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Thesis Summary

"The European Electricity Policy: Can the Transmission Grid Guarantee a Competitive, Secure and Green Industry?"

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Doctoral Thesis Summary

1. Introduction

Over recent decades the European electricity sector has undergone a series of significant regulatory reforms. The liberalisation process has been driven by European directives toward the achievement of a competitive energy market together with security and environmental protection. While this market opening process has shown some positive results, and while significant lessons have been learned from the regulatory measures implemented so far, there are still important steps needed to complete the process and achieve effectively-competitive electricity markets. Thus, if electricity markets in the past have not naturally shaped themselves, a dynamic regulatory process is needed in order to achieve the established European goals.

The European Commission has clearly stated the insufficient development of the Internal Market for both electricity and gas, also in consideration of the three main pillars of the European energy policy: competitiveness, security and environmental sustainability (EC, 2006).

While the last EU energy sector enquiry has indicated that an efficient and competitive European electricity market is still far from being achieved, there are other concerns around the other two pillars of the European electricity policy. Regarding the issue of energy security, the recent blackouts across Europe, the persistent congestion both at national and cross border level, regulatory imperfections as well as lack of transmission unbundling from other segments of the industry have raised the issue that investments are not adequate to meet the pattern of constant demand increase. Moreover, also EU targets on the environmental pillar did not achieve the hoped for results. The European Commission has indicated that only nine Member States[1] have achieved or will achieve the target in the time indicated, and that the majority are far behind (EC, 2007b).

This thesis addresses several aspects of the ongoing and much debated issues within European electricity policy, relating to a more competitive, secure and green industry. The analysis in this work differs from the focus in most of the literature. This study is undertaken from the point of view of the transmission grid infrastructure, and investigates whether this segment could play a proactive role in the achievement of the three aspects of European electricity policy referred to above. While in the past the transmission grid has been rather overlooked, it is now seen as central to the electricity industry debate. As we will see, the different goals of EU

[1] These Member States are: Denmark, Germany, Finland, Hungary, Ireland, Luxemburg, Spain, Sweden and the Netherlands.

electricity policy cannot be fully achieved without appropriate attention to the grid infrastructure.

This thesis is structured as follows. The first chapter analyses the current competitive and regulatory frameworks within the European electricity sector and the results achieved by the liberalisation process, mainly in the generation segment. While this work clearly underlines that EU integration is insufficient, the role of the grid infrastructure is analysed in order to foster competition and avoid strategic behaviour by incumbents.

The second chapter underlines the importance of grid infrastructure investment within the European electricity sector in order to maintain and develop a secure electricity system and achievement of a "robust" transmission grid. In particular, the ownership arrangements of Transmission System Operators (TSOs) across Europe as well as the investments patterns of a sample of operators are studied in order to understand the effect of strategic behaviours coupled with regulatory imperfections. The role of regulation as well as more coordination of TSOs and other authorities are investigated as a possible answer to the creation of a "robust" transmission grid which avoids risks such as blackout and anticompetitive behaviour, which is exacerbated by information asymmetries.

The third chapter investigates the development across Europe of renewable energy sources for electricity (RES-E) in connection with grid transmission barriers, with particular reference to wind power deployment. The development of RES-E, and the establishment of a European regulatory framework are analysed following an examination of the impediments to RES development and particularly those deriving from grid transmission barriers. The discretionary power of TSOs leading to anticompetitive risks, and the nature of new players in the renewable business is underlined. A case study of wind power deployment is carried out, which confirms the general impediments to further RES development and indicates how the cost approach to grid transmission connection could play an essential role in the achievement of the "green pillar" of European energy policy.

In sum, while the three main pillars of European energy policy may lead to some contradictory and perhaps not very satisfactory results, this thesis aims is to underline the importance of the transmission grid in the further development of these goals. The work investigates whether the transmission grid can play a proactive role in the achievement of these goals, noting that TSOs control only one key segment of the electricity value chain. The various issues within European electricity policy can be mitigated if not solved by greater attention to the transmission grid infrastructure across Europe. This work shows that an efficient grid infrastructure is essential for the development of the Internal Market for electricity, increasing both national and cross-border interconnections in order to reduce the scope for market power abuse and to boost competition. In addition, a well connected internal and cross country industry would enhance the reliability of the system at both national and international levels. And finally, a robust transmission grid would allow the deployment of distributed generation, such as green electricity productions, hence favouring green electricity penetration. However, further regulatory steps will need to be undertaken.

2. Liberalisation of the European Electricity Industry: Interconnecting incumbents?*

Over recent years a number of changes have occurred in the European electricity sector and the complexity of the industry has led to difficulties in implementing the liberalization process.

