LUND UNIVERSITY
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The Challenge of Wind Power in Italy: Is the Answer Blowing in the Wind?

A Comparative Analysis of the Italian and Spanish Wind Power Industry

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Abstract: The latest years have seen the worldwide interest around wind power increasing significantly. Italy as well has joined this global movement. But *does the Italian wind power industry have the capabilities for a substantial and sustainable future growth?* This paper analyzes the Italian wind power sector using a slightly modified Porter's diamond model in a comparative analysis with the Spanish one, to investigate the different fortune of this industry in the two countries and how could Italy learn from its Iberian cousin. The study suggests that a well structured national R&D program, the use of feed-in tariffs and the coincidence of Spain's industrialization phase with the birth of a national wind power industry have been the main reasons behind Spanish wind power success. In Italy, instead, the absence of these factors foreshadows an uncertain future for the wind power sector.

Key words: wind power, Porter's diamond model, Italy, Spain

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1. Introduction

The exploitation of wind power resources has been progressing at a sensational speed, especially if compared to any other renewable energy resource. Since the 90s worldwide capacity of wind energy generation has grown at a rate of 20-30% yearly (IEA, 2010). Growth that, though, is not evenly distributed but concentrated in few countries. Exclusion made of China and India, that started to invest significantly in this sector only at the beginning of the 21st century, the countries that have been the main actors in the historical development of wind power are Germany, Denmark, Spain, and the US (ibid).

In Italy real investments in the development of technology and installations for a systematic exploitation of wind resources started later than in other parts of Europe. However, since the last decade, a raising interest around this resource has become evident, in so much that today Italy ranks third in Europe for installed wind power capacity. This substantial increase in number and capacity of wind power plants across the Italian peninsula appears to reflect a quite concrete national commitment to this resource. However, the reasons of this growth could be, instead, rooted in a fortuitous coincidence of the level of maturity reached by global wind power technology and high governmental aids particularly favorable to wind rather than other renewable energy sources (RES) technologies.

Although this important achievement, in absolute numbers the country is still far from catching up with the sector's leaders, Germany and Spain, having only 5.797 MW of installed capacity at the end of 2010, against 27.214 and 20.676 MW of, respectively, Germany and Spain (EWEA,2011). A gap that appears even more noticeable when taking into consideration the population dimension. Italy has only 96 kW of power installed per thousand of inhabitants whereas Spain reaches 450 kW, Germany 334 kW, while Denmark, the leader country, registered 677 kW of installed wind power capacity for thousands of inhabitants at the end of 2010 (ibid).

The aim of this paper is, thus, to investigate *whether the Italian wind power industry has the capabilities for a substantial and sustainable future growth.* In order to find the answer to this question a comparative analysis of the industry of wind power in Italy and Spain and of their development in time will be carried out using a slightly modified Porter's diamond model.

Spain and Italy are very similar countries in several aspects, starting from sharing a Mediterranean culture and a complementary history. The reasons why Spain has been selected as a comparison country for analyzing the Italian wind power industry, though are more profound that similar cultural background. Spain holds the second largest share of total wind power capacity installed in

Europe with a penetration in total electricity consumption of 14,4% (EWEA, 2011), second only to Denmark (24%, ibid), while in Italy the share of penetration of wind is only of the 3,4%. Although having a similar endowment of natural resources and strong dependence from foreign energy import, the development of the wind power industry has undergone a considerable different destiny in the two countries. Hence, analyzing the steps and the factors that resulted in the birth and success of the Spanish industry, and comparing these to their relative Italian counterparts, it will be possible to reach a reasonable conclusion about whether Italy has what it takes to be successful in the wind power sector and how it could improve its performance with a lesson from Spain.

The structure of this paper is as follows: Chapter 2 introduces the theoretical framework on which the research is based, including a brief description of Porter's diamond model, previous utilization of the model in the field of energy industry and major criticisms. Chapter 3 explains the methodology and the data that will be utilized. Chapter 4 presents the limitation of the study. Chapter 5 contains an overview of the energy mix and actors involved in the wind power industry in Spain while the same information for Italy are reported in Chapter 6. In Chapter 7 the determinants and variables of Porter's model are analyzed in respect of the wind power industry in Spain and Italy. Finally in Chapter 8 a summary of the situation and conclusions are drawn.

2. Theoretical framework and previous research

To my knowledge, no previous comparative analysis of the wind power industry in Italy and Spain has been made. However, studies on this particular RES and its development in different countries are becoming every day more numerous as the interest towards it grows. Many of these studies are focusing on Denmark, because of the pioneer role this country has played in the development of the sector and its success, and on developing countries, exploring the possibility that wind power might help those countries to develop in a less carbon intensive way (see Venancio, 2008; Sovacool et al, 2008; Li, 2009; Lewis, 2007; …).

In order to assess the strength and sustainability of the Italian wind power industry compared to the Spanish one, we need a theoretical framework that allows to analyze the situation in the two countries. There are various methods that can be utilize as business measurement tools. The most popular ones are the SWOT analysis (Strengths, Weaknesses, Opportunities and Threats), the PEST analysis (an analysis of Political, Economic, Social and Technological factors) and Porter's diamond model. While the SWOT and the PEST analysis were mainly developed as instruments for business strategic planning, focusing, thus, on a single company point of view, the diamond model, being the fruit of Porter's analysis on comparative advantages among industrialized countries, focuses more on a national industry level (although it can be applied to a single company as well). Each of these approaches has been already used from different scholars to analyze RES industries (Myamoto, 2000; Vestergaard et al, 2004; Brenden et al, 2006;..).

Miyamoto (2000) utilizes the SWOT analysis as a measurement tool to perform a comparative study of the Danish and Swedish wind power industry, integrating the results with a thorough review of the policy framework and the structure of the industry in the two countries. The same criteria are applied by Coskun and Türker (2011) to their study of the Turkish wind power sector, though the two authors appear to balance the SWOT factors in a quantitative way, measuring the number of respective strength or weaknesses rather than the weight that each element has on the final result. All in all, the SWOT model is certainly a powerful tool with the clear advantage of being easy to understand and of giving a comprehensive yet schematic overview of the situation. On the other hand this schematization might be considered extreme when not focusing on a single company, but analyzing a whole industry. A listing of all the elements that contribute positively or negatively to the development of an industry is, in fact, not sufficient to explain the complex system of interdependency that characterize the factors/actors involved. Especially when talking about a RES power industry, where the influence of supporting institutions and policy permeates each aspect of its development (Vestergaard et al, 2004). A way to obviate for this limitation could be to apply different methods. Brenden et al (2009), for example, decided to utilize simultaneously SWOT, PEST and Porter's five forces analysis in their study of wind energy in the Pacific NW region, gaining a better understanding of the industry from an internal and external point of view.

In this work the wind energy industry is analyzed through Porter's diamond model. This, unlike the above mentioned approaches, can be used to study the development and attractiveness of an industry, understanding how a nation builds her own competitive advantage. Due to this characteristic the diamond has been largely used by scholars to investigate RES industries. For example, in Vestergaard et al (2004) are the Danish and American wind turbine business to be compared in the light of Porter's model, that, outlining the role that the different factors have in the development of an industry, allowed the authors to understand why Denmark has been more successful than the US in this field and what led to the current situation. Zhao Zhen Yu and Hu Li (2009), instead, applied the diamond model to the Chinese wind power industry in order to assess its competitiveness in the international market. The two scholars, stating that policies and supporting mechanism have a primary role in the development of RES power industries, modified Porter's model so that the government is considered as a fifth determinants and not as an external variable as theorized by Porter. Zhao and Hu inserted also technology as an intermediate variable to the model, claiming that, due to its highly technological nature, the wind power industry can't develop further without a solid technological support.

2.1. Porter's diamond model

This model has been presented by Michael Porter in his book (1990) "The Competitive Advantage of Nations" as a useful tool for assessing the factors and circumstances that determine the success of a nation in the global environment on the basis of its intrinsic characteristics. The diamond is, therefore, useful also to explain the long-run development of a country's position in a particular industry.

According to Porter, there are four determinants of national advantage:

- *Factor conditions:* resources available in the country that can be exploited. This includes not only natural availability of raw materials but takes into account more dynamic resources as human capital, knowledge and infrastructures.
- *Demand conditions*: describes the characteristics and development of the internal demand. This, providing the primary driver for growth, innovation and quality improvement, can help the nation to foster its advantage also in an international environment.
- *Related and supporting industries*: the presence of related and supporting industries might be of a fatal importance for the development of a particular sector. In this section the author emphasize also the role of "industrial clusters".
- *Firm strategy, structure and rivalry*: the strategy and the structure of the firms belonging to a particular sector determines the success of the sector itself, while the presence of constructive competition among the firms will enhance the pressure on innovation.

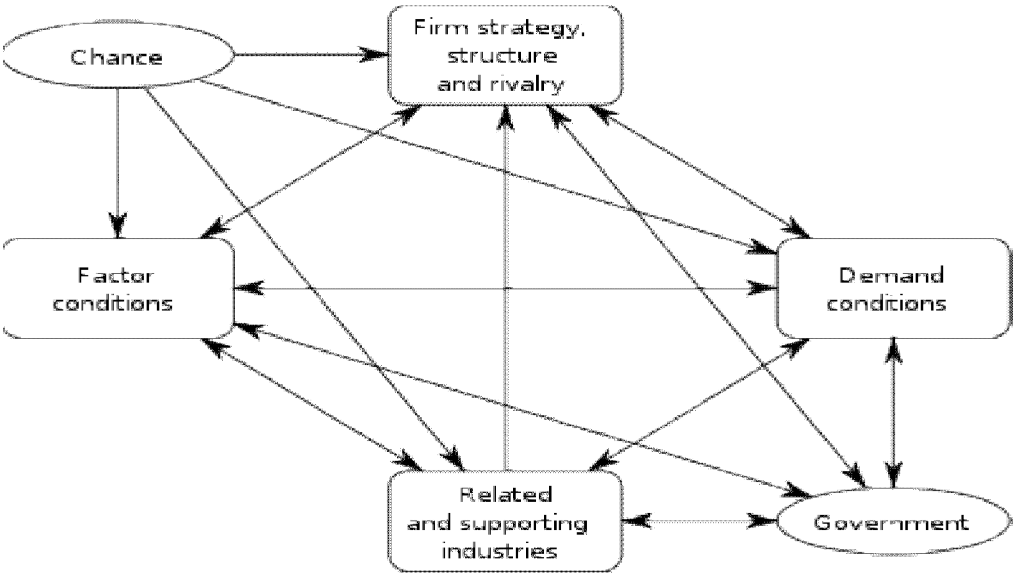
To this four determinants Porter adds two more factors that influence directly the outcome of the previous ones.

- *The role of government*: according to the author government, although considered of great importance for the economy of a country is not a determinant since its role is only to influence positively or negatively the four determinants.
- *The role of chance*: chance represents the unpredictable component that could determine the success of a particular firm/industry and, while influencing all the determinants, it cannot be

influenced neither by firms nor government. This includes circumstances such as war, political decision by foreign government or acts of pure innovation.

