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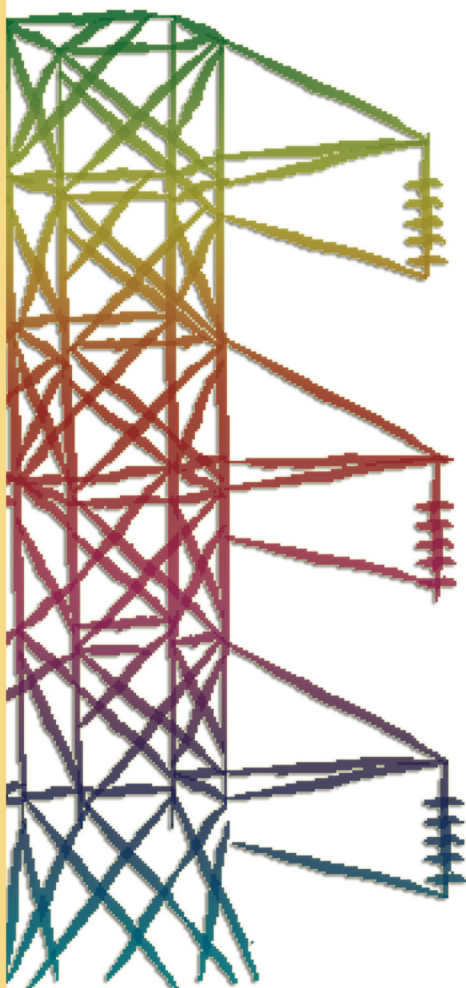
Ministero dello Sviluppo Economico

RICERCA SISTEMA ELETTRICO

IEA Wind Energy Annual Report 2007

Italy Chapter

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IEA WIND ENERGY ANNUAL REPORT 2007 - ITALY CHAPTER

Luciano Pirazzi (ENEA)

Claudio Casale (CESI RICERCA)

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Responsabile Tema: Marco Citterio, ENEA

IEA Wind Energy Annual Report 2007

Italy Chapter

1.0 Introduction

For the Italian wind sector, 2007 was marked by three main developments. Two of these will continue to have an effect in the future, namely the introduction of a new renewable energy sources (RES) incentive scheme in the 2008 Financial Law (Law 244 of 24 December 2007) and the presentation of the Italian government's Renewable Energy Position Paper, which established a maximum theoretical potential for wind energy in 2020. The third development was a new annual record for installed wind power capacity (603 MW in 2007), which brought Italy's total online capacity over the target of 2,500 MW established for wind power in the 1999 National White Paper for Exploitation of Renewable Energy Sources (**Table 1**).

Table 1 - Key statistics 2007: Italy

Total installed wind generation capacity :	2,726 MW
New wind generation capacity installed:	603 MW
Total electrical output from wind:	4,184 GWh
Wind generation as % of national electric demand:	1.23 %
Formal wind target according to the 1999 RES White Paper:	2,500 MW or 5 TWh by 2008–2012
RES target according to Directive 2001/77/EC and Legislative Decree 387/2003:	22% (76 TWh) of gross electricity consumption from RES by 2010
Maximum wind potential according to the 2007 Position Paper of the Italian Government:	12,000 MW or 22.6 TWh by 2020

The Renewable Energy Position Paper (**1**) was presented in Brussels by the Italian government on 10 September 2007, following the adoption by the European Commission of the action plan "An energy policy for Europe" in spring 2007 (this plan established, among other objectives, a EU target of 20% of overall primary energy consumption from RES by 2020).

The Italian Position Paper included a part devoted to incentives and market design, where the importance of a greater, and possibly harmonized, use of market-based instruments together with appropriate technology-specific incentives and a stable and simple framework to encourage investments have all been stressed.

Italy supports the idea of having a harmonized set of incentives across Europe and also supports market-oriented incentives for their advantages in terms of transparency, cost-based competition among sources and cross-border trade.

Technology-specific support has to be provided in this scheme by a series of measures, including so-called "technology banding". Stability in the incentive scheme is deemed necessary to give the industry a clear and long-time framework, which can in turn stimulate investments and promote technological innovation. Administrative barriers need to be removed by streamlining procedures, simplifying support schemes and reducing requirements. However, the duration of incentives should be limited in time.

