibid.). Whereas energy consumers representation is fragmented to many groups (BusinessEurope representing energy intensive industry, IFIEC-Europe representing various national federations of energy-consuming industries and BEUC (Bureau Européen des Unions de Consommateurs)), energy producers are roofed over by EURELECTRIC, traders in EFET (European Federation of Energy Traders) and system operators now by ENTSO-E (formerly ETSO). Among major RES collective actors belong EREC (European Renewable Energy Council) and EUFORES (European Forum for Renewable Energy Sources). A status of a very powerful lobby (at least according to words of well-known Brussels lobbyist Daniel Guéguen) has EWEA (European Wind Energy Association), less then EPIA (European Photovoltaic Association) in the solar sector.

MLG perspective provides an interesting account of ownership unbundling issue, weak regulatory outputs of the third liberalization package as well as interaction of various systemic levels in legislative process. Eikeland argues for more radical flavour of the proposal compared to the second liberalization package, which reflected a stronger independent will of the Commission to press forward internal energy market liberalization due to the fact that competitiveness was at the top of policy Barroso's Commission policy agenda which led to DG Competition's participation in the drafting (Eikeland, 2008).

DG Energy watching over EU security of supply showed a pragmatic will to compromise market-based arrangements with security of supplies. The EP advocated for former to achieve the latter (Eikeland, 2008:38). ETSO and EURELECTRIC were criticized for passivity in the ownership unbundling debate (Eikeland, 2008) as they took no position on OU, pushing rather on stronger implementation of already adopted policies and continuation of regionalization as a first step towards a full-fledged energy market. For example, ETSO argued that OU is not sufficient to incite investments and advocated for development of binding regional cooperation (ETSO, 2007). Nevertheless, the fact that this option was left out shows impact of DG COMP fearing regional cartels on the proposal (Eikeland, 2008:23). As outlined in chapter 3.1.2, the industry restructuring was also affected by *ex post* regulation and strengthened Commission's powers in antitrust policy in general.

Unlikely, RES policy groups and networks are generally reported to be more successful in push for their interest. In the environmental policy sector as a whole, the policy networks played an important role in pushing for task expansion since 1970s as there was no solid green coalition at that time (Zito, 2005:150). At the same time, Zito concludes that *"although the discussions in the policy networks are shaping the utilization of the available ideas"* (2005:155) and policy networks approach can explain course of action in specific issue-areas, no single policy network in the environmental area seems to have provided momentum to drive task expansion for longer time (2005:157). This hypothesis might be less valid for RES lobby which played adequately relevant role, in setting of the targets and the support scheme for RES promotion.

As far as *targets* are concerned, the RES lobby found support in the European Parliament, which is considered to be 'the greenest' of all three institutions, generally pressed for higher ones. In case of both directives, the EP maintained its position that the appropriate figure for overall energy consumption should be 15% and 25% respectively, and that the targets should be binding. However, the final value of 22% of electricity from renewables in 2001 (which corresponded to the original Commission's proposal of 12% of all energy consumption) and 20% of overall energy consumption were adopted. Whereas the targets were set as indicative in the first case, the European Renewable Energy Council (EREC), EU representative of de facto the whole renewable energy sector with support of the EP, kept requiring complex mechanism for states non-complying with their targets (Toke, 2008:3003; Lauber, 2005:43). And RES lobby pressured for binding targets also in the RES Directive, being successful this time.

Even national sub-systemic actors were engaged in the RES debate. German wind energy lobby was credited for playing a particular role for change of the Commission's proposal favouring tradable green certificates (TGCs). The German Wind Energy Association (*Bundesverband Windenergie,* BWE) opposition of the quota system resulted even in a critique from Christophe Bourillion, executive director of EWEA. So we can observe that cases of free-riding of a national organization from European association, with EWEA siding the Commission and defending the necessity of liberalization of the European energy market in the first stage, *"which would give wind a level playing field while we develop to full maturity and become more competitive"* (Michaelowa, 2004:4). It was influenced in this direction by the British Wind Energy Association which favoured a quota system with certificate trading (Reiche, 2005:43). In order to bring the proposal "back into life", the wind groups and environmental groups finally found a common word, creating a transversal coalition led by EWEA and Greenpeace, also including World Wide Fund for Nature, Friends of the Earth, Climate Network Europe, the Business Council for Sustainable Energy Future, COGEN Europe, and significantly, German wind energy groups BWE and Fordergesellschaft Windenergie (FGW) that previously opposed the draft (Windpower Monthly, 1999) – but with EWEA changing its position, not BWE.

In comparison, powerful clearly focused political groups capable of defining security of electricity supply as a distinct political issue are missing. In spite of the fact that the issues were raise, no group called for need to deal with the infrastructure investment and consent procedures loudly enough (probably with exception of EP arguing for higher TEN-E budget). The issue of loop flows was not sufficiently addressed even by ETSO.[62] Some of the insurance measures, such as PSOs or coal subsidies, were often ushered through, being a guise for protectionism.

From the viewpoint of MLG, the Commission also cannot be seen as a unitary agent but *"a collective of Directorates whose separate stockpile of goals and instruments are not necessarily fully harmonized"* (Eikeland, 2004:29). This perspective is thus able to grasp potential clashes stemming e.g. from lack of coordination between DG TREN and DG COMP (eventually also ECJ). A good example of a contradiction between interest to invest in cross-border infrastructure and EU competition policy provides the aforementioned issue of merchant lines (see chapter 3.1.1).

The advantage of the MLG approach is that it internalizes externalities and reflects heterogeneous preferences including within institutions. On the other hand, it does not confer any importance to external factors and only describes the state of the European decision-making (Pierson, 1996:125).

To sum the theoretical debate up, I conclude that the explanatory value of the four approaches varies across different stages of the policy process. None of them is able to encompass all of the issues which this paper defines as problematic. At the same time though, when put together, the macro- and micro- perspectives are complementary to certain extent and provide quite good explanatory framework for policy development and outcomes in the area that this paper deals with. Neo-functionalism and intergovernmentalism depict the logic of task expansion, at the same time justifying the lack of EU regulatory capacity in the area of security of electricity supply. New institutionalism provides reasoning for adoption of some sub-optimal policy decisions which might be either inefficient (such as OU debate outcomes) or even detrimental to security of electricity supply (one-sided policy and regulatory support of RES generation). Multi-level governance (and policy networks) approach, while covering all policy levels

[62] This has been changing though, e.g. regional initiatives Coreso and TSC strive for communicating the issue to the European institutions.

and their mutual interactions, gives account of *de facto* non-existent push for security of electricity supply related measures at the sub-systemic level. Through analysis of institutions not only as self-acting but also dismantling them into sub-systemic level, it also grasps apparent lack of coordination among the three policy streams of the EU energy policy triad, indicating that security of electricity supply concerns might have been overshadowed by other issues.

Conclusion

Availability of electricity supply was referred to as the main premise throughout the paper, with affordability factor taken into account in regard to system adequacy – generation capacity and network investment in particular. Three main challenges to security of electricity supply in the EU were identified: inadequacy of generation capacity, including reserve capacity; inadequacy of network capacity, including cross-border capacity and violation of operational security standards.

Findings of this paper confirm that bringing competition into the market naturally leads to shortening of reserve margins and poses investment challenges. Generation investment challenge is not that urgent and the ways to address imperfections in this area are to large extent compatible with recipes for tackling internal market imperfections (and should be further mitigated by measures adopted under the third liberalization package). By contrast, networks, inter-state interconnectors in particular, due to their specific character require additional incentives for investments. The need for reconciliation between liberalization and security of supply was perceived as apparent. Therefore, so-called 'toolbox for the security of supply' and Trans-European Energy Networks programme were set up. Nevertheless, the tools they provide are very limited and insufficient to tackle the long-term investment challenge.

Legislative measures promoting renewable energy sources not only do not provide any additional safeguards but indirect consequences of their implementation contribute to deterioration of the challenges addressed. Integration of large-scale wind parks generates specific phenomenon referred to as 'loop flows' which in combination with higher cross-border flows resulting from intensifying trading activity pose challenge to both short-term system operation and long-term system adequacy. In the situation when they are paradoxically more needed than ever due to and, those are missing. Under these conditions, application of measures such as public service obligations which are generally considered as pro-security oriented becomes a two-edged sword.

Findings of the paper thus confirm that policy measures stemming from the other two pillars of the EU energy policy ‘triangle’ – internal electricity market and climate policy – as well as consequences of their implementation exert pressure on the security of electricity supplies.

Apart from imperfections of the regulatory framework and RES promotion policy oriented solely on the generation side that aggravate the challenge, the EU-approach towards security of electricity supply is ‘parsimonious’ in general. Policy measures at the EU-level are absent or inadequate for dealing with issues like lengthy consent procedures, coordination in investment planning and operation, as well as a general lack of infrastructure. Security of electricity supply measures are still rooted more in national than EU-level policies, clearly lagging behind developments in the other two policy areas, IEM and climate policy. And even though national approach does not lead to optimal outcomes for security of supply any more, the third liberalization package made only a very limited step forward in this regard.