Each of the components of the model interacts with the others and it's bounded to them (except for chance) by a relationship of mutual interdependence.

Figure 1: Porter's diamond model



Source: Porter (1990: 127)

According to Porter (1990), the characteristics of this national diamond determine the presence or absence of internationally successful industries in the respective countries. Hence, through the analysis of the diamond it is possible to evaluate whether a country has a favorable environment for the development of a particular industry.

Main criticisms

Acclaimed from some as a milestone in the field of strategic management and international economics (Grant, 1991:535) and labeled from others as "hopelessly rich but gloriously wrong" (Davies and Ellis, 2000:1210) Porter's "The Competitive Advantage of Nations", and the diamond model introduced in it, has been the centre of a heated discussion among scholars since its publication in 1990.

The author constructed his model based on a study of successful industries in 10 countries, deriving his results from an array of more than 100 case studies. Although the richness of the dataset has been praised and even utilized as an evidence of the validity of the case study method (Greenaway, 1993), the reasoning behind the choice of these particular cases is not clearly explained, rising doubts about the external validity of its hypothesis (Davies and Ellis, 2000: 1202).

However, the issue of the applicability of the diamond to other countries and industries than the ones analyzed in the initial study has been discussed by numerous scholars, that through the analysis of different case studies proposed a series of additions and improvement.

Yetton et al (1992) diamond analysis of New Zealand, Canada and Australia does not confirm Porter's assumptions on national advantage, stating that the diamond model doesn't hold when utilized in countries of which industries are mainly resource based and the economy is not completely mature. According to the author the model is useful for explaining the competitive advantage of firms and industry within a nation rather than the nation herself.

Brouthers and Brouthers (1997) and Moon et al (1998) discuss the application of the model to relatively small countries as Netherland, in the first case, and Korea and Singapore, in the second. Both researches suggest that Porter's model is incomplete to describe the competitive advantage of these countries, since it doesn't incorporate multinational activities, and that a double or multiple diamond model that includes these activities would be more appropriate. Furthermore, Moon's model differs from the original also in the role of government, considered as determinant and not as an external influencing factor.

The scarce importance Porter gave to the role of multinational enterprises has been criticized also by Dunning (1993) that proposed to include it by adding a third external force influencing the diamond, other than government and chance: "transnational business activities".

In 2000 Öz applied the model to five Turkish industries in order to determine whether it could be used to analyze not only successful cases but also to define the sources of advantages and disadvantages in an uncompetitive industry. The result of his research suggests that the diamond works better in some cases than others but is successful in explaining the reason of the underdevelopment of the Turkish automobile industry, supporting the hypothesis that Porter's framework can be applied to uncompetitive industries and developing countries.

Finally it has been argued (Van den Bosh and Van Prooijen, 1992) that, disregarding the influence of national culture in the success of a firm or industry, the model loses much of his power and that the same diamond is in fact resting on national culture.

3. Methodology and data

As always, when speaking about an economical theory and, especially, when introducing a new model, it is impossible to reach an unanimous consensus. For my side, I acknowledge the criticisms made to Porter's model and I will consider them in the course of my analysis. Thus, with the due changes, I repute the diamond a valid tool for analyzing the reasons behind the strength or weakness of a particular industry within a country.

Although Porter refers to the success of a firm, industry or nation as the achievement of international competitive advantage, in this study the concept of competitiveness has been replaced with success, intended as a sustainable growth and effective exploitation of resources of the industry of wind power. This choice has been made primarily due to the absence of a clear definition of competitiveness given either by the author or by general economic theory. Secondarily, since the aim of the study is to assess whether the Italian wind power industry has the possibility to grow in its national context, the achievement of international competitiveness could be considered more as a side effect than the real objective to reach.

As mentioned before, a slight modified version of the model will be utilized here. This deviation from the original model has already been utilized successfully by scholars (Moon et al, 1998; Zhao and Hu, 2009) that considered the role of government not as a mere influencing variable but as a true determinant. In this study, this modification has been made due to the particularity of the industry subject of the analysis. In the field of renewable energy resources technology, in fact, the intervention of the government and institutions through a system of incentives and subsidies is fundamental for industry specific demand generation (Pirozzi, 2008).

Data

The data utilized in this study are of secondary nature, mainly retrieved from literature about the functioning of wind power industry in general and more specific reviews on the status of the industry in the two countries of interest. In particular, data on energy statistics, national and European legislation, incentives to the development of renewable energy resources and direct incentives on wind power, as well as data on the evolution of wind turbines installation over time, have been gathered through official publications or directly from the responsible organizations.

4. Limitations of the study

Two countries are never perfectly comparable, especially when considering energy issues, as their natural endowments differ. The energy mix of a country is, in fact, partly determined by its natural resource availability. Considering the importance of the energy balance of a country for the development of any energy industry, a limitation of this study can, thus, be found in the differences between the energy mix of Italy and Spain. The Spanish Kingdom has, for example, a considerable share of nuclear among its energy powers, while in Italy the nuclear program, started in the middle of the 80s has been interrupted in 1989, after a popular referendum subsequent to Chernobyl's catastrophe, and the nuclear centrals dismantled. On the other hand Italy enjoys rich hydro power and geothermal resources while in Spain geothermal power is not exploited and hydro power resources are very limited compared with the Italian ones. However for the scope of this research this differences can be considered not significant since the Italian hydro power sector has already almost reached its maximum capacity and geothermal accounts for a very small energy share, while there are currently no plans for either expansion or premature closure of nuclear plants in Spain.

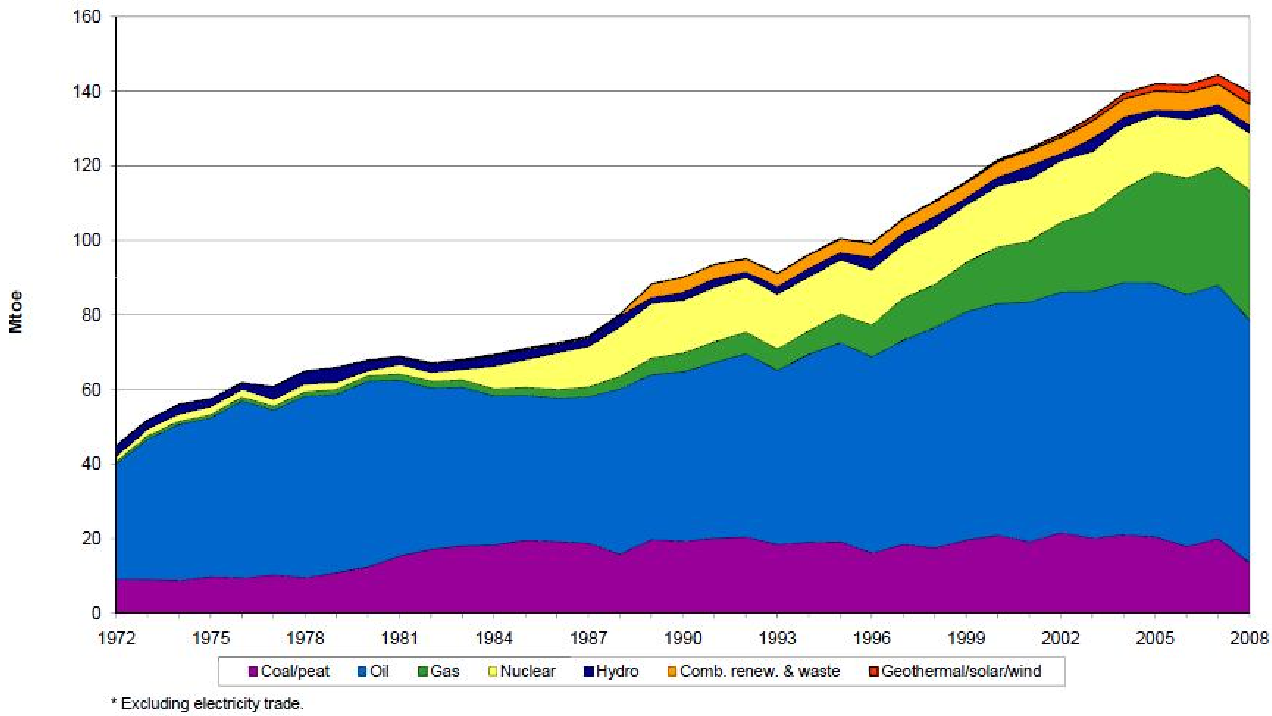
Further limitations of this study derive from the rather short period of time that will be taken in consideration, since there are almost no data relatively to both countries on wind power generation before 1990. In fact, even though wind powered energy has been used from humanity ever since ancient times, its exploitation as an electricity generating resources on a big scale is relatively recent.

5. Spain

5.1. Energy mix

Historically characterized by a strong reliance on fossil fuels, of which it has limited resources, Spain is largely dependent on foreign energy import (83,8% in 2009, Enerdata), although from the year 2005 there has been a slight tendency turnabout due to policy on renewable energy planning and energy efficiency that promoted a higher penetration of RES in the country. These policies have their roots in the oil crisis of the '73 that, striking the country severely due to its high dependence on foreign fossil fuel imports, pushed towards a diversification of primary energy sources (Dinica,2005).

Figure 2: Total primary energy supply Spain 1972-2008



Source: IEA

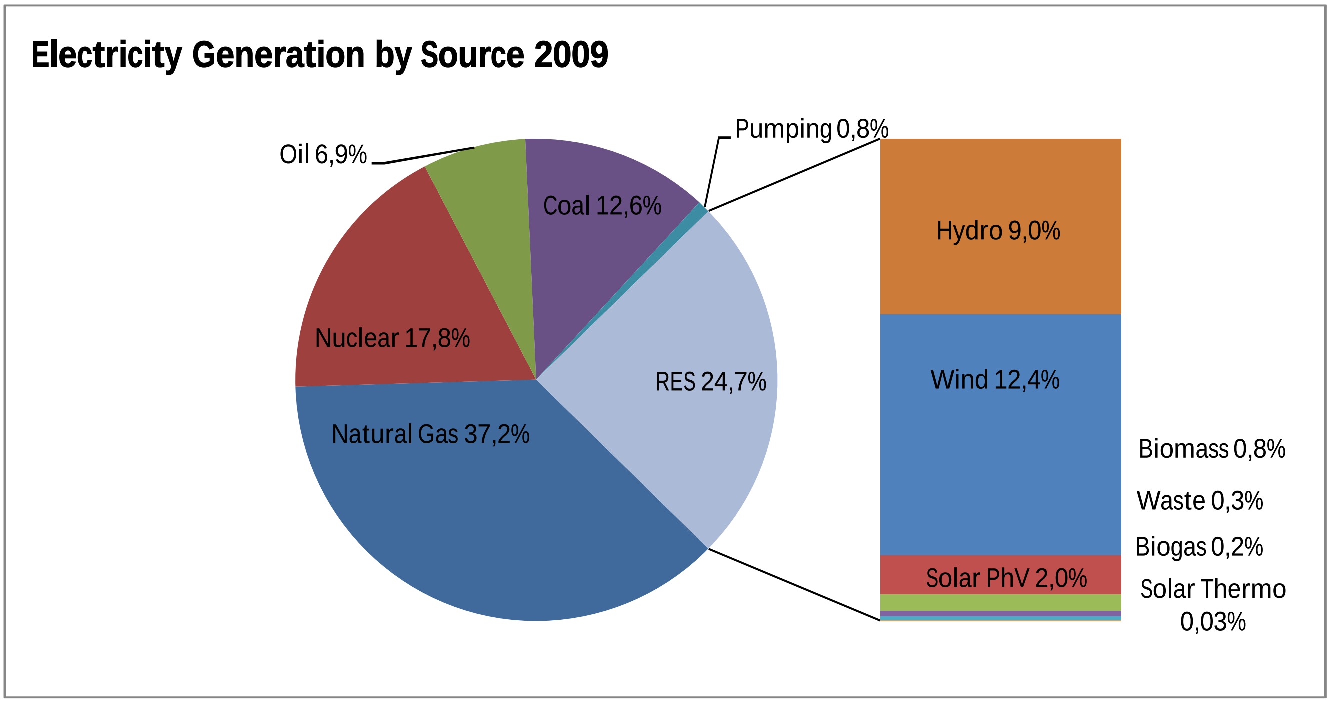
The rapid economic growth subsequent to the country entering the European Union has led to a corresponding increase in energy consumption, insomuch as the energy demand has increased by more than 100% since the 90s. In particular the rate of electricity generation and consumption have grown at a speed nearly double than the rest of Western Europe. It is important to highlight in this context that in the beginning of the 90s Spain was still a semi-industrialized country. This rapid increase in energy consumption reflects, thus, a process of industrial catching up with the rest of Europe.