General issues for Italy

In view of the national targets that should be agreed upon on the basis of the 20% EU-wide goal mentioned above, Italy made a first, preliminary assessment of its maximum theoretical potential of energy production from renewable sources for all uses: electricity, heating/cooling, biofuels (**1**). This estimate considered the current starting point for each renewable source, the role of climate

change in renewable source availability, and the physical constraints related to landscape, climate, endowment of natural resources, and a number of additional source-specific assumptions. These calculations gave a maximum theoretical RES potential of 20.97 Mtoe per year in 2020 (Table 2).

Table 2 – Assessment of the national potentials for annual production of renewable energy (from the 2007 Renewable Energy Position Paper of the Italian Government)

ELECTRICITY	2005		2020	
	Power (MW)	Energy (TWh)	Power (MW)	Energy (TWh)
Hydro	17,325	36.00	20,200	43.15
Wind	1,718	2.35	12,000	22,60
Solar	34	0.04	9,500	13.20
Geothermal	711	5.32	1,300	9.73
Biomass, Landfill gas and Biological purification	1,201	6.16	2,415	14.50
Wave and tidal	0	0.00	800	1.00
TOTAL (MW/TWh)	20,989	49.87	46,215	104.18
Primary energy replaced (Mtoe) * * Using the Eurostat conversion factor	4.29		8.96	
HEATING/COOLING, BIOFUELS	2005		2020	
	Energy (TJ)	Energy (Mtoe)	Energy (TJ)	Energy (Mtoe)
Geothermal	8,916	0.21	40,193	0.96
Solar	1,300	0.03	47,000	1.12
Biomass	78,820	1.88	389,933	9.32
Total Heating/Cooling	89,036	2.12	477,126	11.40
Biofuels	12,600	0.30	25,600	0.61
TOTAL H/C+Biofuels (TJ/Mtoe)	101,636	2.42	502,726	12.01

The practicability of this theoretical potential, and therefore of a much greater diffusion of renewable energy technologies in Italy, is conditional upon a number of issues of a political, institutional, economic and technological nature.

The first and perhaps most important of these issues is that all new plants are subject to political and administrative authorizations which are, in turn, often affected by problems of acceptance by local communities. Italy has experienced frequent “NIMBY” problems that produced delays and in some cases cancellations of infrastructure projects. Streamlining the authorization process, and, above all, improving its efficiency, will be essential to boost the diffusion of renewable energy plants.

This issue is linked to energy policy being subject to various levels of governance in Italy, given the very important role assigned to regions in this sector. In order to achieve an ambitious national target, better coordination will thus be necessary, both among regions and between them and the national government. Regions should also take on their own targets, and define clear and efficient roadmaps to 2020.

An evaluation of the social and economic sustainability of RES promotion policies, including incentives, will also be necessary, with special reference to possible effects of RES promotion on energy prices for consumers and businesses. Possible negative consequences in terms of competitiveness and inflation will have to be taken into consideration.

Greater diffusion of renewable energy generation plants will also require stronger investments in the electricity transmission and distribution grids, also to accommodate small-scale distributed power generation resources that would need to be interconnected like an Internet network and in the form of two-way interacting infrastructures. In this sense, the guidelines provided by the SMART-GRIDS EU Technological Platform are a useful framework.

Specific issues for wind

Specifically in the wind sector, the main issues at stake are local acceptance of the environmental impact resulting from exploitation of progressively more valuable areas from a naturalistic or landscape point of view, and the natural saturation of the locations that have more specific capability. Also for these reasons, some development of offshore plants has been envisaged. Bearing in mind both likely resources and limiting factors, the Position Paper (see **Table 2**) set a potential electricity production at 2020 of up to 22.60 TWh from wind (with an installed capacity of up to 12 GW), compared with 2.35 TWh in 2005 and 3 TWh in 2006. Production from wind further increased in 2007, when it totaled 4,184 GWh according to 2007 provisional electricity statistics provided by Terna (Italian Transmission System Operator). This would mean 40.7% more than the previous year, which is a much higher growth rate than that of installed capacity. Nonetheless, installed capacity also rose by a healthy 28% and established an annual record for the number of MW installed.

As to the whole electricity system, according to Terna's provisional data, the 2007 electrical demand on the domestic grid (including both customer loads and grid losses) was 340 TWh, 0.7% more than 2006. As in previous years, imported electricity provided far-from-negligible help (the balance between import and export was nearly 46 TWh). Italy's 2007 gross domestic electricity consumption (i.e. 314 TWh of gross domestic production plus the balance between import and export) can therefore be put at about 360 TWh.