The theoretical framework of the European electricity policy seems well designed, but its implementation is posing numerous problems. There are several elements to it that are hampering the achievement of an Internal Market in the electricity sector. Although a second package of electricity directives attempted to correct the limitations in the previous legislative framework, several problems still exist. The new EC proposal should guarantee a higher level of unbundling as well as more coordination between transmission system operators and regulators across Europe also with the supervision of a European agency. While it is not clear when and if this package will be implemented by Member states, one can argue since now that the provision of ISO arrangements (as second best option) presents several limitations. The second chapter will analyze in detail this issue.

Added to these problems, are the reactions of incumbents to the new environment created by the liberalization process, and their strategies to increase concentration. Even though on the one hand these concentrations are driven by reasons of efficiency, on the other hand they strengthen the market power of incumbents as well as the risk of future collusion, raising other anticompetitive issues.

Lack of effective privatisation in some Member States, ineffective unbundling, the absence of regulatory authorities that are independent of national governments and the two-thirds rule allow the formation of non-market based "national champions".

Table 1 presents the generation capacity of the major companies compared with demand in 2005, in some of the EU15 Member State. These data and the concentration ratios of main players in the market, helps to explain the high level of concentration in national industries. The particular characteristics of this sector coupled with the recent trend of M&A have hence enhanced the risk of abuse of market power and future collusion.

Table 1: National Concentration Ratio of Major Electricity Utilities (2005)

Member State	Demand (TWh)	Companies	National production company (TWh)	Concentration Ratio	
Spain	260	Endesa	98	c1	38%
		Iberdrola	66	c2	63%
		Union Fenosa	26	c3	73%
		Hidrocantabrica	15	c4	79%
Portugal	51	Electricidade de Portugal	25	c1	49%

* A previous version of this chapter has been presented during the XX World Energy summit (November 2007) as well as published in the Energy Policy Journal (2007), volume 35, Issue 10, *The European Electricity industry: Concentration of the internal Market*.

Member State	Demand (TWh)	Companies	National production company (TWh)	Concentration Ratio	
France	477	EDF	429	c1	90%
Belgium	88	Electrabel	76	c1	86%
Germany	554	E.On	150	c1	27%
		RWE	140	c2	52%
		Vattenfall Europe	83	c3	67%
		EnBW	55	c4	77%
UK	390	British Energy	73	c1	19%
		E.On UK	35	c2	28%
		RWE	33	c3	36%
		EDF Energy	25	c4	43%
Austria	62	Verbund	30	c1	48%
Scandinavia	379	Vattenfall	88	c1	23%
		Fortum	54	c2	37%
		Statkraft	34	c3	46%
		E.On Nordic	33	c4	55%
Italy	322	Enel	126	c1	39%
		Edison	48	c2	54%
		Edipower	25	c3	62%
		Endesa Italia	21	c4	68%

Source: own elaboration on data from Matthes *et al.*'s (2005), Vattenfall, annual report 2005, website companies.

Moreover, the trend towards convergent mergers between gas suppliers and electricity generators needs to be taken into consideration. The main incumbents indeed compete in different geographic and product markets at the same time. As shown in Table 2 all major European players in the electricity sectors are active in both electricity and gas sector in different geographical markets. Moreover, they are active in different segments such as generation, distribution and/or retail in both sectors. The multimarket contact theory explains us how this situation can facilitate collusion within the electricity market[2].

Hence, in absence of interconnection, the abuse of market power by incumbents is a very present threat and several characteristics of this sector can induce future risks of collusion. The achievement of an Internal Market will solve most of the problems in

[2] When firms compete in more than one market, the possibility of successful collusion is easier compared to the case where firms meet only in one market. Firms will collude only if the gains from collusion will be higher than the loss in case of price war. As the number of markets increases, the cost of price war becomes higher relative to the short run gains from cheating[2]. Vertical (and horizontal) concentration is hence able to make difficult the entrance of new actors and it reduces the number of competitors, making easier collusion among integrated firms (Green, 2006). Several authors have criticised this view, because if a firm is present in many markets, it can deviate in all of them at the same time. In other words, this situation has a double effect: on the one hand, it enhances the long-term cost of punishment but on the other, it also increases the short-term gains of cheating. However, there are different plausible circumstances where this theory can facilitate cooperation among firms (see Bernheim and Whinston, 1990).

the electricity sector. It will enhance competition, reducing the risk of market abuse and future collusion. Investments in interconnection are key to limiting most of the present and future risks for competition. Moreover, they will guarantee that future M&A will be for economic efficiency reasons and not to exploit market power. A better implementation of the Internal Market will ensure an open and competitive industry with the best prices for final consumers. However, this is a long way from being realized.

Today, despite EU liberalisation policy, lack of EU directive implementation as well as increasing horizontal and vertical concentration are threatening the creation of the Internal Market for electricity. In absence of interconnection, the abuse of market power by incumbents is a very present threat and several characteristics of this sector can induce future risks of collusion.