Electricity generation in Spain has undergone an important transformation since the end of the 90's, due mainly to the progressive penetration of natural gas, combined cycle and cogeneration, together with RES. The last one in particular accounted for more than 24% of the national electricity generation at the end of 2009 (Mityc/IDAE, 2010). This situation has caused a relative diminution of importance of other energy sources such as coal, oil and even nuclear power, of which RES have exceed the share in electricity generation since the year 2006. It must be kept in mind though, that the share of RES on the total primary energy was still only 9,4% in 2009 (ibid).

In the last decade the production of electricity by renewable sources has increased by nearly 40%, mainly due to the rapid development of the wind power industry that, alone, represented the 12,4%

of total electricity production in 2009. Although, because of the failure to stabilize energy consumption, this increase is reflected only in a minor way in the total energy system structure (Dinica, 2005). Nevertheless it does, still, make Spain the second country in Europe for wind power capacity installed.

Figure 3: Electricity generation by source Spain 2009



Source: Own elaboration on data from Ministerio de Industria , Turismo y Comercio (MITyC/IDAE)

5.2. Main actors involved in the wind power industry

Besides private companies, central actors that operate for the promotion of wind power can be found on the governmental side. The main authority in the field of energy policy, in fact, is the Ministry for Industry, Tourism and Commerce (MITyC), formerly Ministry of Industry and Energy. Complementary to the work of the ministry is the role of the Institute for Energy Diversification and Saving (IDAE). Established in 1984, the institute has financial autonomy and the responsability to implement and oversee the economic supporting schemes for renewable sources, including also the preparation of the national policy plan for the promotion of renewable energy. On the governmental side operates also the National Energy Regulatory Authority, that has the task of ensuring effective competition between the energy providers, and, at the same time, protect the interests of the consumers.

Finally, a relevant role is played also by the regional government of the Autonomous Communities (ACs), that, having administrative authority over RES plants with a power below 50MW, can significantly influence both the timing and extent of wind power penetration. Particularly active in this field have been the ACs of Galicia, Navarra, Castilla y Leon, Castilla la Mancha and Andalucia (Dinica, 2005).

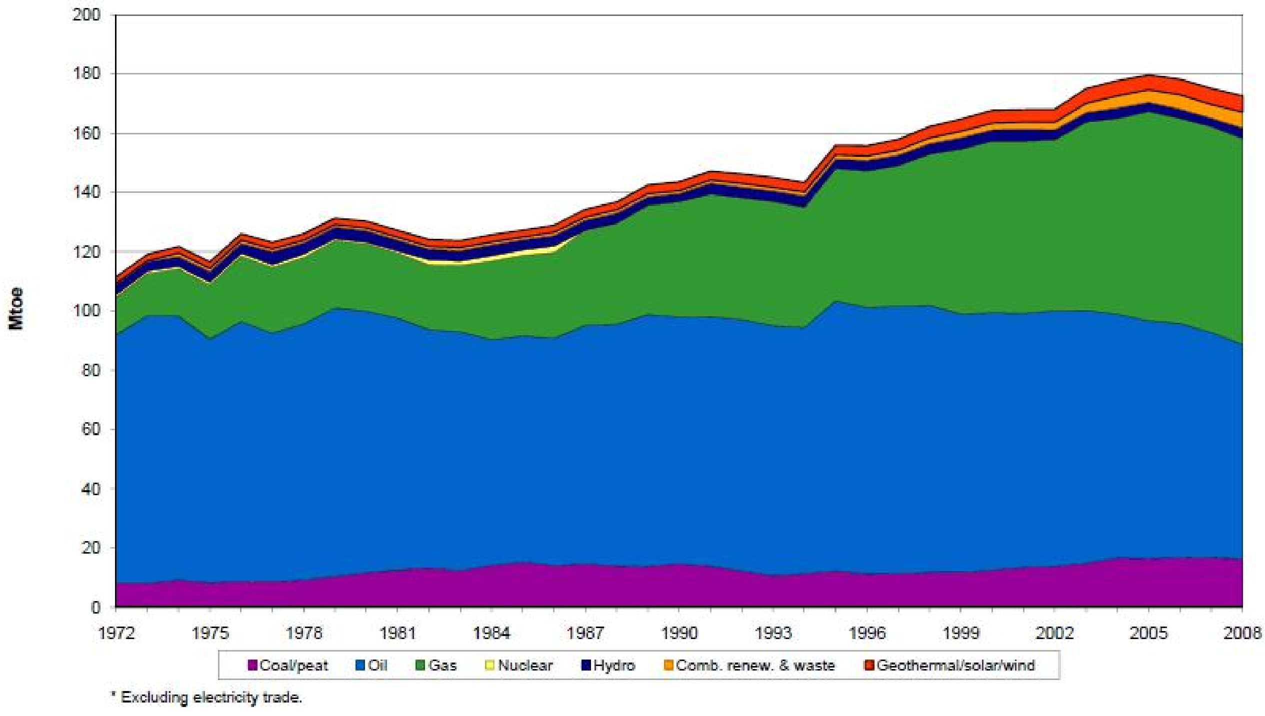
Alongside with public actors, private associations of shareholders have gained greater influencing power. Among these, the Association of Renewable Energy Producers (APPA), counting more than 200 companies among its members, in particular has worked actively and improved the economic support for RES through a sustained media and lobbying campaign (Meyer, 2007: 357).

6. Italy

6.1. Energy mix

Italy is even more dependent on foreign energy resources than Spain. In 2009 roughly over the 85% of the national energy consumption was imported from abroad (Enerdata website, 2011). The causes of such a high dependence are rooted in the large utilization of fossil fuel, of which the country has almost negligible reserves, in the abandonment of nuclear energy and in the slow development of renewable energy carriers.

Figure 4: Total primary energy supply Italy 1972-2008



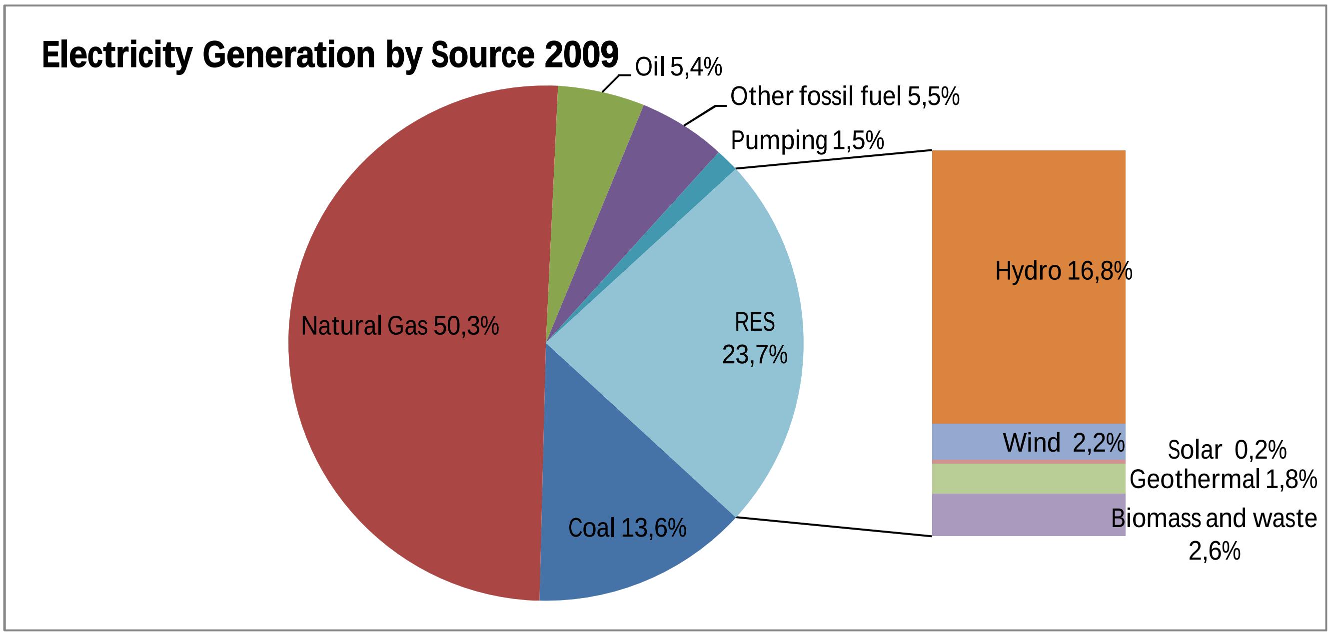
Source: IEA

Unlike today, RES contributed significantly to the energy balance of Italy, due to large hydro power resources, up until the 1960s, when a rapid process of industrialization, cheap oil prices and the pressure of the influential petroleum lobby ENI (National Hydrocarbon Institute) drove the country to a situation of extreme fossil fuel dependence (Di Nucci, 2005).

Despite the country having experienced substantial slow down in terms of economic growth in the last decades, the energy consumption has continue to increase at a steady pace. A primary role in this increase has been played by electricity, the consumption of which has increased at an annual average rate of 2,5% since the beginning of the 90s (TERNA website, 2011).