The four theoretical approaches provide – even though each of them in a limited way – certain explanations for the general as well as more concrete deficiencies. Neo-functionalism and intergovernmentalism depict the logic of task expansion, at the same time justifying the lack of EU regulatory capacity in the area of security of electricity supply by member states resistance. New institutionalism explains partial sub-optimal policy decisions which can be either inefficient or even detrimental to security of electricity supply. Multi-level governance (and policy networks) approach provides account of *de facto* non-existent push for security of electricity supply related measures at the sub-systemic level as well as apparent lack of coordination among the three policy streams of the EU energy policy triad, represented by different policy actors, which might have led to overshadowing of security of electricity supply concerns at the expense of other issues.

A lot of academic proposals for future development accentuating higher investments in both generation and transmission infrastructures have been released since the liberalization and climate packages adoption (Monti, 2010; Zachmann, 2010 etc.), addressing that not only innovation push and pull programmes and massive investments but also more stable and effective regulatory regimes are needed (Glachant, 2010:3). At the same time, ambitious visions for EU energy policy development until 2050 involving even larger RES deployment are being brought on the table and it will be thus worth watching further policy development in this area.

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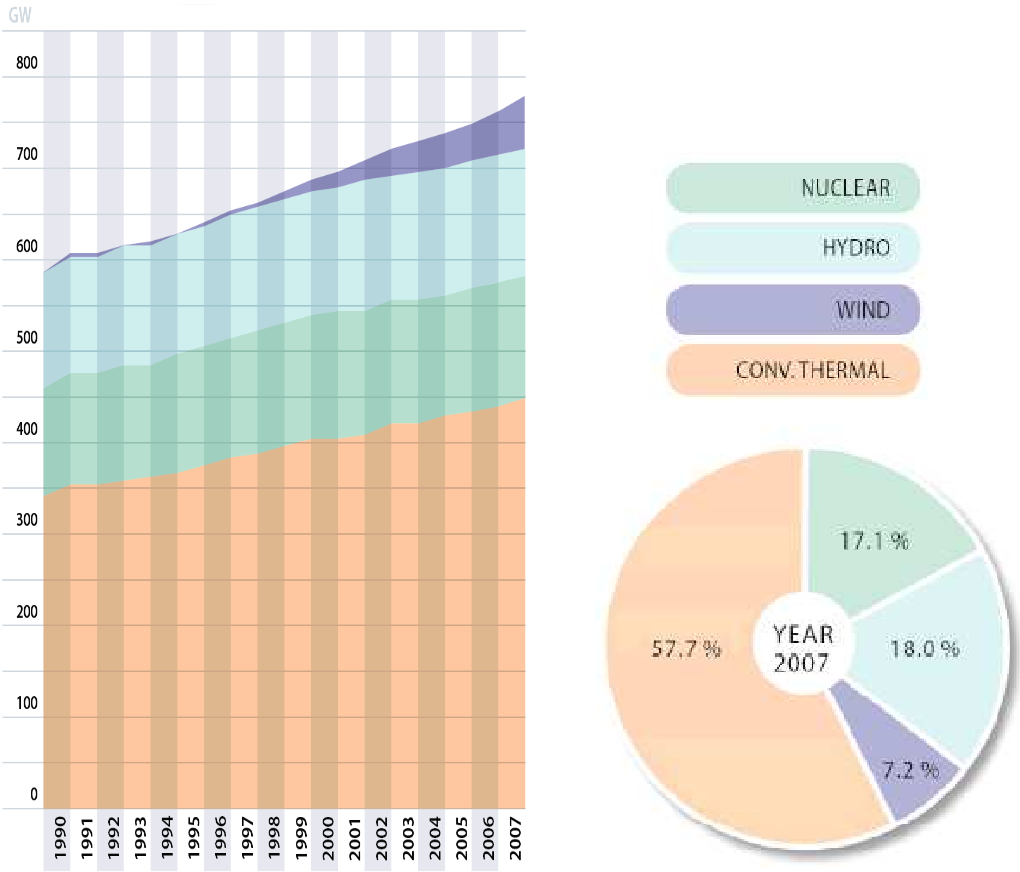
Resumé

V roce 2007 Evropská rada oficiálně odsouhlasila založení energetické politiky EU s třemi hlavními cíli, jež do určité míry odpovídají dosavadním aktivitám Unie v této oblasti: zvýšení konkurenceschopnosti evropských ekonomik a energie za dostupné ceny, prosazování enviromentální udržitelnosti a boj proti klimatickým změnám, a v neposlední řadě zvýšení bezpečnosti dodávek energie. Již nějakou dobu však z řad politiků, energetiků i akademiků zaznívají obavy, že opatření přijatá za účelem dosažení těchto tří cílů si mohou v některých ohledech vzájemně odporovat a ústit v negativní dopady pro danou oblast politiky. Cílem této práce je ověřit platnost tohoto argumentu na případu bezpečnosti dodávek elektrické energie. S přihlédnutím k dalším dvěma politickým cílům provádí hodnocení hlavních výzev pro bezpečnost dodávek elektřiny (pro účely práce definované jako bezpečnost fyzické dodávky s nutným přihlédnutím k ekonomickým faktorům). Jsou jimi investice do infrastruktury a nutnost koordinace plánování a provozu sítí v podmínkách intenzivnějších přeshraničních výměn, vyvolaných v některých zemích EU mimo obchodních toků také přetoky z rozsáhlých větrných parků, převážně v Severním moři. Práce následně analyzuje politická a legislativní opatření přijatá na úrovni EU, která se s těmito výzvami mají potýkat. Hodnotí jejich adresnost a identifikuje mezery v celounijním přístupu. V neposlední řadě práce zkoumá jaká vysvětlení těchto nedostatků nabízejí čtyři teorie evropské integrace: neofunkcionalismus, liberální intergovernmentalismus a víceúrovňové vládnutí.

Appendices

Appendix 1: Electricity production capacity – EU-27 in years 1990-2007 (in GW)



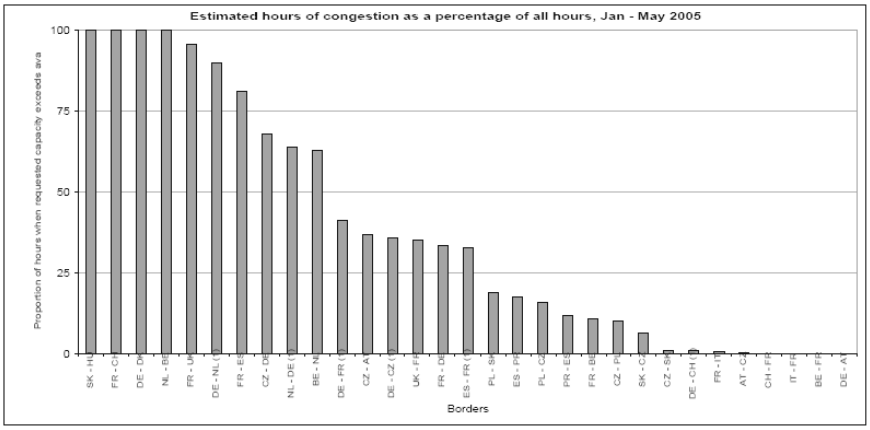
Source: European Commission, 2010a:40.

Appendix 2: Degree of concentration in EU electricity markets

	Electricity (generation)
Very highly concentrated [HHI above 5000]	BE, FR, GR, LV, LU, SK,
Highly concentrated [HHI 1800-5000]	CZ, DE, LT, PT, SI, RO, HU, DK, NO
Moderately concentrated [HHI 750-1800]	FI, PL, UK, ES, IT, NL, AT

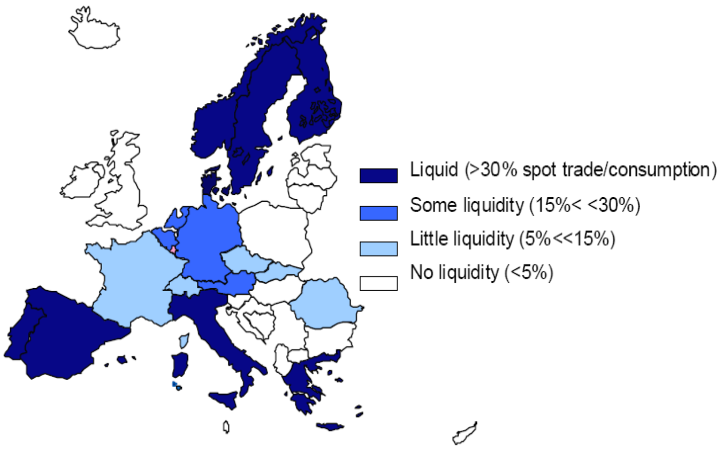
HHI by capacity – sum of squared shares of individual companies
Source: European Commission, 2010b:12.

Appendix 3: Number of hours when the requested capacity exceeded the available capacity of individual interconnectors (as a percentage of all hours, sorted in ascending order)



Source: European Commission, 2007a:172.