Table 2: Electricity and Gas Activities of Main Utilities Across Europe

Electricity utilities (including subsidiaries)		GE	UK	FR	IT	HU	NL	PT	AT	BE	ES	PL	SK
EDF	E	▪	▪	▪	▪	▪			▪	▪		▪	▪
	G	▲	▲	▲	▲								
E.ON	E	▪	▪		▪	▪	▪		▪		▪		▪
	G	▲		▲	▲								▲
ENEL	E				▪						▪		▪
	G			▲	▲						▲		▲
Electrabel	E	▪		▪	▪	▪	▪	▪		▪	▪	▪	
	G	▲			▲		▲			▲			
RWE	E	▪	▪			▪			▪	▪		▪	▪
	G	▲	▲			▲	▲		▲	▲			
Endesa	E	▪		▪	▪			▪		▪	▪		
	G							▲			▲		
Iberdrola	E		▪								▪		
	G		▲								▲		
Centrica	E		▪							▪	▪		
	G		▲							▲			
Vattenfall	E	▪										▪	
	G												

Source: own elaboration based on companies annual report (2005)

A new European policy is needed to create incentives to invest, particularly in interconnection infrastructures to connect the different regional and national wholesale markets.The existing interconnection infrastructures in fact do not guarantee limitation of the possible anticompetitive effects deriving from

concentration in national markets (Jamasb and Pollitt, 2005). The chapter shows that an efficient grid infrastructure is essential for the development of the Internal Market for electricity, increasing both national and cross-border interconnections in order to reduce the scope for market power abuse and to boost competition.

The chapter is structured as follows. After a description of the implications of the industry's characteristics for the liberalization process, an analysis of the European regulatory framework and its achievements is presented. The trend towards horizontal and vertical integration of generators and their possible anticompetitive effects are hence studied. Following a discussion of European policy towards concentration, and in consideration of transmission, a better implementation of interconnection within the Internal Market is proposed as one of the main solutions to present and future risks in the conditions of competition in Europe. Lessons are drawn from other regional and international experiences. The final section offers some conclusions.

3. Development of the European electricity transmission grid: economic investments for reliability?

Since liberalisation, the regulatory framework has mainly focused on competitive issues. However, consideration has also been given to the effects that the opening up and unbundling would have on other important features, such as the transmission grid. In Chapter 1 we analysed the implications for the generation segment of a better interconnected industry, in this chapter we analyse in detail another related issue, European policy concerning the network infrastructure, with specific attention to reliability and economic investments in the grid.

Most of the literature has underlined the positive and negative aspects of this process, but less attention has been given to the role of the infrastructure, partly because of the high uncertainty characterising this segment. What will be the effects on investments and reliability in the future is an open question. The issue is discussed within this chapter.

European policy aimed at a fully liberalised Internal Market has indeed led to regulatory spillovers in the transmission segment of the industry, where features such as unbundling have been introduced. At the same time, policy making in relation to transmission investments have changed. There is currently important debate over the development of the Internal Market and the role of investments in the transmission segment. However, elements such as congestion, price differences across Europe, and blackout risks are introducing other issues into the debate, such as the benefits of a reliable system versus the achievement of European electricity policy goals.

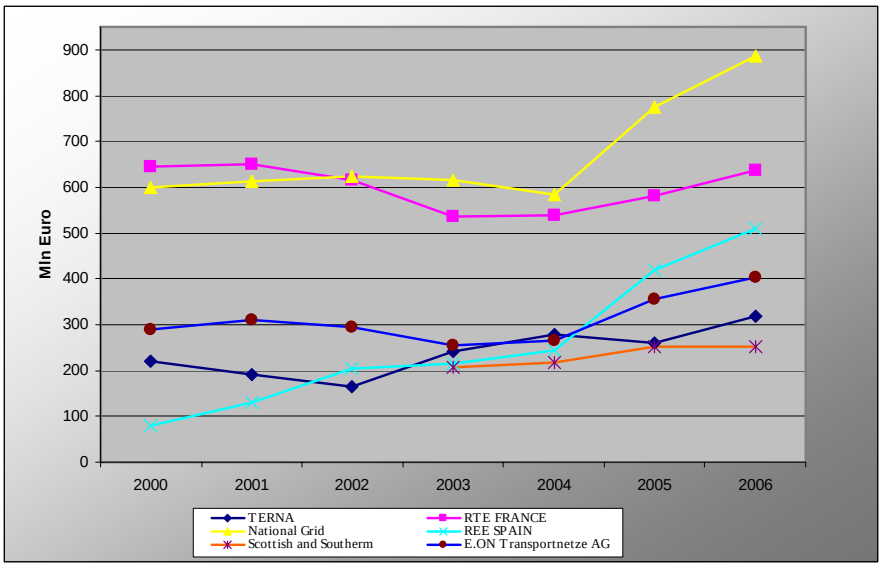
In the past, progressive policy development toward liberalisation has not taken account of its effects on the European transmission grid and its capacity to ensure reliability. Actions are needed to provide incentives for the building of more transmission capacity and to ensure coordination between TSOs and regulators across Europe. In particular way, economic investments should be boosted more efficiently to reduce congestion with the ultimate aim of lowering prices and

improving the reliability of the system. A number of different actions are needed to align the interests of private investors with the interests of the community.