The generation of electricity in Italy after the oil crisis and, at the end of the 90s, the abandonment of nuclear power has been leaning increasingly towards natural gas, which share is above 50% among the electricity generation sources (fig. 4), and RES. As mention before Italy doesn't have any significant reserve of natural gas, this resource is thus imported mainly from north Africa, Russia, Netherlands and Norway (DGSAIE website, 2011), but it is still not sufficient to satisfy the internal electricity demand. The registers of the national electricity network show that Italy has been a net importer since the 50s and that there is no sign of a reversal. Although the country has a high potential for the exploitation of wind and solar power, these sources are still greatly underdeveloped. Geothermic power, instead, represent an exception. The uncommon richness of this resource with which Italy is endowed, determined an early exploitation of geothermal energy, starting already at the beginning of the 20th century, of which Italy is nowadays the second producer, after the USA, in the World (Malanima, 2006). However, the most important RES in Italy remains hydropower, which reached its maximal exploitation already in the 60s and has remained nearly constant since then, depending only on the meteorological conditions.

Figure 5: Electricity generation Italy 2009



Source: Own elaboration on data by Terna

6.2. Main actors involved in the wind power industry

When it comes to the energy sector the division of responsibilities across the institutions is rather complex and confusing. At least seven Ministries are involved in the process of decision making, alongside of which regions and governmental agencies also dispute over various rights. Due to the process of decentralization of the public administration, started with the "Bassanini Decree" in 1998, the role of the regions has been progressively strengthened, attributing to them important administrative rights in matter of production, transport and national distribution of energy (Di Nucci, 2005:201).

Among the governmental agencies involved in this decision making process, the main actors working for the promotion of wind power and other RES are the National Research Council (CNR) and the National Agency for New Technologies, Energy and the Environment (ENEA). The last one in particular, founded in 1994, has played an important role in the definition of energy and environmental policy in the country, providing research on these issues and the technology applied to them. Important has also been the activity of private associations such as APER, the Association of Renewable Energy Producers, founded with the aim of protect and represent the interests of the operators of the sector and ANEV, the National Wind Energy Association, which main scope is promoting the diffusion and knowledge of wind technology.

However, the key role in the development of RES in these recent years has been played by the Manager of Energy Services (GSE), a limited company, controlled by the Ministry of Economic and Finance, that is in charge of organizing and manage the support scheme for renewable energy resources. It controls the distributions of the Tradable Green Certificates and the reimbursement of feed in tariffs.

Finally, the engagement of environmental associations, such as Greenpeace, Legambiente, WWF-Italia, shouldn't be underestimated because of the influence, good or bad, they have on the public. In particular, the diffusion of wind power has caused the raise of a movement, guided by the "Comitato del paesaggio" and "Italia Nostra", against its development, arguing that it is incompatible with the preservation of the cultural, historical heritage of Italy and its landscape resources (Di Nucci, 2005).

7. National Diamonds

According to Porter (1990) the answer to why a nation achieve international success in an industry and another doesn't lies in the *home base* environment in which the firms of this particular industry compete. This environment is shaped by four different determinants and two variables that interacting with each other create the conditions for a firm to be born and flourish.

In this chapter each of these factors will be presented and discussed in relation to the wind power industry in Italy and Spain. Following the order in which Porter himself introduced them, starting with factor conditions, followed by demand conditions, related and supporting industries and firm strategy, structure and rivalry. Then the role of government, due to its strategic importance in energy industries and in particular RES, will be analyzed as a fifth determinant. Finally, what role chance has played in relation to the development of the wind power industry in the two countries will be analyzed.

7.1. Factor Conditions

Porter states that the factors that are most determinant for the growth and success of an industry, especially in advanced countries, seldom are those that a nation inherit, but those that it is capable of creating (Porter, 1990:74). In the case of the energy industry though, it can be argued that it is exactly the endowment of resources that primary causes the development of one particular industry and the society around it, see England and its coal during the first industrial revolution or, more recently the wind power in Denmark. The factor conditions that will be analyzed in this paragraph are divided in: *physical resources, knowledge resources* and *infrastructure.*

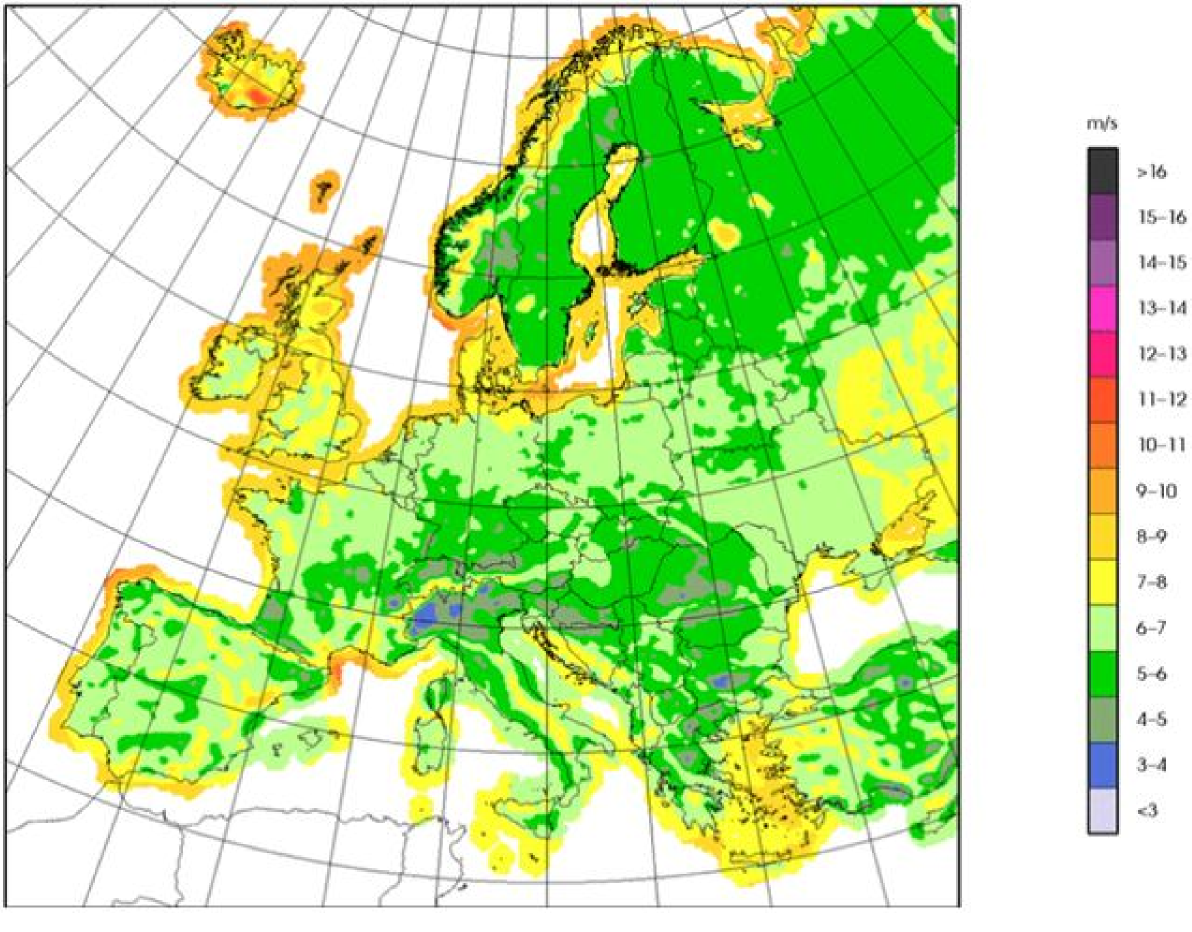
Physical resources

Physical resources are defined by Porter (1990) as the physical traits of a nation, that is its natural characteristics. In the case of the wind power industry the geography of the nation and its position determine the accessibility of wind resources.

Italy and Spain are both located in Southern Europe and enjoy a typical Mediterranean climate, warm and dry summers and mild, wet winters. However, due to the large extension of the two countries, their climate can change significantly among different regions, in particular between mountainous internal regions, that experience a more continental climate, and coastal areas.

Neither Spain nor Italy have an exceptionally windy climate as in the case of Denmark, but both countries have large wind resources onshore and offshore. In Spain the regions of Navarra and Galicia in the northern part of the country are especially rich in wind while in Italy the most windy regions are situated in the southern part.

Figure 6: Mean Wind Speed at 80m, Europe 2010



Source: AWS Truepower

As shown in Figure 6, Although the Iberian peninsula appears to be slightly richer in wind resources than the Italian one, the situation of the two countries is very similar. In particular, it is noticeable that the regions considered more windy are situated in mountainous areas, creating a more challenging situation for the deployment of those resources. These sites, other than difficult terrain, have encountered strong public opposition. In Italy, wind power opponents claim that installations in mountainous areas disfigure the landscape. Furthermore, these areas are usually scarcely populated, meaning that, in order to fully exploit their potential, large electricity transmission implants must be built to make the electricity available on the national grid.

However, the terrain characteristic of windy regions in Spain, in accordance with Porter's theory, has contributed to the success of the country's turbine manufacture and developers industries. The challenging terrain situation has encouraged the operators in these industries to find suitable solutions, resulting in the development of valuable skills and instruments to handle difficult terrain situations that can be exported to other nations (Bolon et al, 2007 :22).

It is also clear from the figure that large wind potential is situated in coastal areas, laying down the basis for a possible positive development of off shore wind power plants.

Knowledge resources

Wind power is a highly technological and innovative sector, therefore the local availability of highly skilled human resources is fundamental for the development of a national industry. However, although the technological and scientific preparation provided by the country's educational system might be an important factor condition, it will not be considered here. The evaluation of the educational system on a national base is a hard task due to the inexistence of valid data and the not homogenous distribution of knowledge among schools. Furthermore, it can be argued that the level of knowledge in a certain sector of a country depends more on the local availability of specific resources than the average level of technological education of the country itself. This availability can, thus, be evaluated through the number and extent of Resources and Development (R&D) activities specific to wind power. The significant investment in these activities is considered necessary for a successful development of an industry, especially in relatively new sectors as RES.

Spain has made a substantial effort in coordinating R&D activities at a national level, through the publication of National Plans and institution of entities that have the scope of elaborating common technological objectives. A first "National Energy Plan for Scientific Research, Development and Technological Innovation" was launched in the year 2000. The plan had the scope of promoting

R&D activities at a national level through the institution of a fund that subsidize only research projects in compliance with the objectives established from the state. In this first plan the projects that could benefit from the fund where mainly aimed to technology cost reduction and development of large wind turbines (1-2,5 MW). From the year 2000 to 2003 this fund approved 34 projects for a total of approximately 6 million € (IEA, 2004). These projects were presented for the greatest part by industrial companies in cooperation with engineering companies, universities and research centers.

In 2001 the National Center of Renewable Energies (CENER), located in the AC of Navarra, started its activities as a public funded research facility focusing on large turbine testing, blade development, control system and related research activities.

The National Energy Program for R&D has been subsequently updated in 2004 and 2008 with the definition of new objectives on which the research in wind power should focus on. In particular in 2004 emphasis was posed on promoting studies on wind turbine design for special sites.

Efforts in pushing technological innovation in the field of renewable energies have also been done by the IDAE. In 2005 this institution presented the “Spanish Renewable Energy Plan 2005-2010” with an exhausting analysis of the technological innovations required in the field of wind energy, defining in this way practical goals for wind manufacturers to achieve.