Appendix 4: Liquidity on the EU wholesale electricity spot market



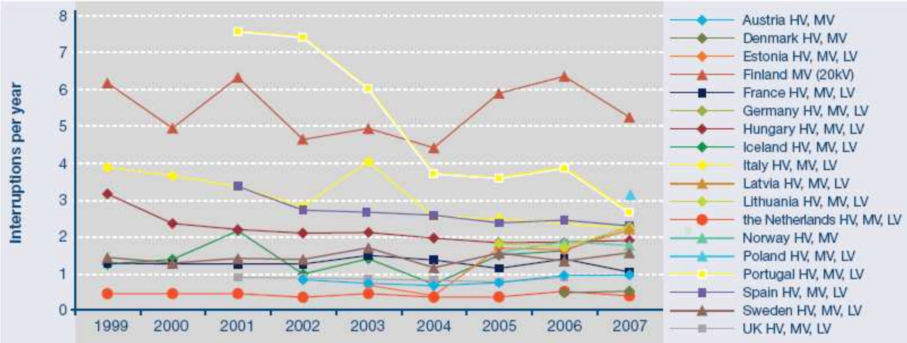
Source: European Commission, 2010b:5

Appendix 5: Share of congestion revenues invested in interconnection (on the basis of data from disclosed TSOs

Congestion revenues and total investments in interconnectors during 2001 - 2005 in mln-euro		
TSO	Congestion Revenues (2001 - 06/2005)	Interconnection Investments (2001 - 06/2005)
A	200-300	25-35
B	0-20	0-10
C	80-150	0-10
D	200-300	0-10
E	200-300	50-100
F	80-150	0-10
G	20-80	0-10
H	80-150	80-150
J	0-20	10-40
K	0-20	10-40
Total	**1000-1300**	**200-300**

Source: European Commission,2007a:179.

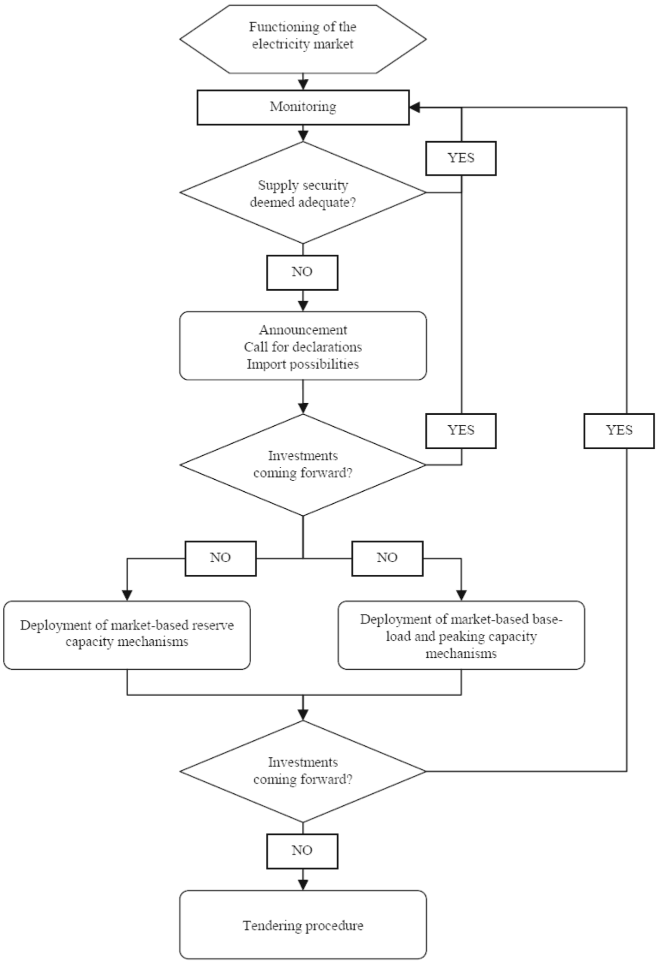
Appendix 6: Unplanned interruptions of electricity supply including all events (1999-2007)[63]



The voltage level (LV, MV, HV) is related to where the incidents occur.

Source: CEER, 2008:37.

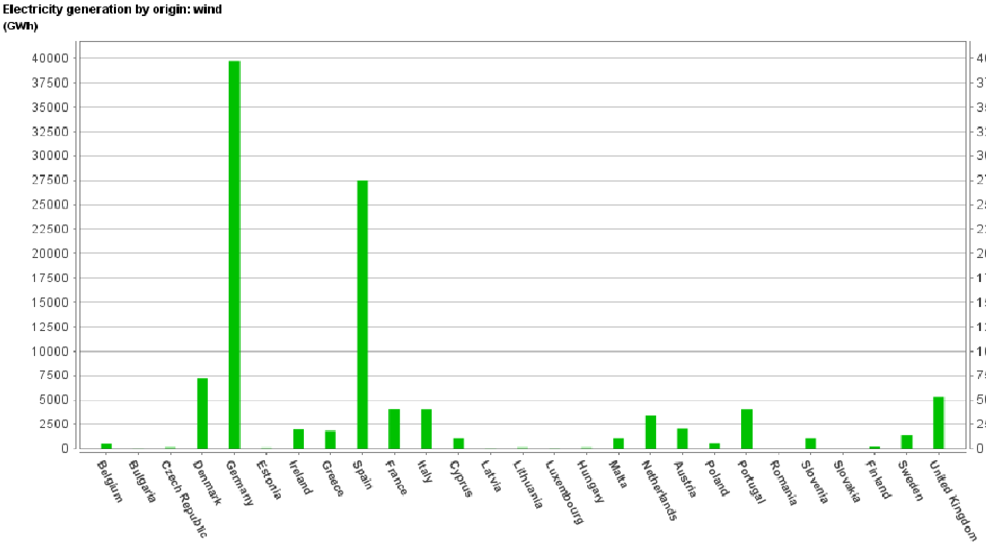
Appendix 7: Sequence of actions when applying instruments to ensure security of electricity supply proposed by EURELECTRIC



Source: EURELECTRIC, 2006:36.

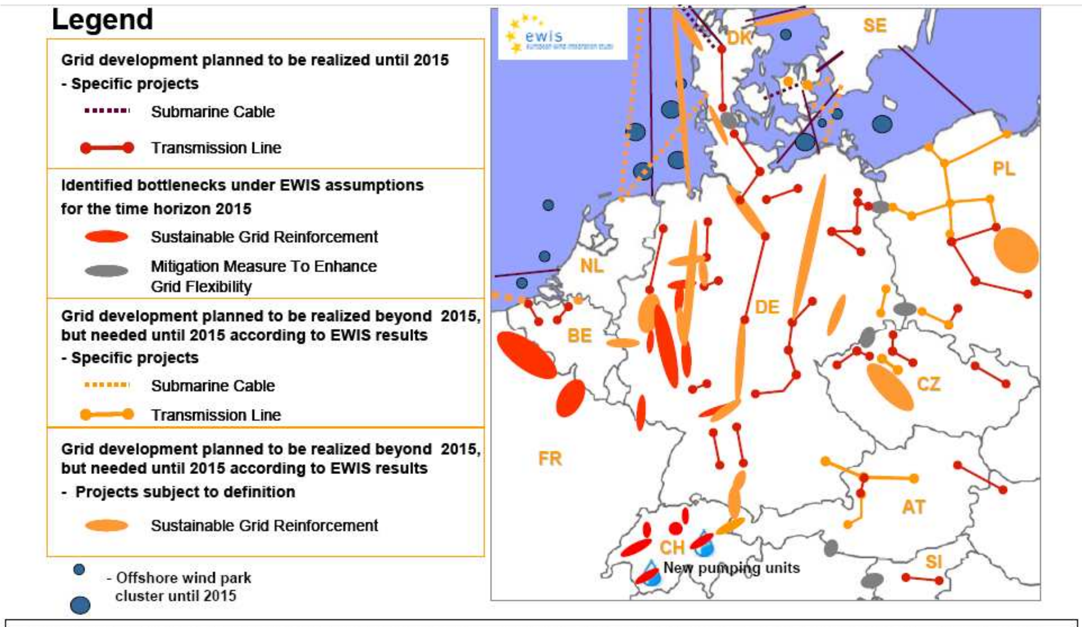
[63] The survey does not involve data from all EU member states, because not all of them replied to it.

Appendix 8: Electricity generated from wind in EU27 in 2007



Source: EUROSTAT

Appendix 9: Bottlenecks identified by EWIS study and grid development planned until 2015



Considered sustainable European wide coordinated measures enhances network capability for the further integration of wind power. Until the new lines proposed for 2015 are in operation, minimum 6,900 MW generation redispatch e.g. in Germany is required

Source: ENTSO-E, 2010a.