In terms of network infrastructure investment, Figure 1 shows an overview of the transmission investment patterns for a sample of transmission network operators within Europe. While this figure does not provide a complete picture for Europe, it can be taken as a good indicator of European investment paths. These companies operating in the different countries represent significant areas of territory and population numbers across Europe. Although data for the Scottish and Southerm TSO are not available before 2003, some general conclusions can be drawn. It seems that transmission investments do not follow a constant pattern. This can generate important congestion problems within control zones and national networks. The data confirm that in the past national regulators have not paid sufficient attention to transmission issues, but, like TSOs, seem to have become more aware of them following the recent blackouts. However, this does not mean that they are sufficient to meet all present and future infrastructural needs in a constant path of increasing demand**.**

There is no guarantee that the present levels of investment will be sufficient to cover future electricity needs. Intuitively, the investment path should to some extent depend also on national consumption patterns. It is therefore useful to compare investments and consumption paths. This comparison enables some conclusions about the nature of investment and the possibility that markets can establish appropriate incentives for new investments in transmission networks.

Figure 1: Investment Path Major EU Electricity TSOs (2000-2006)

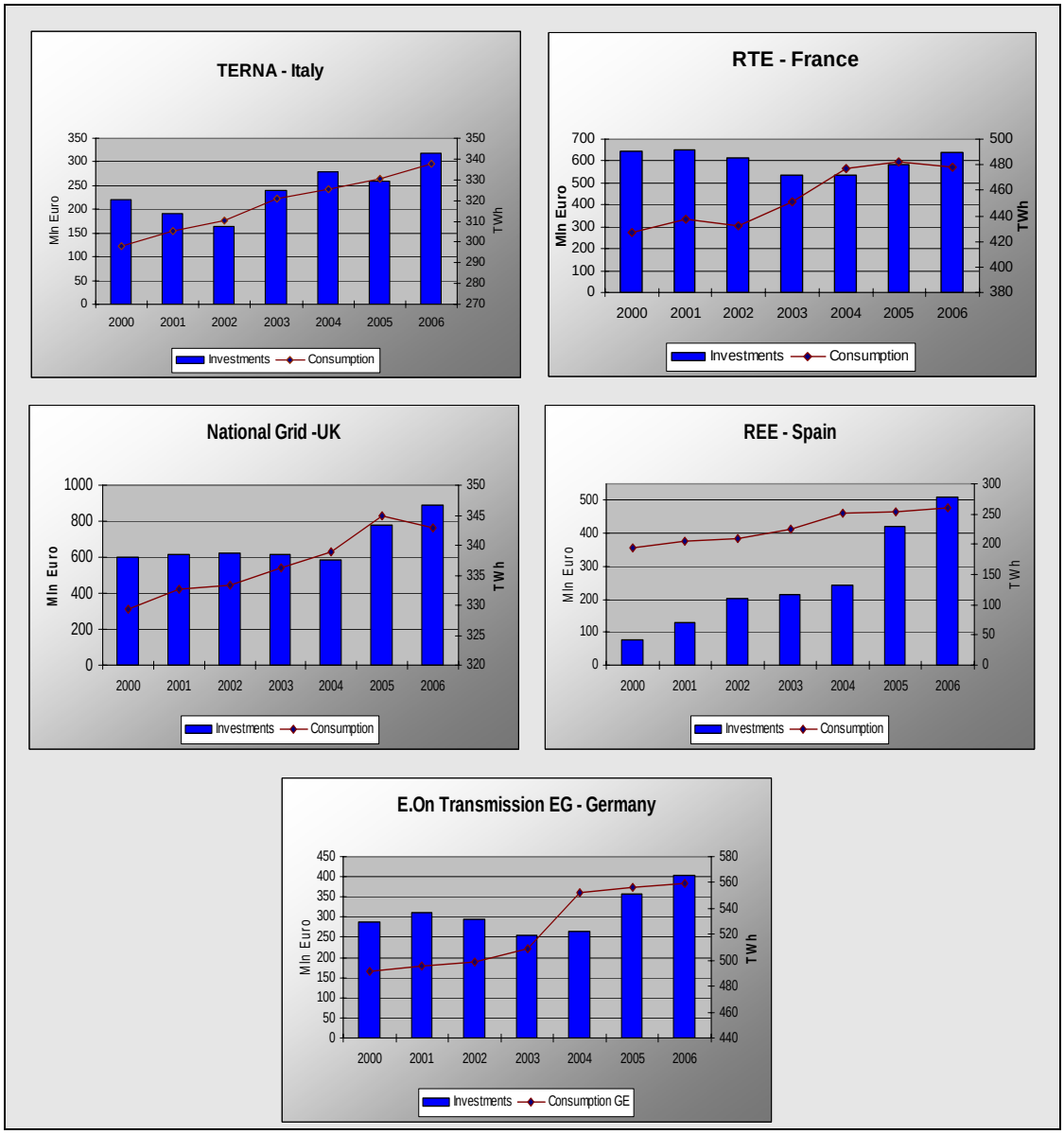


Source: Own elaboration based on annual reports companies

Figure 2 shows this contraposition between company investments and national electricity consumptions. While the figures do not provide information about the right level of investments and it is obvious that this depends on other factors as well, we could argue that in some countries, such as Italy, Spain, France, Germany (concerning E.On.) and UK, investments in the past have not always followed the

pattern of constantly increasing consumption. Based on our sample, it can be argued that, after the opening of competition in the generation segment and the unbundling of natural monopolies across Europe, transmission investments have decreased more in countries where effective separation has not been fully implemented, such as Germany and France

Figure 2: Investment Path TSO compared to national electricity consumptions (2000- 2006)



Source: Annual reports companies, Eurostat.

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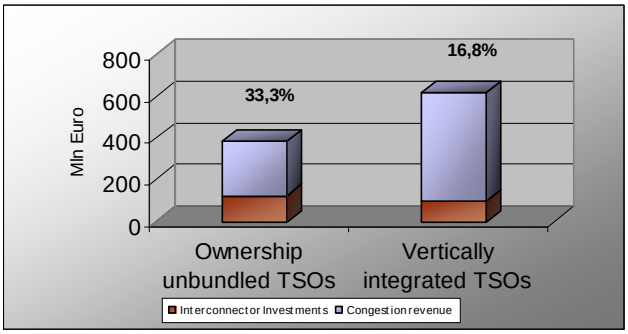
Furthermore, the implementation of unbundling ownership arrangements, as has occurred in Spain, has reinforced the pattern of continuous investment, compared to the position in other countries of Europe. In this sense, Figure 3 illustrates how

during recent years TSOs subject to ownership unbundling have invested higher percentages of their congestion revenue in network infrastructure than have vertically integrated TSOs.

Figure 3: EU15 TSOs Ownership and Reinvested Congestion Revenue (2001-2005)



Source: own elaboration on the Impact assessment (EC, 2007b)