In 2005 a technological network including the industrial sector, the universities and research centers was created: REOLTEC (Spanish Technological Network of Wind Sector), promoted by the Aeolian Business Association (AEE) with the main objective to maintain the positioning of the national industry through the reinforcement of technological knowledge and selective diffusion of the results and experiences.

The private sector has been very active in R&D as well. According to the Manufactures and Promoters Association, Platafoma Eolica Empresarial, the yearly investment in R&D made by Spanish wind manufactures companies amounts approximately to 11% of the their gross value added, a percentage that is more than double than what Spanish manufactures in other technological field, as the automobile sector, use to spend in these activities. In 2006, for example, Gamesa and Ecotecnia launched Windlider 2015, an industrial research project aiming to keep Spain competitive in wind power technology with an expected budget of 40 million € (IEA, 2007).

In 2006 the industrial sector defined the “Strategic National Consortium for Technological Research” (PSE), that had as a main goal to increase the cooperation between public and private entities. Since the year of its formation, it has promoted and financed two projects: Minieolica, a coordination plan for the development of small wind turbine, and Emerge, a project led by the wind developer company Iberdola Renovables in order to implement a technology for building offshore wind farms in deep waters.

In Italy instead there has been no national R&D program running on wind energy, but these activities have been performed by different activities in a sporadic and uncoordinated way. In particular, due to the absence of big national manufacturing companies in the country, research activities have been performed mainly by public research institutions and universities.

The main entities active in the R&D sector for wind power and, more in general, renewable energy sources in the country are:

- ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, that contributes in the field of wind power mainly through participating in national and international collaboration activities in the role of technology and market observatory (ENEA website, 2011).
- Erse, ex Cesi and Cesi Ricerca, that with the merger in 2000 with the R&D department of Enel (the previous state owned electricity monopoly) has become the market leader in testing and certification of electromechanical equipment and electrical power system studies. The main activity of this research center has been the implementation of a general map of Italy's wind resources, the Wind Atlas, completed for the first time in 2002 and subsequently updated in 2006. Cesi expenditures for wind power until the year 2000 have been evaluated as approximately 7.000 € per year (IEA, 2002). After the completion of the Wind Atlas, the main research activity performed by this center has been towards the implementation of solution to exploit offshore wind resources in deep water resulting in a study on floating platforms for offshore wind farms. Erse in 2009 had a financial allowance of about 2 million € and nearly the same budget for 2010 and 2011 (IEA, 2010). Other than research on onshore and offshore wind potential of Italy, in the recent years the center has been interested in control issues of wind turbines and their operating strategies.
- Universities: Wind energy related R&D has been carried out by a few universities (University of Bologna, Trento, Genoa and Polytechnic of Milan) since the beginning of 2000, while since 2007 new projects related to this sector have started in the universities of Catania, Florence, Padua and Naples.

This analysis and the values reported in Table 1 clearly show that the base of technological knowledge in Spain around wind power is significantly greater than in Italy. In fact, only in 2007, the budget allocated to Wind R&D by Spain was 0,122 million € per thousand people, while in Italy the ratio was nearly half.

Table 1: R&D Budgets devoted to wind power in million € in Italy and Spain 2000-2007

Countries		2000	2001	2002	2003	2004	2005	2006	2007
Italy	Wind R&D budget	0,63	0,61	0,59	0,12	0,11	0,11	2,16	3,16
	Wind R&D budget/population	0,011	0,011	0,010	0,002	0,002	0,002	0,037	0,053
Spain	Wind R&D budget	3,52	2,78	3,81	3,96	8,56	9,5	7,52	5,46
	Wind R&D budget/population	0,087	0,068	0,092	0,094	0,201	0,219	0,171	0,122

Source: own elaboration from IEA and OECD data.

Infrastructures

Porter includes infrastructures among the factor conditions, claiming that the state, quality and cost of the available infrastructure affect the competitiveness of an industry. In order to measure the development of this factor relative to wind power I will use the Renewables Infrastructure Index computed by Ernst & Young, which most recent version was published in the Renewable Energy Country Attractiveness Index's issue of February 2011.

This index assign a score between 0 and 100 to the general regulatory infrastructure for renewable energy present in each of the analyzed countries. The score is calculate on basis of three factors, each of which has been given a different weight:

- Electricity market regulatory risk (29%). The more deregulated the market the higher the score.
- Planning and grid connection issues (42%). That measure the level of accessibility to the grid and takes also into consideration the degree of grid saturation for intermittent technologies as wind power.
- Access to finance (29%). That accounts for the financing environment for RES powered projects (Ernst & Young, 2011 :27).

According to the February 2011 issue of the index Italy scores 68 points while Spain scores 55. These points have been given in considering every RES utilized in the countries, thus are not specific for wind power. The industry specific Index, also realized by Ernst & Young, instead is made out of the infrastructure index and a technology index elaborated on the basis of each country tax climate, subsidy availability, market growth potential, installed capacity, quality of the resources and projects' size. The wind index, calculated in the same period of the precedent one, sees Italy scoring higher than Spain again with a respective 62 and 56 points.

The two countries, although having similar physical resources, are noticeably different when it comes to knowledge resources. Spain has, and continues to invest substantially and systematically in wind related R&D activities, while the research in Italy has a more sporadic and unorganized nature and a significantly lower budget. When it comes to infrastructures, Ernst & Young Renewables Indexes highlights a slightly better situation for Italy compared with Spain, but this rather indicates that Italy has higher development margins than Spain, where the industry has reached a more mature state, than it has a comparative advantage.

7.2. Demand conditions

The second determinant of industry competitiveness is, according to Porter, given by the structure and evolution of the home demand, that, although in various extents, influences the development of the supply industry. In particular the scholar highlights that it is rather the quality than the quantity of the home demand that haa a stronger influence in determining competitive advantage (Porter, 1990: 86).

Market Overview and development

The demand for wind power and for RES in general is strongly connected to the demand of electricity and the established objectives of penetration of renewable resources in each country. Specifically, the need to develop RES in both Spain and Italy is further enhanced by the high foreign energy dependence. Thus, in order to estimate the market size and potential for wind power, the current electricity demand, the actual share of wind power and the country's penetration objectives will be analyzed.

Table 2 : Evolution of wind power electricity production in Italy and Spain 2002-2008

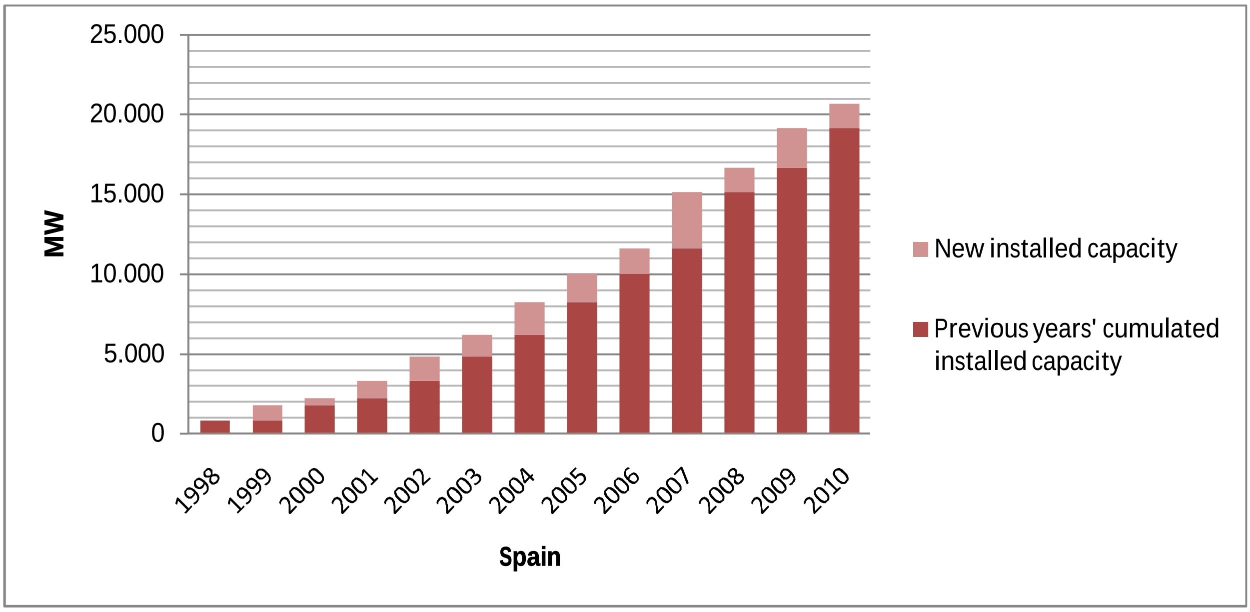
		2002	2003	2004	2005	2006	2007	2008
Italy	Final Electricity consumption	282.751	291.436	295.531	300.880	308.777	309.318	309.317
	yearly increase of electricity consumption	..	3,03%	1,40%	1,79%	2,59%	0,18%	0,00%
	Wind power production	1.404	1.458	1.847	2.344	2.971	4.034	4.861
	% of wind power on final electricity consumption	0,50%	0,50%	0,62%	0,78%	0,96%	1,30%	1,57%
Spain	Final Electricity consumption	205.510	217.898	230.669	242.222	256.466	262.233	268.731
	yearly increase of electricity conssumption	..	5,85%	5,70%	4,89%	5,71%	2,22%	2,45%
	Wind power production	8.704	12.075	15.601	21.219	23.297	27.568	32.203
	% of wind power on final electricity consumption	4,24%	5,54%	6,76%	8,76%	9,08%	10,51%	11,98%

Source: own elaboration from Eurostat data, values in GWh

Table 2 shows the yearly electricity demand in Spain and Italy, the production from wind power and the share of demand it satisfies from 2002 to 2008. It is clear then that the market penetration of this RES in Spain is much higher than in Italy and that it has been able to grow at a faster speed than the respective electricity demand.

In order to further analyze the market development of the wind sector it is useful to take a look at the installed capacity in time, a measure that is most widely utilized to illustrate the growth of electricity sources.