Bibliography

Documents

Decision No 1364/2006/EC of the European Parliament and of the Council of 6 September 2006 laying down guidelines for trans-European energy networks and repealing Decision 96/391/EC an Decision No 1229/2003/EC, Official Journal L 262/1, 22.9.2006, http://eur-lex.europa.eu [1364/2006/EC]

Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity, Official Journal L 27, 30.1.1997, http://eur-lex.europa.eu [96/92/EC]

Directive 2001/77/EC of the European Parliament and the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, Official Journal L 283, 27.10.2001, http://eur-lex.europa.eu [2001/77/EC]

Directive 2003/54/EC of the European Parliament and the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, Official Journal L 176/37, 15.7.2003, http://eur-lex.europa.eu [2003/54/EC]

Directive 2005/89/EC of the European Parliament and the Council of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment, Official Journal L 33/22, 4.2.2006, http://eur-lex.europa.eu [2005/89/EC]

Directive 2009/29/EC of the European Parliament and the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community, Official Journal L 140/63, http://eur-lex.europa.eu [2009/29/EC]

Decision No 406/2009/EC of the European Parliament and the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020, Official Journal L 140/136, 5.6.2009, http://eur-lex.europa.eu [406/2009/EC]

Directive 2009/28/EC of the European Parliament and the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, Official Journal L 140, 05.06.2009, http://eur-lex.europa.eu [2009/28/EC]

Directive 2009/72/EC of the European Parliament and the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, Official Journal L 211/55, 14.8.2009, http://eur-lex.europa.eu [2009/72/EC]

Consolidated Versions of the Treaty on European Union and of the Treaty Establishing the European Community. Official Journal C 321 E/1, 29.12.2006, http://eur-lex.europa.eu [TEU]

Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union, Official Journal C 83/1, 30.3.2010, http://eur-lex.europa.eu [TFEU]

Council of European Energy Regulators (CEER). (2008). *4th Benchmarking Report on Quality of Electricity Supply*. Brussels. http://www.energy-regulators.eu

Council Decision of 28 March 1996 laying down a series of measures aimed at creating a more favourable context for the development of trans-European networks in the energy sector (96/391/EC), Official Journal L 161, 29.6.1996, http://eur-lex.europa.eu [96/391/EC]

Council of the European Union. Presidency Conclusions – Brussels, 8/9 March 2007. 7224/1/07, REV 1, http://register.consilium.europa.eu

Council Directive 2008/114/EC on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection, Official Journal L 345/75, 23.12.2008, http://eur-lex.europa.eu [2008/114/EC]

Council Regulation (EC) No 1407/2002 of 23 July 2002 on State aid to the coal industry. Official Journal L 205/1, 2.8.2002, http://eur-lex.europa.eu

Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty, Official Journal L 1, 4.1.2003, http://eur-lex.europa.eu

ENTSO-E. (2010a). *European Wind Integration Study (EWIS). Towards A Succesful Integration of Large Scale Wind Power into European Electricity Grids. Executive Summary and Recommendations.* Brussels. www.wind-integration.eu

ENTSO-E. (2010b). *European Wind Integration Study (EWIS). Towards A Succesful Integration of L*arge Scale Wind Power into European Electricity Grids (full version). Brussels. www.wind-integration.eu

EURELECTRIC. (2003). *Public Acceptance for new transmission overhead lines and substations*. Networks committee. Retrieved from www.eurelectric.org

EURELECTRIC. (2004). *Security of Electricity Supply*. Discussion Paper. Retrieved from www.eurelectric.org

EURELECTRIC. (2004). *Ensuring Investments in a Liberalised Electricity Sector. Country reports in Annex*. Working Group Ensuring Investments. Retrieved from www.eurelectric.org

EURELECTRIC. (2006). Security of Electricity Supply - *Roles, responsibilities and experiences within the EU.* Working Group on *Security of Electricity Supply*. Retrieved from www.eurelectric.org

EURELECTRIC. (2008). EURELECTRIC Position Paper on the European Commission's proposal for a new EU Directive on the promotion of the use of energy from renewables sources. WG Energy Policy, WG Renewables & Distributed Generation. Retrieved from www.eurelectric.org

European Commission. (1999a). Communication of 8 June 1999 from the Commission to the European Parliament and the Council: Single Market and Environment. COM(99) 263 final, [not published in the Official Journal], http://eur-lex.europa.eu

European Commission. (1999b). Commission working document. Electricity from renewable energy resources and the internal electricity market, SEC (1999)470, 13.04.1999, http://europa.eu/archives

European Commission. (2000). *Towards a European Strategy for the Security of Energy Supply*, Green Paper, COM(2000) 769 final, Brussels. Retrieved from http://www.europa.eu.int/comm/energy_transport/en/lpi_lv_enl.html, 15.7.2010

European Commission. (2005a). Communication on Winning the Battle against Global Climate Change, COM(2005) 35 final, Brussels.

European Commission. (2006). Commission Green Paper of 8 March 2006: "A European strategy for sustainable, competitive and secure energy", COM(2006) 105 final.

European Commission. (2007a). DG Competition report on energy sector inquiry (SEC(2006)1724, 10 January 2007) Brussels, 10 January 2007 http://ec.europa.eu/competition/sectors/energy/inquiry/index.html

Commission of the European Communities. (2007B). Priority Interconnection Plan. COM(2006) 846 final, SEC(2007) 12. http://ec.europa.eu/energy

European Commission. (2007c). Communication from the Commission to the European Council and the European Parliament. An Energy Policy for Europe. Brussels, 10.1.2007 COM(2007) 1 final. http://eur-lex.europa.eu

European Commission. (2007d). Commission Staff Working Document. *Accompanying the* legislative package on the internal market for electricity and gas. SEC(2007) 1179 http://ec.europa.eu/energy/gas_electricity/interpretative_notes/doc/2007_09_19_impact_assessment.pdf

European Commission. (2008a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Second Strategic Energy Review. An EU Energy Security and Solidarity Action Plan. Brussels, 13.11.2008 COM(2008) 781 final. http://ec.europa.eu/energy

European Commission. (2008b). Commission Staff Working Document *accompanying the* Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Second Strategic Energy Review. An EU Energy Security and Solidarity Action Plan. *Europe's current and future energy position Demand – resources – investments.* Brussels, 13.11.2008 SEC(2008) 2871. http://ec.europa.eu/energy

European Commission. (2010a). EU energy and transport in figures. Statistical Pocketbook. Belgium. http://ec.europa.eu/energy/publications/statistics/statistics_en.htm

European Commission. (2010b). Communication from the Comission to the Council and the European Parliament. Report on progress in creating the internal gas and electricity market SEC(2010)251 Brussels, 11.3.2010 COM(2010)84 final, http://eur-lex.europa.eu

European Commission. (2010c). Communication from the Commission to the European Parliament, the Council, the European Economic Committee of the Regions. Commission Work Programme 2010. Brussels, 31.3.2010, COM(2010) 135 final. http://eur-lex.europa.eu

Regulation (EC) No 1228/2003 of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges in electricity, Official Journal L 176/1, 15.7.2003, http://eur-lex.europa.eu

Regulation (EC) No 1159/2005 of the European Parliament and of the Council of 6 July 2005 amending Council Regulation (EC) No 2236/95 laying down general rules for the granting of Community financial aid in the field of trans-European networks, Official Journal L 191/16, 22.7.2005, http://eur-lex.europa.eu

Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators, Official Journal L 211/1, 14.8.2009, http://eur-lex.europa.eu

Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003, Official Journal L 211/15, 14.8.2009, http://eur-lex.europa.eu

Treaty establishing the European Community (1957) (Consolidated version 1997)
Official Journal C 340 of 10 November 1997 http://eur-lex.europa.eu/en/treaties/index.htm [EEC]

ATSOI, BALTSO, ETSO, Nordel, UCTE, UKTSOA. (2008). Power System Adequacy Report. An Assessment of the Interconnected European Power Systems 2010-2020. Retrieved from https://www.entsoe.eu/fileadmin/user_upload/_library/publications/etso/security_of_supply/ETSO_PSAR2008_Final.pdf, 15.7.2010.

Literature

Abbott, Malcolm. (2001). Is the Security of Electricity Supply a Public Good? *The Electricity Journal*, 14(7), 31-3.

Anderson, Dennis & Leach, Matthew. (2004). Harvesting and redistributing renewable energy: on the role of gas and electricity grids to overcome intermittency through the generation and storage of hydrogen. *Energy Policy*, 32 (14), 1603–1614.

Bahgat, Gawdat. (2006). Europe's energy security: challenges and opportunities. *International Affairs*, 82 (5), 961-975.

Bartle, Ian. (1999). Transnational Interests in the European Union: Globalization and Changing Organization in Telecommunications and Electricity. *Journal of Common Market Studies*, 37(3), 363–83.

Barysch, Katynka. (2008). The EU's New Russia Policy Starts at Home. Center for European Reform. Retrieved from http://www.cer.org.uk/pdf/russia_bn_kb_24june08.pdf, 15.7.2010.

Behrens, Arno & Egenhofer, Christian. (2008). *Energy Policy for Europe. Identifying the European Added-Value.* CEPS Task Force Report. Brussels: Centre for European Policy Studies. Retrieved from http://www.ceps.eu/ceps/download/1452, 15.7.2010.

Buchan, David. (2009). *Energy and Climate Change: Europe at the Crossroads.* Oxford University Press.