Hydropower once again supplied the largest RES contribution to gross domestic production, although its output (leaving out the production of pumped-storage plants) decreased by 10% compared to 2006, falling to about 33.5 TWh, because of less rainfall. As a consequence, despite the growing production from wind and other RES plants, total domestic production from RES in 2007 is estimated to be below the level of the previous year (52 TWh).

Wind-generated energy, as a percentage of national electricity demand, increased in 2007 to 1.23%, about 25% more than in 2006. A similar growth rate is forecast in 2008 as well.

2.0 Progress toward National Objectives

Despite a preliminary assessment of natural RES potentials indicated in the aforementioned Position Paper, Italy has not yet formally changed its previous target for RES established in the relevant White Paper of 1999, which also called for total RES electricity generation of 76 TWh/year by 2010 (this target was confirmed through Legislative Decree 387 of 2003). Nevertheless, this official target is now to be considered outdated because of the new goals recently fixed by the European Union, which will have to be achieved by the member states with different contribution shares. Consequently, new formal national RES targets will shortly be set according to the final decisions about the RES quota assigned to each country.

Considering the figures of Table 2 and comparing the energy expected from wind in 2020, or 22.6 TWh, with the previous target of 5 TWh in the 1999 White Paper, the wind sector should grow by a factor of 4.5 to comply with this new possible target. This would be possible by adding at least a further 9,300 MW, of which 2,000 MW likely offshore, in 13 years, through an average annual growth of something more than 700 MW. On the other hand, 700 MW is the minimum value that can now be anticipated for 2008.

2.1 Commercial development

With 603 MW of new generating capacity installed in 2007, which brought cumulative capacity to 2,726 MW, a new record of yearly growth was achieved, exceeding the previous one, established in 2005, of 453 MW (**Figure 1**).

However, this 2007 result is not enough to comply with the aforementioned European Union plans (20% of overall primary energy consumption from RES by 2020) and so it is necessary to increase

the annual growth rate (**Figure 2**) through the cooperation of all the central and southern Italian regions with the best potentials.

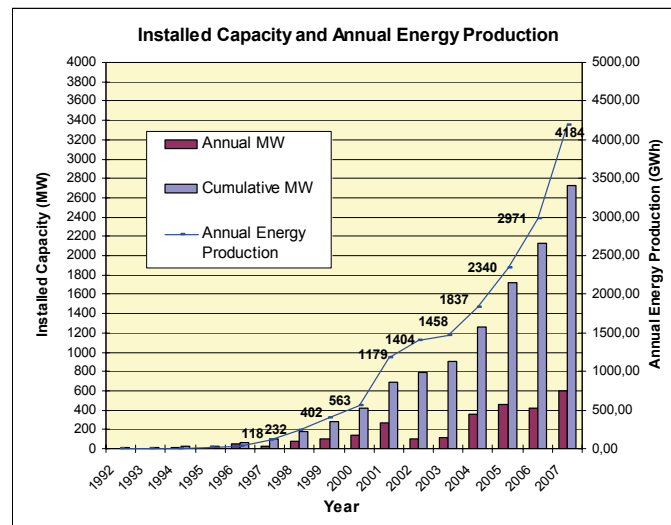


Figure 1 - Trend of annual and cumulative wind turbine capacity and electricity production from wind in Italy

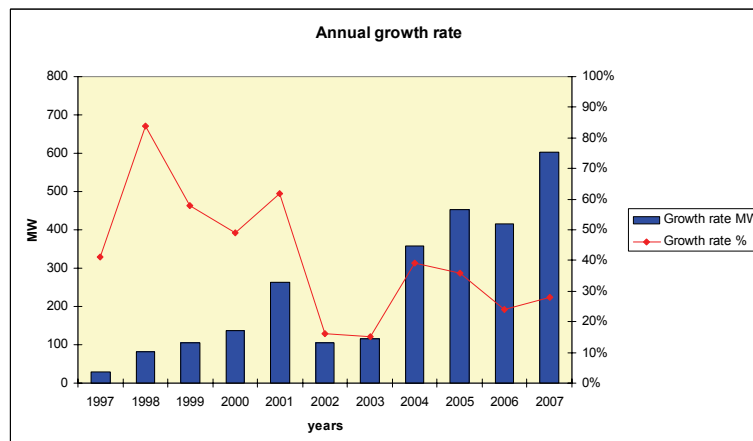


Figure 2 - Trend of annual growth rate (absolute and as a percentage) of Italy's cumulative wind capacity

Only a few regions have shown a very strong commitment to the promotion of wind energy. This is the main reason why Italy did not fully achieve the result anticipated at the beginning of 2007.