The European infrastructure has a number of weaknesses. Firstly, internal congestion and a weak interconnection infrastructure between Member States (Finon *et al.*, 2004) have led to the creation of different markets for electricity within Europe with persisting price differences (Neely and Goulding, 2005). Second, the enlargement of the EU is leading to ever greater complexity and instability in the network system. There is a need for more coordination. Third, utility privatisation has not created an environment that attracts investment in network infrastructure, and actions such as ownership unbundling and new mechanisms to provide incentives for merchant investments are needed. An orientation towards profit for the TSOs would create problems of loop investments.

There are various policies that should be promoted in the transmission segment in order to benefit more from liberalisation and maintain a reliable system, in addition to ownership unbundling. First, it is essential to increase internal and cross border network transmission capacity also providing other direct incentives. Second, better regulation is needed to improve merchant investments in transmission and to provide incentives for locational signals. Third, there is a need to enhance the level of coordination management among TSOs as well as regulators.

Differently than in past, today the European Commission seems to be aware of the key role of the transmission infrastructure in the achievement of EU energy policy. The creation of an efficient European market for energy requires improvements in the infrastructure. For instance, the so called SmartGrid programmes are aimed at developing technologies to enable an accessible, reliable, flexible and economic future electricity network for Europe (Coll-Mayor *et al.*, 2007). A reliable grid will improve security and quality of supply. The new EC proposal for a new package of measures for the European electricity industry is focussing on unbundling, coordination among European TSOs and regulators, effective medium term investments plans and the establishment of the new European agency to take on specific tasks. If successful, this regulatory framework would solve some of the problems in the European transmission infrastructure.

The chapter is structured as follows. Section 2 discusses the importance of transmission investments and the achievements of the European regulatory framework. This is followed by an examination of ownership arrangements of TSOs across Europe and the investment patterns of a sample of operators. Having underlined the importance of economic investments for reliability within the electricity system, different policy actions are discussed as a solution to a "robust" transmission grid. These policies should help in avoiding risks such as blackouts or unfair competition as a result of asymmetries of information. The last section concludes.

4. Promoting renewable energy sources for electricity: can the transmission grid guarantee it?

Since the '90s, governments around the world have implemented renewable energy policies. These actions have evolved in different countries in a multitude of patterns. Also the European Union (EU) has recognized the importance of renewable energy, setting clear national targets for achieving increased production of electricity from renewable energy sources (RES). While there are important benefits deriving by the development of RES sources, currently only a small number of the European Member States are exploiting these opportunities.