Buchan, David. (2010). Energy Policy: Sharp Challenges and Rising Ambitions. In: Wallace, H., Pollack, Mark A. & Young, A. (eds.), *Policy-making in the European Union* (pp. 357-379). Oxford University Press.

Buijs, Patrik; Meeus, Leonardo & Belmans, Ronnie. (2007). *EU policy on merchant transmission investments: desperate for new interconnectors?* Belgium: Katholieke Universiteit Leuven – ESAT/Electa.
Retrieved from http://www.infraday.tu-berlin.de/fileadmin/documents/infraday/2007/papers/paper_buijs_v02_bv_27.09.2007.pdf, 15.7.2010.

Buzan, Barry; Waever, Ole & de Wilde, Jaap. (2005). *Bezpečnost. Nový rámec pro analýzu.* Praha: Centrum strategických studií.

Chevalier, Jean-Marie. (2005). *Security of the Energy Supply for the European Union.* To be published for the forthcoming International Journal of the European Sustainable Energy Market. Retrieved from
http://www.dauphine.fr/cgemp/Publications/Articles/Chevalier%20SECURITY%20OF%20ENERGY%20SUPPLY.pdf, 15.7.2010.

Coen, David. (2009). Business Lobbying in the European Union. In: Coen, David & Richardson, Jeremy (eds.), *Lobbying the European Union: Institutions, Actors and Issues* (pp. 145-168). Oxford University Press.

Collier, Ute. (2002). European Union Energy Policy in a Changing Climate. , In: Lenshow, Andrea (ed.): *Environmental Policy Integration. Greening sectoral policies in Europe* (pp. 175-192). London: Earthscan.

De Jong, Jacques J. (2008). *The Third EU Energy Market Package: Are we singing the right song?* Clingedael International Energy Programme Briefing Papers. Retrieved from http://www.clingendael.nl/publications/2008/20080200_ciep_briefingpaper_jong.pdf, 15.7.2010.

De Joode, Jeroen & Van Oostvoorn, Frits. (2008). *European Energy Market Liberalization and Integration: An Assessment of the New EU Energy Package.* Retrieved from http://www.ecn.nl/docs/library/report/2008/m08045.pdf , 15.7.2010.

Delvaux, Bram; Hunt, Michael & Talus, Kim (eds.). (2008). *EU Energy Law and Policy Issues.* The Energy Law Research Forum Collection, Euroconfidentiel SA.

De Vries, L.J. & Hakvoort, R.A. (2004). *The Question of Generation Adequacy in Liberalized Electricity Markets.* Indes Working Paper No. 5/March 2004. Retrieved from http://www.ceps.eu/ceps/download/962

Derdevet, Michel. (2009). *L'Europe en panne d'énergie. Pour une politique énergetique commune.* Paris, Descartes & Cie.

Egenhofer, Christian. (2001). European Energy Policy. Turning Point. *Independent Review of UK Energy Policy*, British Energy.
Retrieved from http://www.british-energy.co.uk/documents/Turning_Point_-_European_energy_policy.pdf, 5.7.2010.

Egenhofer, Christian; Gialoglou, Kyriakos; Luciani, Giacomo; Boots, Maroeska; Scheepers, Martin; Costantini, Valeria; Gracceva, Francesco; Markandya, Anil & Vicini, Giorgio (eds.). (2004). *Market-based Options for Security of Energy Supply.* Fondazione Eni Enrico Mattei. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.128.2161&rep=rep1&type=pdf, 5.7.2010.

Eikeland, Per Ove. (2004). *The Long and Winding Road to the Internal Energy Market – Consistencies and inconsistencies in EU policy.* FNI Report 8/2004. Norway: Frijdhof Nansens Institut.

Eikeland, Per Ove. (2007). *EU Energy Infrastructure Policy – Unintended Redistribution of Economic Opportunities?* Memo for CANES meeting, 09/11/2007. Norway: Frijdhof Nansens Institut. Retrieved from http://www.fni.no/CANES/POE-energy-infrastructure.PDF, 5.7.2010.

Eikeland, Per Ove. (2008). *EU Internal Energy Market Policy. New Dynamics in the Brussels Policy Game?* a CANES Working Paper. FNI Report 14/2008. Norway: Frijdhof Nansens Institut.

Frédérick, Bernadette. (1995). *Le marché unique de l'électricité. Analyse et perspective.* Namur.

Furfari, Samuel. (2007a). *Le Monde et l'Énergie Enjeux géopolitiques. 1. Les clefs pour comprendre.* Paris, Editions Technip.

Furfari, Samuel. (2007b). *Le Monde et l'Énergie Enjeux géopolitiques. 2. Les cartes en mains.* Paris, Editions Technip.

Gallagher, Catherine. (2010): *How does Europe seek to promote investment in electricity infrastructure against the backdrop of a liberalizing electricity market?* University of Dundee, Scotland. Retrieved from http://www.dundee.ac.uk/, 5.7.2010.

Glachant, Jean-Michel & Lévêque, François (eds.). (2009). *Electricity Reform in Europe. Towards a Single Energy Market.* Cheltenham, UK: Edward Elgar.

Glachant, Jean-Michel; Grant, Robert; Hafner, Manfred & De Jong, Jacques. (2010). *Toward a Smarter EU Energy Policy: 22 Recommendations.* EUI Working Paper RSCAS 2010/52. Florence: European University Institute. Retrieved from http://cadmus.eui.eu/dspace/bitstream/1814/14181/1/RSCAS_2010_52.pdf, 5.7.2010.

Greenwood, Justin. (2002). Electricity Liberalization. In: Pedler, Robin (ed.): *European Union Lobbying. Changes in the Arena* (pp. 269-292). NY, Palgrave.

Hancher, Leigh & De Hauteclocque, Adrienne. (2010). *Manufacturing the EU Energy Markets: The current dynamics of regulatory practice.* EUI Working Paper 2010/01. Florence: European University Institute. Retrieved from http://cadmus.eui.eu/dspace/bitstream/1814/13077/1/RSCAS_2010_01.pdf, 5.7.2010.

De Hauteclocque, Adrienne & Rious, Vincent. (2009). *Reconsidering the Regulation of Merchant Transmission Investment in the Light of the Third Energy Package: the Role of Dominant Genarators.* EUI Working Papers, RSCAS 2009/59. Florence: European University Institute. Retrieved from http://cadmus.eui.eu/dspace/bitstream/1814/12793/1/RSCAS_2009_59.pdf, 5.7.2010.

IEA. (2001a). *Competition in Electricity Markets*. Paris: OECD.

IEA. (2001b). *Regulatory Institutions in Liberalized Electricity Markets.* Paris: OECD.

IEA. (2002). *Security of Supply in Electricity Markets. Evidence and Policy Issues.* Paris: OECD.

IEA. (2003). *Power Generation Investment in Electricity Markets*. Paris:OECD.

IEA. (2005a). *Learning from the Blackouts. Transmission system security in competitive electricity markets.* Paris: OECD.

IEA. (2005b). *Lessons from liberalised electricity markets*. Paris: OECD.

IEA. (2007). *Tackling Investment Challenges in Power Generation. In IEA Countries.* Paris: OECD.

IEA. (2009). *World Energy Outlook 2009 – Global Energy Trends to 2030*. Paris: OECD.

Jachtenfuchs, Markus & Kohler-Koch, Beate. (2004). Governance and Institutional Development. In: Wiener, Antje and Thomas Diez. 2004. *European Integration Theory* (pp. 97-115). Oxford University Press.

Jamasb, Tooraj & Pollitt, Michael. (2005). *Electricity Market Reform in the European Union: Review of Progress toward Liberalization & Integration.* University of Cambridge. Retrieved from http://dspace.mit.edu/bitstream/handle/1721.1/45033/2005-003.pdf, 5.7.2010.

Joskow, Paul L. (2006a). *Competitive Electricity Markets and Investment in New Generating Capacity*. Center for Energy and Environmental Policy Research (CEEPR). Retrieved from http://tisiphone.mit.edu/RePEc/mee/wpaper/2006-009.pdf, 5.7.2010.

Joskow, Paul L. (2006b). Patterns of Transmission Investment. In: Lévêque, François (ed.). *Competitive Electricity Markets and Sustainability* (pp. 131-182). Cheltanham, UK: Edward Elgar.

Karr, Karolina. (2007). *Democracy and Lobbying in the European Union.* Campus Verlag.

Lafferty, William M. & Ruud, A. (eds.) (2008). *Promoting Sustainable Electricity in Europe. Challenging the Path Dependence of Dominant Energy System.* Edward Elgar, Cheltenham, UK: Edward Elgar.

Lenshow, Andrea. (2010). Environmental policy. In: Wallace, H., Pollack, Mark A. & Young, A. (eds.), *Policy-making in the European Union* (pp. 307-330). Oxford University Press.

Lévêque, François (ed.). (2006). *Competitive Electricity Markets and Sustainability*. Cheltanham, UK: Edward Elgar.