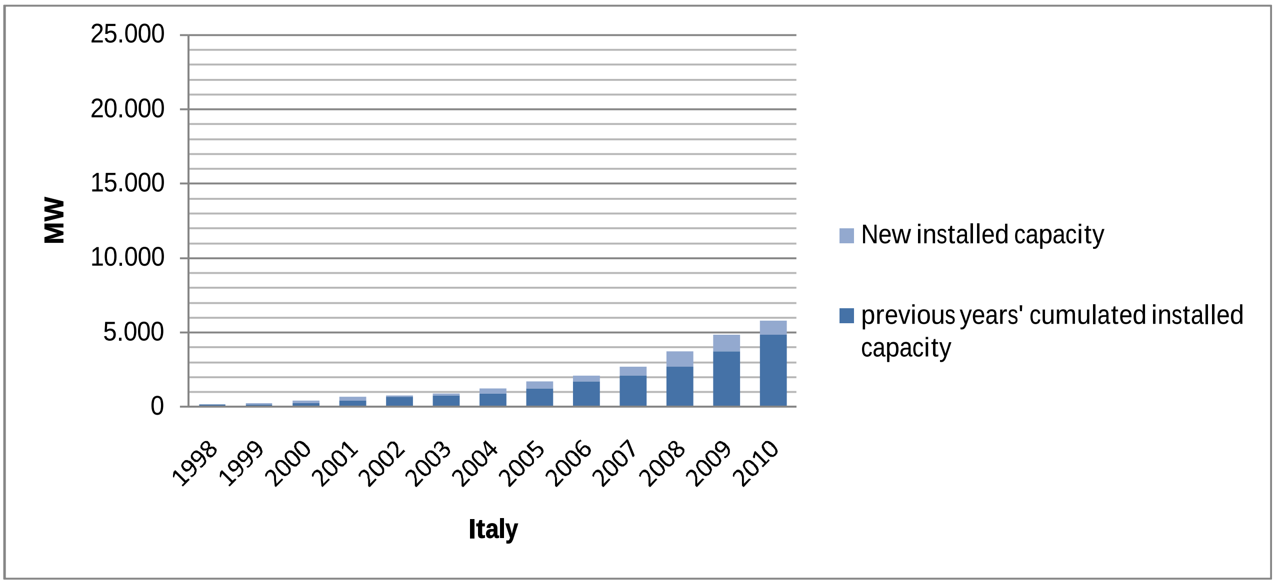
Figure 7: Cumulative Installed Wind Power Capacity Spain 1998-2010



Source: own elaboration on EWEA data

From the Fig. 7 it is evident that the installed capacity in Spain has been growing at an almost steady rate, in particularly noticeable is the increase in 1999, due to the liberalization of the electricity market in 1997 and in 2007, when the cap and floor price system was introduced.

Figure 8: Cumulative Installed Wind Power Capacity Italy 1998-2010



Source: own elaboration on EWEA data

In Italy the Fig.8 shows a clear delay in the implementation of wind power generation plants compared to Spain, the real catch up appears to start as late as 2004, after the publication of the

Legislative Decree 387/03, that established the first clear definition of renewable energy sources.

Spanish society welcome positively the great development of installed wind power, appreciating its capacity of contributing to CO_2 reduction and at the same time, through the development of an industry, influence the economic growth of the nation and creating new jobs (IEA, 2003).

Both states have more or less defined the objectives for the future development perspective of the industry. According to the majority of the Spanish Autonomous Communities the country has the possibility to reach 41.000 MW of installed capacity between 2010 and 2020 (almost double the actual capacity). In Italy, instead, the development of the sector is estimated to have the possibility of reaching 16.000 MW (more than three times the actual capacity), considering also the possible development of offshore wind farms (APER, 2010).

The distribution of wind farms is naturally dependent on the availability and accessibility of wind resources. In Spain wind plants are present in fifteen out of seventeen AC, among these the leadership is hold by Castilla-Leon, that alone had almost 4,000 MW of installed capacity at the end of 2009 (IEA, 2010), following with more than 3,000 MW installed respectively are Castilla-La Mancha and Galicia. In Italy wind energy is present in sixteen regions out of twenty, but only has a significant production in the southern regions. Specifically, Apulia and Sicily are the regions with a higher installed capacity, each slightly over 1,000 MW.

The reason of such chaotic development of wind power in Italy it is to be traced in the absence of a national guideline for location of wind farms and landscape impact. This absence pushed local authorities to issue their own regulations and a consequent diffusion of wind farms at a speed that reflect the availability of easy accessible wind resources. This situation caused a high uncertainty for investors in the sector of wind power since it resulted in a very heterogeneous, sometimes unclear and long collection of procedures which can easily create delays, financially unbearable by small companies.

Obstacles to wind power market growth can be founded in Spain in the public acceptation of offshore wind farms and the reduction of incentives that is likely to happen in the future (Bolon et al, 2007:22). Issues that affect the growth of the Italian market are, instead, other than the absence of national guidelines, strictly connected to the electricity grid. According to TERNA, (Italian National Electricity Transmission Grid Operator), the actual Italian grid is not sufficiently capable of transporting electricity created by wind plants in periods of high wind speed, resulting in forced power reductions in order to avoid grid overload (APER, 2010).

7.3. Related and supporting industries

The presence of suppliers or related industries that are internationally successful is what Porter considers the third determinant for national competitive advantage. Having a strong supply base in the home country represent, in most cases, an efficient and preferential access channel to cost-effective inputs (Porter, 1990: 101). In the same way, thriving related industries with which it is possible to share activities during various steps of the value chain, can have a positive influence for the successful development of the industry itself.

Supply industries in the wind power sector are generally considered to be the manufacturers of wind turbine components as blades, generators, gear-boxes, towers and wind sensors. In Italy there are numerous companies that produce components for wind turbine and wind farms, among which the main are ABB, for engines and generators, Bonfiglioli and Comam for reduction gears and Monsuld for towers (IEA, 2005:145). However, all these suppliers operate exclusively in Italy and don't represent a substantial competitive advantage in so much that the Italian wind power industry in manufacturing is still at an embryonic stage, while the sector of services and wind farm developers is expanding rapidly. In Spain, on the other side, the wind turbine manufacturer industry is highly developed, being home of one of the world leader wind manufacture company, Gamesa Eolica, that other than in complete wind turbines is also specialized in the production of their components (IEA, 2008:208). The success of this sector of the industry has most certainly influenced the sector of wind farm developers, among which the Spanish Iberdola is one of the world's top wind power producers.

When it comes to related industries, both countries have a strong tradition in industries such as automobile and aircrafts that constitute a valid aid to the development of wind power. Until now, though, only the Spanish wind industry has been able to fully utilize this knowledge base to focus on high value-added activities. In Italy instead the complexity of wind technology was initially underestimated, so that system and components weren't designed and tested properly, resulting in failures (Pirazzi and Silvi, 2005).

7.4. Firm strategy, structure and rivalry

The forth determinant of national advantage described by Porter is represented by the context in which firms are created and organized, as well as the composition of domestic rivalry (Porter, 1990:107). The managerial style, the company culture and the hierarchical structure of companies are considered by Porter important determinants that influence significantly the success or failure of a particular firm, industry or nation. However, it is difficult to evaluate whether a particular firm structure will be more successful than another and Porter himself doesn't give any particular guideline. Everything is highly dependent on the specific sector or company are being examined. In this particular context, since both Italy and Spain are characterized by a mild authoritative management system, strong familiar ties and a similar Mediterranean culture (Pavett and Morris, 1995), it can be reasonably assumed that this factor didn't play a fundamental role in the different development of the wind power industry observed in the two countries. Thus the focus on the industry's characteristics in this paragraph will be mainly on the level of rivalry present in the countries, measured through the number of firms, the relative market shares and their development over time.

The birth of an industry

The first wind generator of significant size and advanced technology, a 100 kW turbine, was installed in Spain in 1982, followed throughout the 80s by a series of small scale experimental projects financed by public resources in R&D for the development of wind power in the country (Venancio, 2008:10). Despite this early start, it was only after the electricity reform of 1994 that the real expansion of the sector begun. The two main producers of wind turbines in this initial phase were Made and Ecotècnia that reached competitive expertise thanks to a combination of technological transfer, from USA and Denmark, and internal development (Neij et al, 2003: 67).

Nowadays Gamesa holds the largest market share (47,6%) among wind power manufacturers. This company entered the wind industry in 1994 forming a joint venture with the Danish giant Vestas. The agreement provided the Spanish company with the rights to manufacture, assemble and sell Vestas' turbines in Spain. The joint venture terminated in 2001, when Gamesa bought out the Danish's share maintaining, though, the intellectual property rights on the technology utilized up until the end of the collaboration. This last particular allowed the company to produce and develop Danish technology in Spain and worldwide (Venancio, 2008:12).

The integration of technology transfer with local implementation has been, thus, at the base of the success of wind power in Spain. The agreement between Gamesa and Vestas was, in fact, part of a strategic plan actuated by the Spanish government in order to increase the competitiveness of the local industry (ibid).

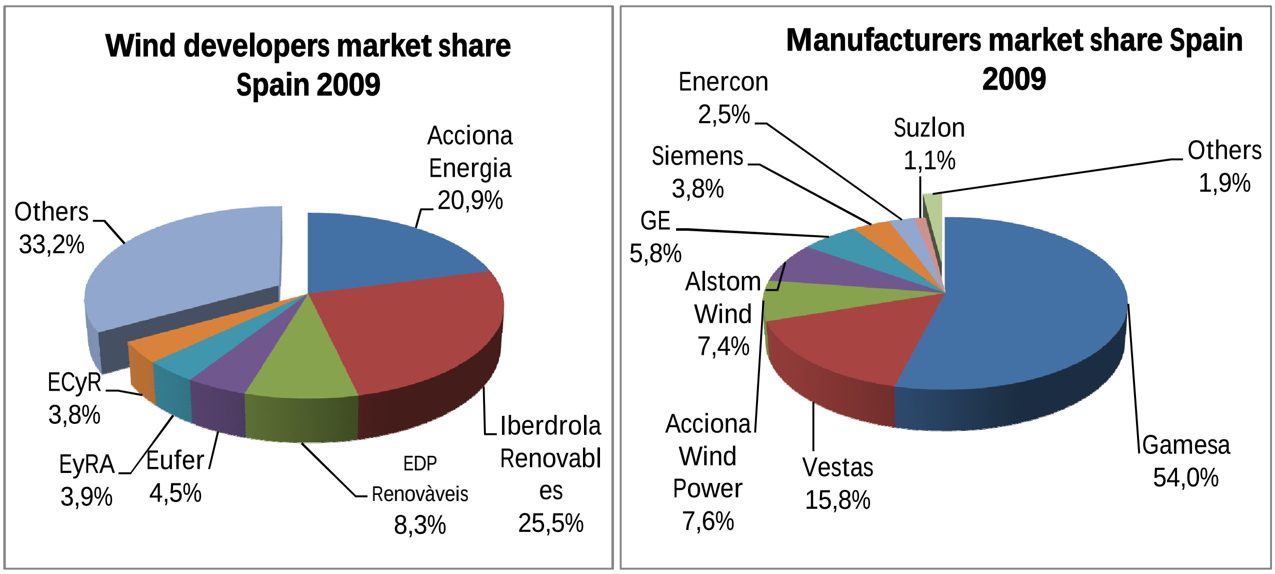
In Italy as well the production of electricity from wind begun in the 80s with a series of experimental prototypes, but a real industry started to develop only in the second half of the 90s, when the first wind power park publically utilized for the production of electricity was installed, 1996, in Montefalcone by IVPC s.r.l. with a capacity of 7,2 MW. However, IVPC, born as an offspring of the American UPC, is an operator in the production and sale of wind power in Italy and does not manufactures its own turbines.

The wind manufactory technology industry instead, started in the beginning of the 90s with the creation of IWT (Italian Wind Technology) as a joint venture between Finmeccanica (an Italian holding) and the Danish Vestas. Despite an encouraging start, in 2001 the destiny of IWT took an opposite turn than for the Spanish Gamesa. The company was in fact bought out from Vestas and transformed into an Italian subsidiary of the Danish company, Vestas Italia. Nowadays, the national industry maintains only a marginal role in manufacturing, producing components or small turbines, while most of the firms in the wind power sectors focus on commercial activities, infrastructure and system design.