There are indeed various reasons for the European failure to achieve the established targets, and this chapter aims to analyse the development of renewable energy sources for electricity (RES-E) and the barriers to their deployment, with particular attention on infrastructure aspects. We also analyse the main source of renewable electricity production in the immediate future - wind power.

Table 3: Connection Policies in the Main EU Member States

Country	Connection Policy	Country	Connection Policy
Austria	deep	Belgium	shallow
Czech Republic	deep	Denmark	shallow
Estonia	deep	Finland	shallow
Poland	deep	France	shallow
Portugal	deep	Germany	shallow
Romania	deep	Greece	shallow
Slovenia	deep	Italy	shallow
Sweden	deep	Netherlands	shallow
Hungary	partially deep	Spain	shallow
Ireland	partially deep	United Kingdom	very shallow
Slovak Republic	partially deep		

Source: Scott and Kinini (2007)

The increasing role of RES-E within Europe is raising new challenges for the electricity industry. Their deployment will play an important role in the future. However, there are a number of threats that are hindering their future expansion. For instant, Table 3 underlines the connection approaches adopted by some European countries. The different connection approach indicates which part of overall

connection costs is burden by new green actors[3] and hence plays an important role in the penetration level of these technologies. Indeed, future development of green energy production will be significantly affected by the implementation of different cost allocation methods (Aeur *et al.*, 2007).

Elements such as the cost connection approach have not been properly considered by the European regulatory framework mainly because of the small penetration of RES-E power plants in the past. However with the increasing share of electricity from green generators, a new European policy is needed. Transmission issues related to the deployment of RES-E technologies need to be considered carefully to reduce the delays that are occurring in achieving the EU targets for green power.

Characteristics such as unreliability and intermittence of RES-E production create problems that must be taken account of when integrating new green power plans into the transmission grid. However, technological developments and the implementation of better forecasting methods as well as more interconnection between countries will reduce these risks and also long run system costs. The creation of a European Smart Grid will play a fundamental role in accommodating RES-E technologies and improving the reliability of the electricity system.

Different barriers to the deployment of RES-E persist. Both the hardware and software are inadequate to support the changes in the industry structure. For instance, the policy maker has to play a stronger role than in the past to resolve issues such as the capacity of the transmission grid to support the entrance of new actors, a clearer cost sharing mechanism for overall system costs and provision of incentives for TSOs to guarantee more RES-E penetration. Specific problems need effective solutions.

First, the costs, and who will bear them, of integration into the system of these technologies needs to be explicit. As will be discussed below, socialisation seems the best option to promote great penetration of RES production. However, the cost of RES integration within Member States is not always clear and requires good regulation to ensure that TSOs can transfer these costs to final consumers.

Second, the EC Directive 2003/54/EC on the liberalisation of the electricity markets requires the industry to become more competitive. To achieve this, one of the main measures to be implemented is the unbundling of the different electricity segments. The separation of the competitive segments from the grid infrastructure has been seen as essential to reach non-discriminatory access to the grid for new market actors, including RES electricity producers. However, the less than successful results in achieving unbundling and the absence of a clear definition between the role of RES-E producers and TSOs in the overall cost allocation process, is hindering the further penetration of these technologies[4].

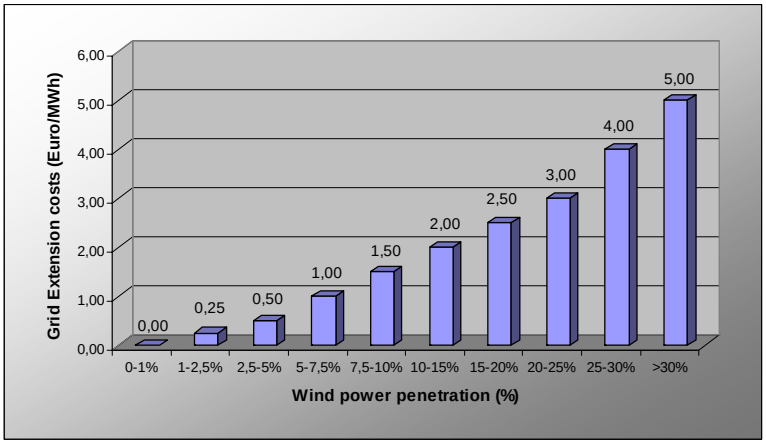
Although green players are often seen as new actors enhancing competition within

[3] In the literature (and in practice) there are three main approaches to RES infrastructure cost integration. The first is super shallow integration in which the interconnecting costs of new green plans are borne by the end consumers through final electricity prices including the transmission tariff. The second approach is deep RES integration methods, which mean the new player has to bear most of the infrastructure costs. This method provides incentives for the RES-E producer to choose the optimum plant location in terms of the cost of network infrastructure. The third approach, which puts only some of the cost burden on the RES-E developer, is the shallow interconnection method.

the industry, there are several barriers to their entry. At the same time the big energy utilities are becoming more active within the green energy sector. While renewable energy policy has different beneficial effects and spillovers for other sectors, there are serious concerns over whether it will enhance competition and substantially increase the number of big players.