Lévêque, F; Glachant, Jean-Michel; Saguan, Marcelo; de Muizon, Gildas. (2009). *How to rationalize the debate about « EU energy third package » ? Revisiting criteria to compare electricity transmission organizations.* Loyola de Palacio Programme on Energy Policy, RCAS 2009/15

Lovinfosse, Isabelle de. (2008). *How and why do policies change? A comparison of renewable electricity policies in Belgium, Denmark, Germany, the Netherlands, and the UK.* New York: Peter Lang.

Luciani, Giacomo. (2004). *Security of Supply for Natural Gas Markets.* Brussels: Centre for European Policy Studies. Retrieved from http://www.ceps.eu/ceps/download/959, 16.4.2010.

Marks, G. (1993). Structural Policy and Multilevel Governance in the EC. In Cafruny, A & Rosenthal, G. (eds.), *The State of the European Community, Vol. 2: The Maastricht Debates and Beyond*. (pp. 391-410). Boulder: Lynne Rienners; Harlow: Longman.

Marks, G., Hooghe, L., & Blank, K. (1996). European Integration from the 1980s: State-Centric v Multi-Level Governance. *Journal of Common Market Studies,* 34, 341-78.

Michaelowa, Axel: *The German Wind Energy Lobby. How to successfully promote costly technological change.* Hamburgisches Welt-Wirtschafts-Archiv (HWWA) Discussion Paper 296. Hamburg Institute of International Economics 2004. Retrieved from http://www.econstor.eu/bitstream/10419/19268/1/296.pdf, 16.4.2010.

Monti, Mario. (2010). *A New Strategy for the Single Market. At the Service of Europe's Economy and Society. Report to the President of the European Commission José Manuel Barroso.* Retrieved from http://ec.europa.eu/bepa/pdf/monti_report_final_10_05_2010_en.pdf, 16.7.2010.

Moravcsik, Andrew. (1993). Preferences and Power in the European Community: A Liberal Intergovernmentalist Approach. *Journal of Common Market Studies*, 31(4), 473-524

Moselle, Boaz. (2008). *Reforming TSOs: Using the 'Third Package' Legislation to Promote Efficiency and Accelerate Regional Integration in EU Wholesale Power Markets.* 21 (8), 9-18

Nies, Susanne. (2010). *At the Speed of Light? Electricity Interconnections in Europe.* Gouvernance Européenne et Géopolitique de l'Énergie Tome 8. IFRI. Retrieved from http://www.ifri.org/downloads/interconnectionbis_1.pdf, 16.7.2010.

Oberthür, Sebastian & Pallemaerts, Marc (eds.). 2010. *The New Climate Policies of the European Union. Internal Legislation and Climate Diplomacy*. Vrije Universiteit Brussel: Brussels University Press.

Pelkmans, Jacques. (2001). Making EU Network Markets Competitive. *Oxford Review of Economic Policy*, 17(3), 432-456.

Pelkmans, Jacques; Hanf, Dominik & Chang, Michele (eds.). (2008). *The EU Internal Market in Comparative Perspective.* Brussels: Peter Lang.

Peterson, John & Bomberg, Elisabeth. (1999). *Decision-making in the European Union*. NY: Palgrave.

Pierson, Paul. (1996). Path to the European Integration. *Comparative Political Studies*, 29(2), 123-163.

Pollack, Mark. (2010). Theorizing EU Policy Making. In: Wallace, H., Pollack, Mark A., Young, A.: *Policy-making in the European Union* (pp. 15-44), Oxford 2010.

Ranci, Pippo. (2007). How regulatory risks may affect security of electricity supply. *European Review of Energy Markets*, 2(2). Retrieved from http://www.eeinstitute.org/european-review-of-energy-market/erem5-article-ranci, 16.7.2010.

Reiche, Danyel (ed.). (2005). *Handbook of Renewable Energies in the European Union. Case studies of the EU-15 States.* Peter Lang, Frankfurt am Main.

Rious, Vincent; Glachant, Jean-Michel & Dessante, Philippe. (2010). *Transmission Network Investment as an anticipation problem.* Robert Schuman Centre for Advanced Studies. Loyola de Palacio Programme on Energy Policy, 2010/04. Retrieved from http://cadmus.eui.eu/dspace/bitstream/1814/13081/1/RSCAS_2010_04.pdf, 16.7.2010.

Rosamond, Ben. (1999). *Theories of European Integration*. Basingstoke: St. Martin's Press.

Rosamond, Ben. (2000). *Theories of European Integration*. Basingstoke : Palgrave.

Scharpf, Fritz, W. (1988). The Joint-Decision Trap: Lessons from German Federalism and European Integration. *Public Administration*, 66 (3), 239-278.

Schimmelfennig, Frank. (2004). Liberal Intergovernmentalism. In: Wiener, Antje and Thomas Diez. *European Integration Theory* (pp. 75-94). Oxford University Press.

Schmidt, Susanne K. (1996). Sterile Debates and Dubious Generalisations: European Integration Theory Tested by Telecommunications and Electricity. *Journal of Public Policy*, 16(3), 233-271.

Silvast, Antti & Kaplinski, Joe. (2007). *White Paper on Security of European Electricity Distribution.* Project Understand. Retrieved from http://www.understand.se/docs/White_Paper_EN.doc, 16.7.2010.

Stoft, Steven. (2006). Problems of Transmission Investment in a Deregulated Power Market. In: Lévêque, François (ed.). *Competitive Electricity Markets and Sustainability* (pp. 87-130). Cheltanham, UK: Edward Elgar.

Szabó, Sándor & Jäger-Waldau1, Arnulf. (2008). More competition: Threat or chance for financing renewable electricity? *Energy Policy*, 36, 1436–1447.

Toke, David. (2008). The EU Renewables Directive – What is the Fuss about Trading? *Energy Policy*, 36, 3001-3008.

Torriti, Jacopo. (2008). *Does the Impact Assessment on the „Third Package" provide the correct economic forecast for the liberalization of the EU electricity market?* EUI Working Papers, RSCAS 2008/14. Florence School of Regulation. Retrieved from http://cadmus.eui.eu/dspace/bitstream/1814/8687/1/RSCAS_2008_14.pdf, 16.7.2010.

Van den Bergh, Jeroen C.J.M. & Bruinsma, Frank R. (eds.). (2008). *Managing the Transition to Renewable Energy. Theory and Practice for Local, Regional and Macro Perspectives.* Cheltenham, UK: Edward Elgar.

Van Hertem, Dirk. (2009). The Use of Power Flow Controlling Devices in the Liberalized Market. Katholieke Universiteit Leuven. Retrieved from https://lirias.kuleuven.be/bitstream/1979/2047/5/main_phd.pdf, 16.7.2010.

Wiener, Antje, Diez, Thomas (eds.). (2004). *European Integration theory*. Oxford.

Wilks, Stephen. (2005). Competition Policy. Challenge and Reform. In: Wallace, Helen; Wallace, William & Pollack, Mark A. *Policy-Making in the European Union. Fifth edition.* (pp. 113-139). Oxford University Press.

Weaman-Jones, Thomas. (1997). Energy Policy in the European Community. In: Stavridis, Stelios; Mossialos, Elias; Morgan, Roger & Machin, Howard: *New Challenges to the European Union: Policy & Policy Making* (pp. 545-567). Aldershot: Dartmouth Publishing.

Weare, Christopher. (2003). *The California Electricity Crisis: Causes and Policy Options.* San Francisco: Public Policy Institute of California. Retrieved from http://www.ppic.org/content/pubs/report/R_103CWR.pdf, 16.7.2010.

World Energy Council. (2008). *Europe's Vulnerability to Energy Crises. Promoting the sustainable supply and use of energy for the greatest benefit of all.* London, United Kingdom.

Zachmann, Georg. (2010). Power to the People of Europe. Bruegel Policy Brief, Iss. 4. Retrieved from http://www.bruegel.org/uploads/tx_btbbreugel/1006-Electricity_Single_Market-PB.pdf, 16.7.2010.

Zito, Anthony R. (2005). Task Expansion: A Theoretical Overview. In: Jordan, Andrew: *Environmental Policy in the European Union. Actors, institutions and processes.* (pp. 141-161). Sterling, USA.

Other sources

Archer Energy. (2009). Danish wind farm owners face negative electricity prices. Retrieved from http://archer-energy.com/index.php?option=com_content&view=article&id=69:danish-wind-farm-owners-face-negative-electricity-prices&catid=1:latest-news&Itemid=50, 16.7.2010.

Argus. (2009a). *Power Europe*, 9(9).

Argus. (2009b). *Power Europe*. 9(12).

Belmans, Ronnie. (2009). *Is there a missing money problem in transmission?* Retrieved from http://www.energypolicyblog.com/2009/01/19/is-there-a-missing-money-problem-in-transmission/, 16.7.2010.

ČEPS, a.s. (2009). *The Czech transmission system again troubled by power flows from wind plants in Germany*. Retrieved from http://www.ceps.cz/en/news/zobrazakt.asp?ID=162, 16.7.2010.

De Vries, Laurens. (no date). *Security of Electricity Supply : Where the Market Fails.* [Powerpoint slides] Retrieved from http://www.ecn.nl/fileadmin/ecn/units/bs/INDES/indes-ldv.pdf, 16.7.2010.