Industry status

There are approximately 400 companies operating in the wind power sector in Spain, spread through the whole value chain, from blades and gear boxes manufactory up to wind park maintenance (IEA, 2009). Although the number of operators entering the industry is slowly increasing, the largest market share, both among manufactures and developers, is still maintained by few big companies.

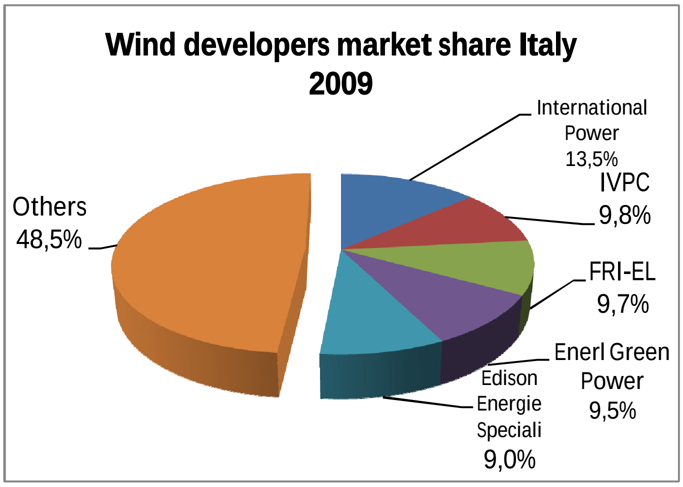
Figures 9 and 10: Developers and Manufacturers share of wind power capacity installed in Spain at the end of 2009

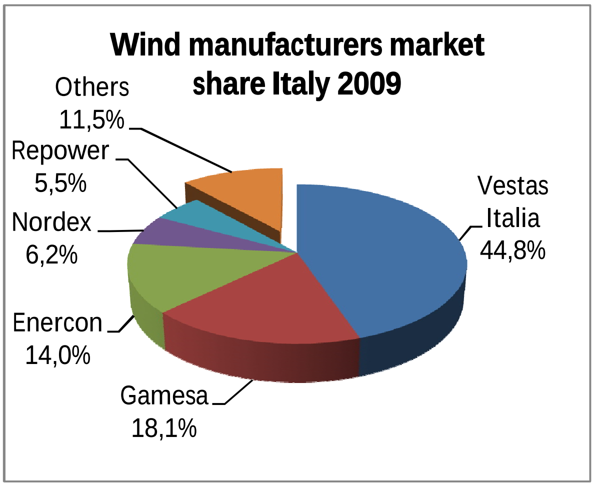


Source: own elaboration on data from AEE

As shown in Fig. 9 and 10, almost every wind developer operating in the Spanish market is a national company, whereas in the manufactory sector, although the solid position maintained by Gamesa, foreign firms are increasing their presence, in particular the Danish Vestas, the German Siemens and Enercon, the American GE and the French Alstorm.

Figures 11 and 12: Developers and Manufacturers share of wind power capacity installed in Italy at the end of 2009





Sources: own elaboration on data from APER and ENEA

The number of companies directly involved in the wind power sector in Italy, instead, is approximately 150, less than half of those in Spain,(IEA, 2009). As it is evident from fig.12 foreign manufacturers supply most of the wind turbines in the country, with the largest shares hold by Vestas Italia and Gamesa. In particular, Vestas Italia is the only manufacturers with a production site in the country. Although the presence of national manufacturers of large wind turbines (over 1MW) is almost nonexistent, except for Leitner AG that in 2009 launched its 1,2 MW turbine (APER, 2010), it should be reported that Italian manufacturers of small and medium turbines, such as Jonica Impianti, Salmini and Tozzi, have been operating since the end of the 90s, mostly for privates or small community installations (Pirazzi, 2008). Most of the firms operating in the sector are, instead, developers or service companies, but, also in this field, the market leader is the British multinational International Power.

Compared to Spain, Italy, still lacks a strong national presence in the industry of wind power, considering both wind farm developers and manufacturers, the national market is dominated by foreign companies and technology. In Spain, on the other hand, the already high number of firms involved in the sector continues to grow, increasing the competition between companies and, thus, creating that domestic rivalry that Porter (1990) considers necessary for a successful development of an industry, since competition forces companies to improve and innovate.

7.5. The Role of Government

According to Porter, government is not a determinant but a variable that, from outside the diamond, influences, and can be influenced in return, the four determinants. As discussed previously, in the specific case of renewable energy industries, the role of government is more important that it is in other industries, since the demand for RES is usually created by the government through a series of incentives, from taxes to investment subsidies. These, keeping the value of electricity generated by renewable sources high, stimulate investments in the sectors and enable them to compete with more traditional sources (Pirazzi, 2008:246).

In this paragraph, thus, the different systems of incentives adopted by the two countries in the field of renewable energies will be analyzed and their effectiveness assessed.

Spanish RES legal framework

In Spain, the first legal framework for RES support was introduced in 1980 with the 82/1980 Energy Conservation Law, that created a special economic regime for all users of hydropower plants below 5 MW and any other RES. The law guaranteed the right to grid connection for the RES producers, a contract with the local electricity utility to buy the surplus, a certain guaranteed price[1] and several investment subsidies. Thanks to this first step the number of projects based on non-hydro started to increase sensibly after 1990. In particular, between 1980 and 1994, investment subsidies enabled a range of profitability of wind technology based projects of 10-20%. The relatively high profitability of the sector attracted entrepreneurial economic actors, creating a favorable environment for the development of this industry (Dinica, 2006: 467).

However, before 1994 RES weren't clearly defined. The first rough definition of renewable energy came with the Royal Decree 2366/1994 and even here only three out of six groups of energy technology, eligible for the special regime, utilized non fossil fuel resources. In addition, the decree extended the guarantee of the purchasing contracts to a minimum of five years and transferred the responsibility of setting the prices from the Minister of Energy and Industry to a Royal Decree.

The real milestone that signed the beginning of the Spanish success was, though, laid when, under the reorganization of the electricity industry in 1997 that initiated the process of liberalization of the sector, the Royal Decree 2818/1998 clearly defined RES, divided in nine different categories, and

[1] The price was set annually by the Minister of Energy and Industry (Dinica 2002).

implemented the feed-in-tariff (FIT) scheme (Dinica, 2002:2).

After 1997 the producers through renewable sources could choose among three different schemes to sell their electricity:

- The ordinary regime (R.O.), that regulated all the conventional generating source with plants above 50MW, where electricity is sold through a pool system and RES producer receive a bonus of 0,01 €/KWh (Dinica, 2002:6).
- An independent system for producer with plants smaller than 50MW, in which they stipulate freely bilateral contracts with distributor, supplier or costumers (ibid).
- The special regime (R.E.) that regulates RES and CHP (Combine Heat and Power) plants, and includes a fixed tariff and a market price option.

Under the R.E. the market price option is constituted by a pool price, determined as a monthly average price calculated by the national electricity network Red Electrica Española (REE), and a bonus, established for each different technology. The fixed tariff is also dependent on the kind of technology used and it is revised annually according to the estimated evolution of market prices: for wind power it has varied from 6,2 and 6,6 €cent/KWh in the period 1999-2004 (Meyer, 2007:357).

In the latest years Spanish RES supporting system has promoted increasingly integration of the RES in the national energy market. The Royal Decree 436/2004 established new incentives for RES producers to join the national pool with the introduction, other than a market bonus, of a green bonus corresponding to 40% of the average costumer price (Mayer, 2007:357). The system has been further updated in 2007 (RD 661/2007) with the introduction of a *cap and floor price* that, securing a minimum profitability level, guaranteed an internal rate of return between 5 and 9 percent to the RES generators that decide to participate in the electricity pool market (González, 2008:2926).

Table 3: Evolution of electricity prices and wind power incentives in Spain 2001-2006

Spain	2001	2002	2003	2004	2005	2006
fixed price	6,26	6,28	6,21	6,21	5,86-6,5	6,6
bonus	2,88	2,89	2,66	2,66	3,66	2,47
electricity market price	2,92	3,07	3,01	3,06	3,11	3,27

** values in € cent/kWh, market prices per industry 25MW, data IEA and Eurostat*

Table 3 presents a summary of the evolution of wind power incentives relatively to electricity market prices, highlighting the two options of a fixed annual tariff and a bonus price to be added to the market price. It appears noticeable how the values of the incentives are always kept in line with the ones of the electricity traded on the market to ensure the producer a gain almost equal to the market price itself.

In addition to these policies, it must be mentioned that local content requirements for wind power industry have been in place in Spain for many years. According to this rule, every project for the installation of wind turbines in the country's territory must include a certain percentage of locally manufactured technology. The origin of the fortunate joint venture with Vestas from which Gamesa was born can be traced to the enforcement of this local content policy (Lewis and Wiser, 2007:1851).

In 2010 Spanish government issued a decree showing a tendency turnabout of its policy on RES. According to the Royal Decree 1614/2010, the feed-in tariff (FIT) for wind power generation will be reduced by 35% from the beginning of 2011. Moreover, this decree establishes a limit of electricity generated from thermal and wind plants eligible for government support, equal to net electricity generated over the year divided for the plant's nominal power, once that limit is reached, every excess of electricity generated will not be entitled of any financial support (IEA website, 2011).

Italian RES legal framework

The first, timid, step taken by the Italian government towards the promotion of renewable energy sources can be traced back to 1992. In this year the Inter-ministerial Committee on Prices (CIP) issued the decree n°6 establishing a 6% increase in the final electricity price to the consumers, the revenue of which should be used to incentivize the development of renewable resources. In reality this decree, nowadays still in force, is not fulfilling properly its intent. Due to a very generic classification of renewable energy sources, only an average of 15% of the founds accumulated from it goes each year to investments in RES such as wind, solar or geothermal power, the rest goes mainly to waste and CHP plants (GSE website, 2011).

A turning point in the history of RES development in the country was when, in 1999, the Legislative Decree 79/1999 (so called "Bersani Decree") established the obligation for producers and importers of electricity from non renewable sources to introduce on the market a minimum quota of electricity generated by RES. This quota was equal to 2% of the production/import until year 2003 and has been augmented annually since then of 0,35% until 2007 and 0,75% from then. The quota can be reached either by the direct input of renewable generated electricity in the network or by purchasing the so called “Tradable Green Certificates” (TGC) from producers of renewable energy that attest an emission of electricity equal to the respective due quota.

In 2003 the Legislative Decree 387/03 acknowledged the European Directive 2001/77/CE in order to promote the introduction of renewable energy sources in the internal electricity market. The decree established, for the first time, a clear definition of RES excluding any energy sources derived from fossil fuel and limiting the considered biomass exclusively to those concerning the biodegradable parts of waste. It also introduced a financial sanction for the electricity producers that fail to fulfill their renewable quota. However, the enforcement of this sanction is very difficult in practice due to ambiguities of the legislation.