Thirdly, if the objective of European energy policy is to boost RES technologies, then a cost interconnection approach needs to take into more consideration the particular features of different RES production. Overall system costs cannot be borne by other market players or by the TSO, and should be socialised. At the same time, there is a need for an efficient approach complemented by strong actions to the network infrastructure to maintain the robustness of the grid. Grid extension and reinforcement is essential to create a really competitive electricity market and to guarantee the entrance of new actors. Grid integration can be an important barrier for RES-E producers in distant locations. Moreover, if the RES producer has to pay for the interconnection, then a compromise must be found in relation to the distance from the infrastructure. However, the power plant location plays an essential role in performances of intermittent generators and sometime a compromise between location and overall connection costs is not acceptable, as in the case of wind power (IEA, 2005).

Figure 4: Grid Extension Costs as a Function of Wind Penetration (Overall Results from Analysis of Specific Countries)



Source: Own elaboration on data GreenNet 2007

It must be remembered that wind power will play a strategic role in the future. To sustain its development, further regulatory effort is needed. With higher penetration of these technologies, overall system costs will increase more than proportionally, and this could slow the progress of wind power projects. For instant, Figure 4 provides an average assessment of grid extension costs as a function of wind penetration, demonstrating the over proportional cost increase. Moreover, with

[4] For instance, grid codes with technical requirements often present non-transparent rules, which sometime have been formulated by the vertically integrated power companies.

higher penetration, the intermittent nature of these sources needs to be complemented by solutions such as forced curtailment of wind power and increased interconnection, as in the Danish case.

All these factors demonstrate that technologies such as wind power and small hydropower could be better promoted with a shallow (or even super shallow) approach. For instant, Table 4 indicates that the major producers of wind power in terms of generating capacity (GWh) are mainly countries where the shallow (or very shallow) approach has been implemented. For other kinds of renewable electricity productions a hybrid approach could be established, in a way to provide location signals for the decision of where to build the power plant.

Table 4: EU Major States Wind Production (2005)

Ranking	Country	Wind Penetration (GWh)	Connection Approach
1.	Germany	27229	shallow
2.	Spain	21219	shallow
3.	Denmark	6614	shallow
4.	UK	2908	very shallow
5.	Italy	2344	shallow
6.	Netherlands	2067	shallow

Source: Own elaboration on data Eurostat and Scott and Kinini (2007)

Another problem is the cost of these technologies. However, it can be argued that electricity from renewable sources is not too expensive, but rather electricity from conventional plants is too cheap. Fossil fuel sources have always received and continue to receive subsidies and R&D financing, while their environmental costs are not internalized.

In sum, there are several barriers to a greater presence of RES-E producers in Europe. In order to integrate the total capacity of intermittent RES-E within national and European electricity systems, new policy actions are needed. While the new proposal of the European Commission envisages ownership unbundling, which will have important effects for RES deployment, it does not contain any specific actions to improve the development of RES. Moreover, it is not known when and if this proposal will be implemented by Member States, leading to other delays for the achievement of EU green targets. In particular, the European policies toward the promotion of RES-E generators do not consider the indirect costs imposed on TSOs, which are an economic disincentive for their integration within the electricity system. It is essential to consider cost recovery for TSOs in the context of RES-E promoting policies. At the same time, regulation should take more account of possible anticompetitive behaviours that hinder the deployment of RES productions and try to generate efficient and effective rules to cope with this. It is clear, therefore, that there needs to be a rethinking about the definition of boundaries between RES-E policies and grid infrastructure as a precondition for further RES production development within Europe.

The chapter is structured as follows. The first part analyses the RES-E development, the European regulatory framework and its achievements. We examine the

impediments to RES development and the grid transmission barriers. Having underlined the discretional power of TSOs (also leadings to anticompetitive risks) and the nature of new players in the renewable business – different impediments to further RES development within Europe as well as wind power deployment are discussed. The last section concludes.

5. Conclusions

Since the `90s, various countries around the world have undertaken electricity industry reforms. In order to restructure the sector, policy actions such as privatisation and liberalisation, have been implemented with different mixes and degrees of achievements. While the motivations of each country differed, they had in common a willingness to create a more efficient sector based on competition, fostered by a better functioning market with rationalisation of the industry and investments driven by market decisions. Policy maker have been led by the idea that all these actions would contribute to increased consumer welfare.

These experiences across the world have brought important lessons about this complex industry, although the best design for the electricity industry is still an open debate, which is set to continue, perhaps without end. It appears that well designed policy frameworks do not necessarily lead to hoped results. Moreover, international experience has shown that they can lead to unexpected effects provoking the need for further policy actions (Sioshansi, 2006).