ETSO. (2007). *Key messages on the EC 3rd legislative package*. Retrieved from https://www.entsoe.eu/fileadmin/user_upload/_library/publications/etso/others/ETSO%20key%20messages.final.pdf, 16.7.2010.

Euractiv (2006). *Security of electricity supply and infrastructure.* Retrieved from http://www.euractiv.com/en/energy/security-electricity-supply-infrastructure/article-131147, 16.7.2010.

Euractiv. (2007). *Germany backs electricity giants in bid against 'unbundling'.* Retrieved from http://www.euractiv.com/en/energy/germany-backs-electricity-giants-bid-unbundling/article-162271, 16.7.2010.

Euractiv. (2008). *Regulators doubtful over EU energy agency.* Retrieved from http://www.euractiv.com/en/energy/regulators-doubtful-eu-energy-agency/article-169850, 16.7.2010.

Euractiv. (04/06/2010). *Integrating renewables into the electricity grid.* Retrieved from http://www.euractiv.com/en/energy/integrating-renewables-electricity-grid-linksdossier-494846, 16.7.2010.

Euractiv. (21/July/2010). *Commission proposes phasing out coal subsidies.* Retrieved from http://www.euractiv.com/en/energy/commission-proposes-phasing-out-coal-subsidies-news-496532, 21.7.2010.

EURELECTRIC. (2005). *Ensuring security of electricity supply - who and how?* Dinner-Debate at the invitation of EURELECTRIC. Retrieved from http://www.europeanenergyforum.eu/archives/european-energy-forum/electricity-matters/ensuring-security-of-electricity-supply-who-and-how, 21.7.2010.

EUROFOCUS. (2009). Delegation of the European Commission to USA. http://www.eurunion.org/News/eunewsletters/EUFocus/2009/EUFocus-EnergySecur-11-09.pdf, 16.7.2010.

De Jong, J. (2009). *Restructuring EU Energy Industry. Basic policies and relevant features.* [Powerpoint slides]. Florence School of Regulation. Retrieved from http://www.florence-school.eu/portal/page/portal/FSR_HOME/ENERGY/Training/Summer_School/Presentations/2010.06.28%20Jacques%20de%20Jong.pdf, 29.5.2010.

Kabouris, Yannis. (2006). *UCTE System disturbance on 4 November 2006.* [Powerpoint slides]. Hellenic Transmission System Operator S.A. Retrieved from http://www.cigre.org/fr/events/download/1-%20EUROPE%20UCTE.pdf, 29.5.2010.

Perks, Jonathan. (no date). *Study on Risk Governance of European Critical Infrastuctures in the ICT and Energy Sector*. [Powerpoint slides]. Unpublished manuscript, AEA.

PSE-Operator. (2010). *Higher capacity in power exchange agreed between Poland and Germany*. PSE-Operator press release. Retrieved from http://www.pse-operator.pl/index.php?dzid=32&did=738&lang_id=2, 29.5.2010.

Nies, Susanne. (2008). *Ownership Unbundling in Energy Markets. An Overview of a Heated Debate in Europe.* Edito Energie. Retrieved from http://www.ifri.org/?page=detail-contribution&id=233&id_provenance=97, 16/04/2010.

Windpower Monthly Magazine. (1999). *Lobby groups unite to bring Directive back to life*. Retrieved from: http://www.windpowermonthly.com/news/955377/, 16/04/2010.

European Small Hydropower Association (ESHA). (2010). *Water Framework Directive severely impacting hydropower development in the EU.* Retrieved from http://www.esha.be/fileadmin/esha_files/documents/Stream_Map/European_Small_Hydropower_Association_Press_release_12.2.2010.pdf, 16/04/2010.

Thesis project

UNIVERZITA KARLOVA V PRAZE
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Projekt diplomové práce na téma:

Security of electricity supplies in the EU

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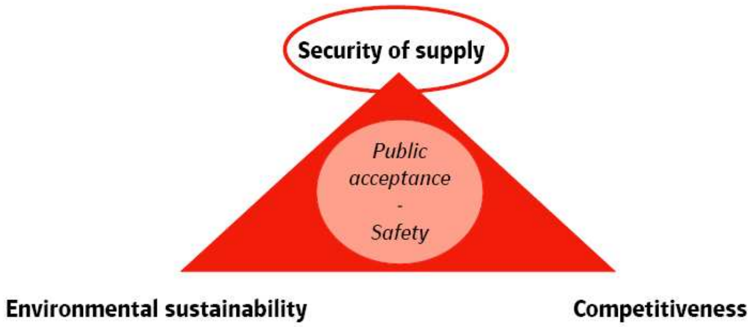
Security of electricity supplies in the EU

Both globally and regionally, energy security has become broadly discussed issue in the last couple of years (since the first Ukrainian crisis in 2006 in particular). We can presuppose (and hope) that the last gas crises that lasted from December 2008 to January 2009 and cut several countries from gas supplies will accelerate realization of new infrastructure projects and lead to adoption of a common EU energy policy. Gas (and oil) import dependency is expected to be its main driver. Nevertheless, some areas having direct impact on energy security have not been paid so much attention to. One of them is electricity.

The aim of my paper is thus to examine the area of electricity supplies that is often omitted even though it deserves (at least) equal amount of attention. I would like to identify main vulnerabilities and threats to the European electricity sector, their origin and their resolution at the EU level in particular. Doing so, the fact of absence of the common energy security policy must be taken into account. Energy security policy is often interpreted as being established via realization of internal electricity market and environmental sustainability policies (see the illustrative scheme below).



I am going to summarize the key developments with emphasis on the electricity sector. However, the EU policies in this area have been dealt with many times. Therefore, the core of my paper will be in the 2nd and 3rd part.

First and foremost, the impact of the above mentioned policies at the security of electricity supplies will be discussed and main threats and vulnerabilities – to the transmission networks in particular – identified. Rising market integration without proper allocation signals and grid investment and unlimited access of volatile renewable energy sources (wind energy in particular) to the grid rank among the key ones. My analysis is going to illustrate that in spite of the fact that they are apparent to specialists and could be mitigated by implementation of suitable regulatory and legislative framework at both EU and member state level to a large extent, they often remain non-reflected. As a result, EU electricity market liberalization and environmental sustainability policy do not only enhance the security of supply "as an added value" but even contradict it.

In search of causes of this state, I am going to apply various theories of international relations (including integration theories) in order to find out which explanations of this state (if any sufficient ones) and proposals for the issue resolution they provide. For this purpose, I have picked neo-functionalism, two-level games theory, multi-level governance theory and new institutionalism.

Topic:
EU security of electricity supplies in relation to liberalization of electricity market and environmental sustainability policies.

Main question:
What causes the fact that some measures adopted in terms of the liberalization of electricity market policy and environmental policy in spite of the declared goal to enhance the EU security of electricity supplies lead to opposite outcomes?

Sub-questions:
In which circumstances does it occur?
How do the IR theories explain it (if at all)?
What should be done to overcome this state?

Hypothesis:
Most of the negative impacts originate in the absence of a suitable legislative and regulatory framework at the EU level and could be eliminated by its adoption. There are multiple reasons for that and finding if any of them prevails requires further analysis.

Main concern:
The necessity to minimize the EU electricity market creation impact detrimental to the EU security of electricity supply.

Reasoning:

EU policies/policy proposals of electricity market liberalization and environmental protection are not always compatible with energy security as a public service objective.

Strategy/methodology:

Policy-making analysis using both qualitative and quantitative tools; parallel interpretation of theories.

Elements of analysis:

EU environmental and energy market liberalization policies and vulnerabilities and threats to the EU security of electricity supply.

Variables:

Concepts stemming from various IR and integration theories, e.g. state interests, communication gap between policy-makers and technicians, EU institutional mechanisms as factors that come into play during the process of policy making (independent variables).

Values:

Relation between the EU security of electricity supplies and other EU policies. The ability to cope with the negative impacts on the EU security of electricity supplies caused by other EU policies.