In 2007, the Apulia, Sicily and Campania regions confirmed their willingness to develop significantly wind energy (**Figure 3**). In particular, Apulia alone put into operation more than 200 MW in 2007. In Sicily some 130 MW of new generating capacity brought the total in the island close to 600 MW, and a lot of civil-engineering work was also underway on additional wind farms developed by several old and new investors.

In 2007, Calabria also provided a good contribution with around 100 MW of new installations, and in 2008-2009 the same capacity or something more should be added. On the contrary, other regions like Abruzzo, Molise and Basilicata have recently issued only a few permits to build new plants.

It is worth stressing that the major contribution to new wind capacity in 2007 came from the use of large-sized turbines in the range of 1.5-3 MW, which raised the average unit power set in 2007 to 1.638 MW. The total of 368 wind turbines installed in 2007 was about the same annual number of

units seen since 2004, but with a significant increase in power. The cumulative number of on-line units at the end of 2007 was 2,943. Since cumulative capacity was 2,726 MW, this means a cumulative average online capacity of 926 kW per turbine (**Figure 4**).

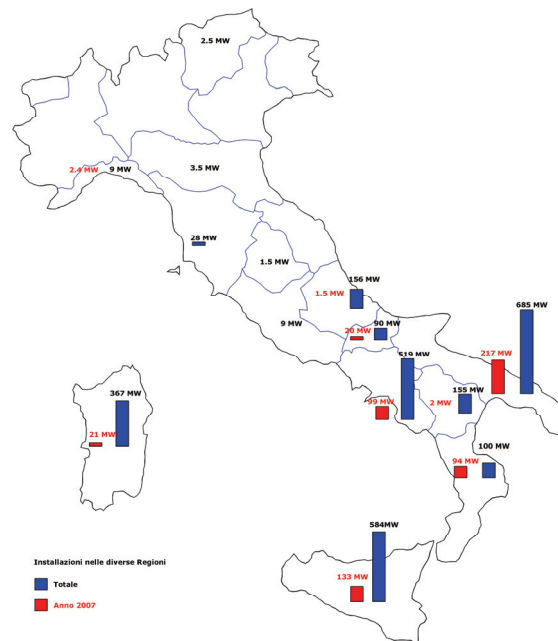


Figure 3 - Wind capacity at regional level in Italy as of the end of 2007 (cumulative MW in blue and 2007 MW in red).

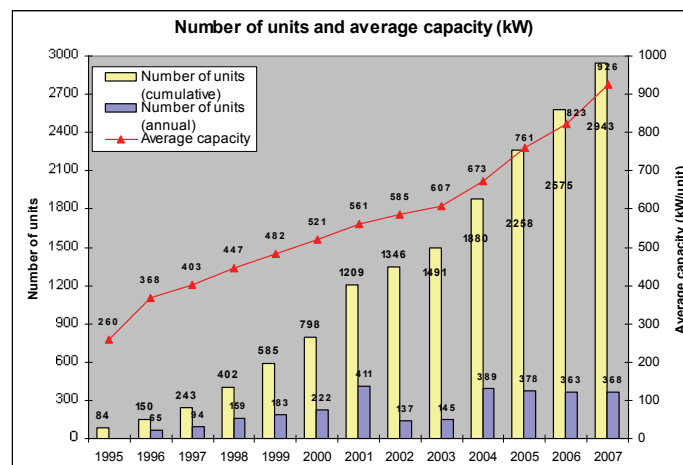


Figure 4 - Trend of cumulative and yearly-added numbers of wind turbines in Italy, and average online unit capacity

In 2007, Vestas Italia, Gamesa, Enercon and GE Wind were the most active manufacturers. Vestas alone, with some 280 MW, covered 46% of the Italian market, while the remainder was, in large part, supplied by Gamesa, totaling more than 140 MW of new plants. Gamesa was followed by Enercon, which was around 90 MW with 2 MW and 2.3 MW turbines, and GE Wind with 1.5 MW turbines.

In 2007 Nordex, through a wind farm made up of 1.5 MW units located in Sardinia, also entered the Italian market, where it has planned to build more than 300 MW in the islands and in Calabria in the

period 2008-2009. Ecotècnia has planned to build two large plants totaling about 80 MW in southern Italy in 2008.

The IVPC group remained the leader of Italy's wind-farm developers in terms of overall installed capacity record. Its cumulative capacity share at end-2007 had slightly decreased from the past even though it installed just a little less than 100 MW in the course of the year.