The European electricity industry with its three packages of measures including several directives is a clear example of a dynamic regulatory process. In Europe, the mix of liberalisation, privatisation and government intervention needs to be considered with reference to the transmission infrastructure and will be key to achieving the three fundamental pillars of EU electricity policy. While there is a clear call for a specific policy for the transmission grid in order to meet EU goals, there is the more general problem of the need for a robust infrastructure. It is essential to have a minimum of network redundancy in order to allow the overall system to function properly in the different segments of the industry. However, the definition of an efficient network does not always match with the private goals of TSOs, especially those quoted on the exchange markets which hence are devoted to profits.

This work has analysed several aspects of the current debated issues within the European electricity sector for a more competitive, secure and green industry, from a different angle to most of the existing literature, i.e. from the point of view of the transmission grid infrastructure. While it received insufficient attention in the past, this segment can now be seen as vital in the electricity industry reform debate. This analysis demonstrates that this segment plays a proactive role in the achievement of European electricity goals. Policy makers and market actors need to pay appropriate attention to the grid infrastructure.

First, considering the competitive pillar of the EU energy policy, it can be argued that while the trend towards concentration within the generation segment is increasing (often without efficiency reasons), the Internal Market is far from

complete. A new European policy is needed in order to create incentives to invest, particularly in interconnection infrastructure to connect the different regional and national wholesale markets. The existing interconnection infrastructure does not guarantee the limitation of possible anticompetitive effects deriving from concentration in national markets. Investments in transmission will enhance competition, reducing the risk of market abuse and future collusion and hence are key to limiting most of the present and future threats to competition. At the same time, they are also essential to reduce internal congestion. A better implementation of the Internal Market would ensure an open and competitive industry with the best prices for final consumers. However, this is not envisaged in the near future.

Second, as already discussed, in the past progressive electricity policy developments have not considered in a proficient manner the effects on the European transmission grid and hence the capacity of this segment to ensure reliability of the system. The analysis of different transmission system across Europe underlines that in past years investments have not followed a constant pattern, especially when compared to the growth in electricity demand. This problem is supported by the existence of issues such as ineffective unbundling, lack of coordination among TSOs, recent blackouts, asymmetry of information, regulatory imperfections as well as persistent internal and cross border congestion. Moreover, this situation indicates that in the past utilities have been more conscious than regulators about the strategic importance of grid transmission investments. Actions such as ownership unbundling and new mechanisms to provide incentives for merchant investments are needed. However other grid transmission policies are needed to maintain a reliable system. First, it is essential to increase internal and cross border network transmission capacity. Second, better regulation is needed to improve merchant investments in transmission and to provide incentives for location signals. Third, there is a need to enhance the level of coordination management among TSOs and regulators.

Third, we have to remember the role of the European grid infrastructure for the development of the third pillar of EU energy policy. There are a number of barriers hindering the further development of renewable energy sources within the electricity sector. These obstacles have not been considered in the past because of the small penetration of such technologies. However, with an increasing share of electricity coming from renewable power plants, a new European policy is needed. Within this context, the transmission issues related to the deployment of RES-E productions need to be carefully considered in order to avoid delays. Currently, it appears that neither the hardware nor the software of the transmission grid are adequate to support further renewable productions developments. The policy maker needs to play a stronger role than in the past to resolve issues such as the transmission capacity required to support the entrance of new actors, clearer cost sharing mechanisms for overall system costs as well as provision of cost recovery processes for TSOs in order to guarantee higher RES-E penetration. For instance, wind power will play a dominant role in the near future, but overall system costs will increase more than proportionally and this could slow the progress of wind power projects.

Hence, all three pillars have important correlations with infrastructure development both at national and cross border levels. Investments in this segment play an important role, for instance an adequate infrastructure can help to overcome local

market power and the losses from internal and cross border congestion. They should help to enhance the security of supply and improve the deployment of RES-E.

The creation of an efficient European market for energy requires improvements in the infrastructure. The new EC proposal seems to be aware of the key role of the transmission infrastructure in the achievement of EU energy policy. If successful, this regulatory framework would solve some of the issues affecting the European transmission infrastructure.

In general, one can truly argue that regulatory activity and monitoring is hence essential in order to provide a sustainable industry in terms of future development. We need to take particular account of the special characteristics of this sector and each segment within the sector. In particular, we have to consider the problems of regulatory asymmetries in infrastructure specificity.

Regulatory policies need to be reinforced to stimulate these changes. The present framework shows that liberalisation and integration in Europe represent a discovery process, with continuous interactions between market players and regulatory authorities. This third package can be only another step towards the definition of rules for this sector, while the Internal Market is still far from fruition. The development of the European electricity policy represents the classical example of a “reform of reforms” as indicated by Joskow (2006). The different changes in industry structure coupled with the effective implementation of European directives in future should lead to new dynamic interactions and challenges in the electricity sector.

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