Proposed outline:

1. Characteristics of the key concepts and their interconnection; EU policy evaluation
    a. Security of electricity supplies in EU
    b. Liberalization of the EU electricity market
    c. EU environmental policy

2. EU Security of electricity supplies as "an added value"
    a. Positive impacts of the above mentioned policies
    b. Vulnerabilities and threats
        i. Resulting from the above mentioned EU policies
        ii. Accentuated by the above mentioned EU policies
        iii. Have not being dealt with at the EU level yet/underestimated at the EU level[64]

3. Explanation provided by the IR theories

[64] E.g. critical infrastructure protection – often in terms of different policies and thus will not be analysed to such an extent.

a. Neo-functionalism
    i. Explanation provided
    ii. Ability to contribute to the issue resolution
b. Two-level games theory
    i. Explanation provided
    ii. Ability to contribute to the issue resolution
c. Multi-level governance theory
    i. Explanation provided
    ii. Ability to contribute to the issue resolution
d. New institutionalism
    i. Explanation provided
    ii. Ability to contribute to issue resolution

Literature:

Bahgat, Gawdat, Europe's energy security: challenges and opportunities. *International Affairs*. 2006, Vol. 82, No. 5, s. 961-975

Bandelow Nils C. & Schumann, Diana: Deepening by Logrolling: European Commission's and Large Firms' Bargaining Strategies as an Instrument of Achieving Transnational Competencies Paper prepared for presentation to the ECPR Joint Sessions of Workshops in Mannheim 26-31 March, 1999

Barton, Barry; Redgwell, Catherine & Ronne, Anita: *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment.* Oxford University Press, 2004

Belyuš, Marián (2008) Větrná energetika v energetickém mixu ČR? Ano. Kolik? Přiměřeně. Pro-Energy, Vol. 2., No. 3, pp. 56-59

Bergman, Lars & Vaitilingam, Romesh: *A European Market for Electricity?: Monitoring European Deregulation 2*. Centre for Economic Policy Research, 1999

Buzan, B., Waever, O. & De Wilde, J. *Security, A New Framework for Analysis.* Boulder: Lynne Rienner Publishers, 1998

Cole, S., Van Hertem, D., Meeus L. & Belmans R. (eds.) *The influence of renewables and international trade on investment decisions in the grid of the future.* Belgium: Katholieke Universiteit Leuven, 2006

Deese, D. A. and Nye, J. S. *Energy and Security.* Cambridge, Massachusetts: Ballinger, 1981

Egenhofer, Christian, Europe needs a new approach to securing its energy supply, Centre for European Policy Studies 2005; http://www.ceps.be/wp.php?article_id=178, staženo 24.02.2007

Egenhofer, Christian (eds.) Security of Energy Supply: A Question for Policy or the Markets? Centre for European Policy Studies 2001; http://shop.ceps.be/BookDetail.php?item_id=37, staženo 28.4.2007

Eising, Rainer: Policy Learning in Embedded Negotiations: Explaining EU Electricity Liberalization. International Organization, Vol. 56, No. 1 (Winter, 2002), pp. 85-120

Ekengren, Magnus: From a European Security Community to a Secure European Community – Analysing EU 'Functional' Security, SGIR Conference, Fifth Pan-European Conference, The Hague, Netherlands, September 9-11, 2004

Ekengren, Magnus, New Security Challenges and the Need for New Forms of the EU Cooperation: The Solidarity Declaration against Terrorism and the Open Metod of Coordination. *European Security*. 2006, Vol. 15, No. 1, 2006, s. 89-111

Geradin, Damien: *The Liberalization of Electricity and Natural Gas in the European Union.* Kluwer Law International, 2001

Genoud, Christophe & Finger, Matthias: *Regulatory convergence? The example of the European electricity sector.* Institut de hautes etudes en administration publique, Lausanne, Working paper de l'IDHEAP no 8/2002

Gheorghe, Adrian V.; Masera, M.; Weijnen, M. P. C. (eds.) *Critical Infrastructures at Risk: Securing the European Electric Power System.* Springer, 2006

Glachant, Jean-Michel & Finon, Dominique: *Competition in European Electricity Markets: A Cross-country Comparison.* Edward Elgar Publishing, 2003

Global Wind Energy Outlook 2008
http://www.gwec.net/fileadmin/images/Logos/Corporate/GWEO_A4_2008_lowres.pdf

Hall, Peter A. and Rosemary C.R. Taylor. Political Science and the Three New Institutionalisms. *Political Studies,* Vol. 44, No. 5 (1996), pp. 936-957.

Haas, Ernst B.: *Beyond the Nation State*. Stanford: Stanford Univ. Press 1964

Haas, Ernst B.: *When Knowledge is Power: Three Models of Change in International Organizations.* Berkeley: Univ. Calif. Press 1990

Hooghe, Liesbet & Marks, Gary: *Unraveling the Central State, But How? Types of Multi-Level Governance.* Institute for Advanced Studies, Vienna, 2003
http://www.ihs.ac.at/publications/pol/pw_87.pdf

Jamasb, Tooraj and Poplity, Michael: *Electricity Market Reform in the European Union: Review of Progress toward Liberalization & Integration*, Centre for Energy and Environmental Policy Research, 2005 http://web.mit.edu/ceepr/www/publications/workingpapers/2005-003.pdf

Kalicki, J. H. & Goldwin, D. L., eds. *Energy & Security, Toward a new foreign policy strategy.* Washington: Woodrow Wilson Centre Press, 2005

Keohane, R. O. and Nye, J. S. *Power and interdependence, World Politics in Trasition.* Boston: Center for International Affairs, Harvard University, 1977

Keohane, Robert O. – Hofmann, Stanley (eds.): *The New European Community. Decision making and Institutional Change*. Oxford 1991

Keohane, Robert O.: International Institutions: Two Approaches. *International Studies Quarterly*, Vol. 32, No. 4 (Dec., 1988), pp. 379-396

LaBelle, Michael Carnegie: *Finding the Barriers Preventing Increased Cooperation and Coordination in Central and Eastern Europe.* Regional Centre for Energy Policy Research, Budapest, 2006

Ladislaw, S., Zyla, K. & Childs, B.: *Managing the Transition to a Secure, Low-Carbon Energy Future*. Washington: Centre for Strategic and International Studies 2008

Levi-Faur, David: The Governance of Competition: The Interplay of Technology, Economics, and Politics in European Union Electricity and Telecom Regimes. *Journal of Public Policy*, Vol. 19, No. 2 (May - Aug., 1999), pp. 175-207

Lund, Henrik: Large-scale integration of wind power into different energy systems. Denmark: Aalborg University 2004

Michelman, Hans J. – Soldatos, Panayotis: *European Integration: Theories and Approaches.* London 1994

Möhrlen, Corinna: *Uncertainty in Wind Energy Forecasting*. University College Cork, National University of Ireland 2004

Pierson, Paul: Politics in Time: *History, Institutions, and Social Analysis.* Princeton University Press, 2004.

Putnam, Robert D.: Diplomacy and Domestic Politics: The Logic of Two-Level Games. *International Organization*, Vol. 42, No. 3 (Summer, 1988), pp. 427-460

Schmidt, Susanne K.: Sterile Debates and Dubious Generalizations: European Integration Theory Tested by Telecommunications and Electricity. *Journal of Public Policy*, Vol. 16, No. 3 (Sep. - Dec., 1996), pp. 233-271

Singer, David Andrew: Capital Rules: The Domestic Politics of International Regulatory Harmonization. *International Organization*, Vol. 58, No. 3 (Summer, 2004), pp. 531-565

Sioshansi, Fereidoon P. & Pfaffenberger, Wolfgang: *Electricity Market Reform: An International Perspective*, Elsevier 2006

Strachan, Peter A., Lal, David (2004) Wind Energy Policy, Planning and Management Practice in the UK: Hot Air or a Gathering Storm? *Regional Studies*, 38(5), 549-569

Tarar, Ahmer: International Bargaining with Two-Sided Domestic Constraints. *The Journal of Conflict Resolution*, Vol. 45, No. 3 (Jun., 2001), pp. 320-340

Trumbore, Peter F. and Boyer, Mark A.: International Crisis Decision making as a Two-Level Process. *Journal of Peace Research*, Vol. 37, No. 6 (Nov., 2000), pp. 679-697

Yergin, Daniel, Ensuring Energy Security. *Foreign Affairs*. 2006, Vol. 85, No. 2, s. 69-82

Young, Oran R.: Political Leadership and Regime Formation: On the Development of Institutions in International Society. *International Organization*, Vol. 45, No. 3 (Summer, 1991), pp. 281-308

Van den Hoven, Adrian: Limiting Regional Electricity Sector Integration and Market Reform: The Cases of France in the EU and Canada in the NAFTA Region. Comparative Political Studies, Vol. 37, No. 9 (2004), pp. 1079-1103

Weale, Albert: Environmental rules and rule-making in the European Union. *Journal of European Public Policy*, Vol. 3, No. 4 (December 1996) , pp. 594 - 611

Woods, Ngaire: Economic Ideas and International Relations: Beyond Rational Neglect. *International Studies Quarterl*y, Vol. 39, No. 2 (Jun., 1995), pp. 161-180

Documents:

Communication from the Commision to the Council and the European Parlament, An Energy Policy for Europe, COM (2007) 1, 10 January 2007; http://www.eurlex. europa.eu

Communication from the Commission to the Council and the European Parlament, Report on progress in creating the internal gas and electricity market, COM(2005) 568, 2005; http://ec.europa.eu/energy/electricity/report_2005/doc/2005_report_en.pdf, staženo 23.4.2007

Council Decision of 14 December 1998 adopting a multiannual framework programme for actions in the energy sector (1998-2002) and connected measures, Official Journal of the European Communities L 007, 3 January 1999; http://www.eurlex. europa.eu

Towards a European strategy for the security of energy supply, Green Paper, COM(2000) 769, 2000. European Union Documents; http://europa.eu/documents/comm/green_papers/index_en.htm

Zelená kniha – Evropská strategie pro udržitelnou, konkurenceschopnou a bezpečnou energii, KOM(2006) 105, březen 2006; http://europa.eu/documents/comm/green_papers/index_cs.ht