As to new capacity, IVPC was preceded only by the utility Endesa, which was the leader in 2007 through 126 MW of new plants. Endesa almost doubled its 2006 market share and achieved a 9% cumulative capacity quota, very close to the large national utilities Enel and Edison.

During 2007, IVPC also replaced the main components of 51 ten-year-old 600 kW turbines totaling 30.6 MW with new gearboxes, generators, etc., in order to obtain the right to get green certificates according to the Italian law. Previously these turbines had been entitled to obtain the premium feed-in tariffs granted for a period of eight years under the former RES support scheme (CIP Provision 6/92, see following section on National Incentive Programs).

Other new investors are now interested in entering the Italian wind market, but their efforts are mainly absorbed by the need to deal with complex bureaucracy. The evaluation process generally takes a long time, particularly due to the growing number of applications.

In 2007, the average capacity factor of all running plants was around 0.2, thus confirming the fact that a large number of Italian sites are endowed with rather weak wind conditions and, consequently, it is not easy for investors to find new economically exploitable sites free of constraints.

2.2 Constraints

Technical problems hampering the exploitation of potentially good sites are mainly related to the fact that most of the best wind areas are located in mountainous terrain, which obviously makes it more difficult to transport wind turbines and connect them to the grid.

Other more complex barriers come from unfavorable perceptions of wind technology by regional, but sometimes also central authorities, as well as by a part of the environmentalist associations, particularly those active at local level. To some extent, the public may also have unfavorable perceptions of wind energy, especially when people are not appropriately informed in advance of the projects planned on their territory. In addition, even in cases of more favorable attitudes, investors have to embark on the bureaucratic procedure for permissions. As mentioned above, it generally requires a long time for a project to receive all necessary authorizations.

Legislative Decree 387 of 29 December 2003 and, more recently, the 2008 Financial Law (Law 244 of 24 December 2007) have called upon regions to help fulfill the country's international environment and energy commitments, by simplifying plant authorization procedures and indicating regional targets in accordance with national ones, although it will likely take time for them to give a fully satisfactory response.

Nonetheless, such a sharing of national targets by local governments is of paramount importance due to the general energy situation, and particularly the shortage of domestic conventional energy resources, which makes Italy heavily dependent on oil and gas imports from many countries at variable and generally rising costs.

Grid connection issues are still posing problems as well. Despite the new rules issued by the Regulatory Authority for Electricity and Gas in late 2005 to streamline technical and cost aspects of the connection of generating plants to the electrical grid, investors still complain of several wind farms suffering major delays in their completion process owing to grid connection problems.

Terna (the Italian TSO), with the aim of improving wind energy penetration into the electrical system, has planned several works, some of which are currently in progress, to upgrade parts of the transmission grid in southern regions and particularly in the main islands of Sicily and Sardinia.

Here, new submarine cables for connection to the mainland will substantially improve energy transfer in the next few years.

3.0 Benefits to National Economy

3.1 Market characteristics

Wind energy is the renewable source growing most rapidly in Italy and, considering its possible development in the coming years, it is very likely to contribute more substantially to a cleaner energy sector. The economic turnover of the wind sector in 2007 was more than 1 billion €, including turbines delivered to foreign countries, up significantly with respect to 2006. This increase has been due partly to the growth of the domestic market and partly to the increasing cost of raw materials, components, and development of projects, which together with the shortage of turbines on the market has brought about a steady rise of costs during the year.

One positive consequence of the strong development of the wind market is that the total number of personnel directly and indirectly employed in the wind sector at year's end was about 10,000.

Some companies producing components such as steel and concrete towers, and small wind turbines, increased their activities in 2007, while other new ones have been set up. Prospects for newcomers have become more attractive as measures to stimulate new companies and investors in the 2008 Financial Law have come into effect.

IVPC is a private group, which, after further development in 2007, continues to lead the Italian installation record with a share of 28% of total installed capacity at year's end, and has many additional projects underway with medium and large turbines. The other major developers, with a share of around 10% each, are the utilities Enel, Edens and Endesa.

Fri-El Green Power, too, has a good presence in the field and several new installations underway. Fri-El is a private company mostly engaged in wind, hydro, biomass and biogas activities. In 2004 Fri-El established an important partnership with EDF Energie Nouvelles from France, one of the world's leading renewable energy companies, for the construction and operation of wind farms and the development of new renewable energy projects. In 2007, Fri-El further expanded its wind power operations through the construction of its tenth wind farm in Ricigliano, a wind farm with installed capacity of 36 MW. The know-how acquired over the years has enabled Fri-El to install, in the difficult geomorphologic conditions of this area, 12 of the most powerful wind turbines operating in Italy today, with a capacity of 3 MW each and blades of 44 m. In coming years, Fri-El intends to strengthen further its position in the renewable energy sector through a substantial investment plan. Investments will be made primarily in the wind sector, but Fri-el will also focus on the production of electricity from biomass and biogas, as well as on the production of biodiesel.