The legal framework on RES has been subsequently updated by the Budget Law 2007 and 2008. In particular the Budget Law 2008 (244/07) brought some changes to the Tradable Green Certificates and introduced a new feed-in system for small (below 1MW) renewable power plants. As for the TGC, the value of each certificate was established to 1MW and their emission guaranteed exclusively to GSE (Electricity Services Administrator) in a number equal to the product of net renewable electricity generated and a constant that differs for each kind of RES plant: from 0,8 to 1,80. The price of the certificates is calculated each year as the difference between 180€/MWh and the average cost of electricity registered the previous year. Furthermore, the law established that the TGC are paid to RES electricity producers only for the first 15 years of activity of each plants.

The new feed in tariff instead can be chosen in alternative to the green certificate system from the producers of RES with plants power below 1MW (0,2 MW for wind power) exception made for PV (photovoltaic) installations for which it is in force a special incentives plan since 2007. The new FIT plan consists of a premium price, to be added to the market price of electricity, that varies for each RES, from 0,18 €/KWh of gas from landfill to 0,34€/KWh of tidal and wave energy.

Table 4: Evolution of electricity prices and wind power incentives in Italy 2002-2007

Italy	2002	2003	2004	2005	2006	2007
Tradable Green Certificates price	8,42	8,24	9,74	10,89	12,53	13,75
electricity market price	6,01	6,45	6,3	7,2	8,2	8,2

** Values in € cent/kWh, market prices for industry 25 MW, data IEA and Eurostat*

Comparing Table 4 with Table 3 it appears evident the higher absolute value of the Italian incentives relatively to the Spanish one. However, comparing the incentives values to the respective market price for electricity, it is noticeable that Spain guarantees more than the double of the price to wind power producers while Italy a premium around 50%. At this point it would be interesting to see what are the actual costs for kWh of producing electricity from wind power in the two countries, so to have a rough estimation of the amount of benefit wind producers receive. Unfortunately these data are difficult to get, since wind power owners are unwilling to share them and they can vary significantly according to the level of windiness, terrain characteristics and distance from the grid (IEA, 2005).

Other than the above-mentioned measures, RES produced electricity benefits, in Italy, from a series of financial and investment incentives: its value added tax (VAT) is reduced to 10% (instead than 20%) and plants installed in southern regions enjoy a 10 years corporate reduction. Small plants (from 20kW to 100kW for wind power) qualify also for a refund for capital cost that can be up to 30% of their initial cost.

In the beginning of this year a new decree (28/2011), that will be in force from the beginning of June 2011, has further modified the legal framework around RES, with a substantial reduction of the incentives for the installment of new PV plants and a more complex procedure for these plants to access the benefits of the feed in tariff. This move of the Italian government has sensibly affected the stability of an industry such as the PV that is very dependent on the system of incentives.

Effectiveness assessment

Spain and Italy have, thus, adopted two different policy strategies in the promotion of wind generated electricity. While Spain introduced a feed in tariff program, Italy decided for a green quotas and tradable certificate. Both these instruments ensures a higher price to be corresponded to wind electricity producer compared to conventional electricity prices and, at the same time, promote the integration of wind energy in the electricity grid (Walz and Schleich, 2009:122).

More in detail, the implementation of FITs have been praised by its promoters because, since the price is fixed differently for each technology utilized on the basis of its learning curve, it will provide support for various technologies in each of their development stages. On the other hand, its opponents claim that the same guaranteed price is an inefficient and expensive way to promote the development of RES, since its burden falls on the consumers and tax payers. Furthermore, they state the FIT gives an excessive security to the producers discouraging competition. In contrast, renewable quotas, or as they are most generally called RPS (Renewable Portfolio Standard), are preferred by promoters of free-market, which argue that price and technology should be set by the market. The inconvenience associated with this policy, though, is that the free market tends to support strongly those technologies that are already in an almost mature phase, since those are the ones allowing to produce electricity at the lowest possible price, and, for the same reason, it penalize small producers that cannot reach the efficiency standard of big power plants (Lipp, 2007).

However, according to many scholars (Sijm, 2002; Lauber, 2004; Rowlands, 2005, Lewis and Wiser, 2007) FIT has been the policy scheme that has given, historically, more successful results. FIT appears, in fact, to create a stable and profitable market that attracts investors more than any other policy scheme. It is no accident that this is the policy scheme implemented in countries that are leading the wind power sector such as Denmark, Germany and Spain.

Although many different factors, as it has been analyzed in the course of this research, influence the success or failure of an industry, in this particular case it appear evident that the policy framework has had a fundamental role in the course of events that brought the Spanish and Italian wind power industry to their actual state. The choice on the Italian side to implement RPS it has revealed unfruitful since its formulation has limited its potential encouraging the development of few big companies, mainly adopting foreign technology, concentrated in particular areas where the wind blows stronger.

7.6. The Role of Chance

Porter (1990) states that chance plays an important role in shaping the future of an industry, single firm or even a nation. Chance is not considered a real determinant since, although it has the power to influence drastically every other factor, it can’t be influenced by the other actors in the diamond. A chance event is, in fact, defined as an occurrence that has little to do with circumstances and is outside the power of firms, or governments (Porter, 1990:124). In this category of events fall break-through inventions, major discontinuities in technology or input costs, political decision by foreign governments and, finally, wars.

In this context, fortunate or unfortunate events that have influenced the development of the wind power industry in Italy and Spain must be retraced primarily in the series of circumstances that affected the energy situation and sources of the countries. The oil crisis of the 70, together with the historically high dependence of the countries on foreign energy imports, played certainly an important role in pushing them towards the exploitation of new energy carriers. In this case, though, due to the still experimental stage in which renewable energy were, Spain reverted to coal for electricity production and started to implement nuclear power, while in Italy, after a brief parenthesis of nuclear power generation, it was natural gas that started to gain more and more importance (Di Nucci, 2005; Dinica, 2005).

The analysis of the per capita consumption of energy in the two countries demonstrates that they maintain almost the same level until 1960, when Italy enters a rapid electrification phase and accelerates its consumes while Spain continues to lag behind until the 1990s (Gales et al, 2007). Due to this delay, the industrialization process in Spain started, by chance, in the same period when all across Europe interest in wind power was growing (Ackermann and Söder, 2002) and the rapid implementation by the Spanish government of a scheme of incentives for the development of RES, can reasonably be assumed to have played a decisive role in the subsequent expansion of the sector. In other words, Spain, that at the time was a developing country decided to point on the emerging wind power technology, performing a sort of leapfrog ahead of Italy that, stuck in its old industrialized economy, failed to recognize an opportunity in the wind resource.

8. Summary and conclusions

The aim of this research was to establish whether Italy has the capabilities for a substantial and sustainable growth in the industry of wind power or, instead, the increase of wind farm installations is the fruit of large speculation on the high incentives grant from the state that are not contributing to the creation of an healthy industry.

Based on the assessment of each determinant of the diamond model and the role of chance presented in the paper, the future of the Italian wind power industry doesn't look bright. In particular when compared with Spain.

Table 5: Sources of advantages according to Porter's model for the Spanish and Italian wind power industry

Country	Factor conditions			Demand conditions	Related and supporting industries	Firm strategy, structure and rivalry	Government	The role of chance
	Physical resources	Knowledge resources	Infrastructure					
Spain	M	H	M	H	H	H	H	M
Italy	M	L	M	M	L	L	L	L

Key: The level of influence/development of each factor in Porter's diamond model has been assessed either as high (H), medium (M) or low (L).

In order to have a clear picture of what is the industry situation in the two countries, the main findings from the analysis have been summarize in Table 5. From a glance at the table it appears clear that the Italian wind power industry is lacking many of the requirement to be successful. In particular is noticeable the weakness in knowledge resources associated with wind power, resulting from the absence of a coordinate research and development plan across the country (well developed in Spain, instead) where R&D activities are performed in a sporadic and uncoordinated way by universities and public institution without relevant contacts with private manufacturer.

The absence of local manufacturers and the low development of related and supporting industry has also a decisive impact on the actual and future situation of the wind sector in Italy. One of the main factor of success in Spain has been, in fact, the birth of a strong local manufacture sector that implementing foreign and national technology have created Gamesa, one of the world leader wind plant manufacturer. With its continuing investment in the country, this company, still contributes actively to the growth of the sector.

However, the determinant that most likely has had the heaviest weight on the fortune of wind in the two country, is the government. Through its incentives the government has encouraged and guided the development of the sector from the start. But, while in Spain its intervention has been strong, coherent and organized, ensuring a stable environment that has attract private investment not only from big firms but also for a myriad of small manufacturers and service providers. In Italy high incentives and tax reductions, accompanied by an intricate structure of responsibility division among the institutions, created an unstable environment particularly hostile to small investors. This resulted in a almost complete absence of Italian wind manufactory industry in a national market dominated by large multinational companies attracted by the incentives of the state, but that, keeping their R&D and manufactory plants abroad do not contribute to the development of a local industry.

According to the latest trends, the amount of incentives granted by these countries will diminish significantly, and, if a more stable environment for the development of wind power will not be implemented in Italy, the future of the sector could be compromise. Large multinational investor could be driven away by the low prizes and a real local industry has not yet been established.

List of abbreviations

AC	Autonomous Communities (Spanish Comunidad Autónomas)
AEE	Asociación Empresaria Eólica (Spanish Aeolian Business Association)
ANEV	Associazione Nazionale Energia del Vento (Italian National Wind Energy Association)
APER	Associazione Produttori Energia da Fonti Rinnovabili (Italian Association of renewable energy producers)
APPA	Asociación de Productores de Energías Renovables (Spanish Association of Renewable Energy Producers)
CENER	Centro Nacional de Energías Renovables (Spanish National Center of Renewable Energies)
CHP	Combined Heat and Power
CIP	Comitato Interministeriale Prezzi (Italian Inter-ministerial Committee on Prices)
CNR	Consiglio Nazionale delle Ricerche (Italian National Research Council)
ENEA	Agenzia Nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (Italian National Agency for New Technologies, Energy and the Environment)
ENI	Ente Nazionale Idrocarburi (Italian National Hydrocarbons Institute)
EWEA	European Wind Energy Association
FIT	Feed-In Tariff
GSE	Gestore Servizi Energetici (Italian Manager of Energy Services)
IDAE	Instituto para la Diversificación y Ahorro de la Energía (Spain Institute for Energy Diversification and Saving)
IEA	International Energy Agency

IVPC	Italian Vento Power Corporation
MITyC	Ministerio de Industria, Turismo y Comercio (Spain Ministry of Industry, Tourism and Trade)
PV	Photovoltaics
R&D	Research and Development
RE	Régimen Especial de energia (Spanish special regime energy)
REE	Red Electrica Española (Spanish national electricity network)
REOLTEC	Red Tecnológica Española del sector eólico (Spanish Technological Network of the Wind Sector)
RES	Renewable Energy Sources
RPS	Renewable Portfolio Standard
TERNA	Trasmissione Elettrica Rete Nazionale (Italian national electricity transmission grid operator)
TGC	Tradable Green Certificate

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