The other developers on the Italian market are private investors and small companies belonging to large industrial or commercial groups.

There are some 150 companies directly involved in the wind sector and about the same number are indirectly involved with the sector, consultant firms included.

Some re-powering of older plants started a few years ago, but for the time being this possibility is not yet considered by developers as a major opportunity, mainly for the lack of specific legislative measures. New measures are needed to promote this concept through a simplified authorization procedure, in order to improve energy production by encouraging the use of new, larger machines. Only IVPC in 2007, as mentioned above, refurbished 51 old wind turbines, thus obtaining access to green certificates without any need for further authorization on the sites, but maintaining the same installed capacity.

Offshore plants, too, could represent an interesting opportunity in Italy, in consideration of the very long coastline. This is true even though most of the windiest areas are located in deep waters, which makes them very difficult to exploit, at least with current offshore technologies.

3.2 Industrial development and operational experience

Among wind turbine manufacturers (**Figure 5**), Vestas Italia led the expansion of the Italian market in 2007, as it put into operation about 46% of annual new capacity, thus coming to hold 55% of the country's total on-line capacity. It was followed by Gamesa, which confirmed its strong presence in the country and particularly in the Calabria region, and Enercon, which added some 90 MW to its previous capacity by installing large turbines in the Apulia region.

All these manufacturers have established direct industrial activities and/or commercial agreements with Italian producers for the supply of wind turbine components.

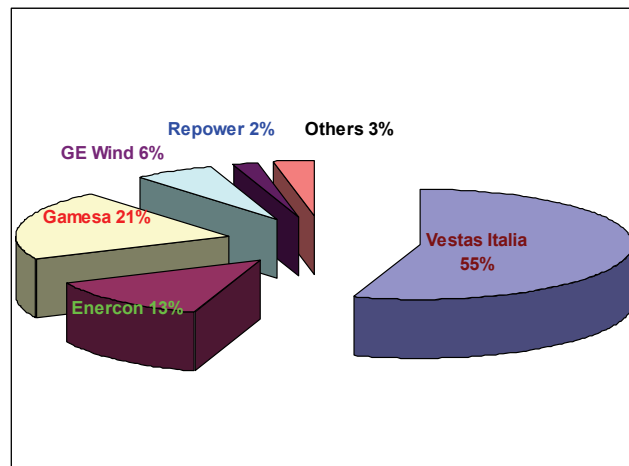


Figure 5 - Market shares of wind turbine manufacturers at the end of 2007 (percentages of total online capacity)

In 2007, Vestas Italia increased the number of employees in its two factories in Taranto to 650 people, with good employment prospects for coming years due to the building of a new production line for V90 3 MW turbines (**Figure 6**), which should be operational in early 2008.

Apulia's favorable attitude to wind technology was recently confirmed by a visit of the regional official responsible for environmental issues to the Vestas factories. The regional government of Apulia has been involved in the screening and authorization process of a large number of new applications.



Figure 6 – Some Vestas V90 turbines at the 36 MW Surbo wind farm developed by Inergia in Apulia (courtesy of Vestas)

The Vestas 850 kW units, produced only at the Taranto factories, were mainly sold and installed in Italy, while the remainder were exported abroad to Eastern Europe, Turkey and, above all, China. Vestas Italia has a particular attention towards domestic and local suppliers, who have been providing a substantial part of its turbine components.

Enercon in 2007 resumed a high level of activity in Italy and, as a consequence of its large number of projects underway, decided to work jointly with IANUS, a local concrete tower production firm very close to the harbor of Bari. This is an optimal place both for its proximity to the majority of Enercon's forthcoming plants and for exporting towers overseas. It is worth mentioning that concrete towers were used for the first time in Italy to erect 13 Enercon 2 MW turbines near Alberona in autumn 2007.

Moncada Costruzioni, in its double role of plant developer and energy producer, has been looking for opportunities abroad and particularly in Albania, where it has been authorized by the local government to build and manage a 500 MW submarine high-voltage (400 kV) direct-current line between Albania and Italy for a total length of 145 km, of which 130 undersea. The line, besides improving energy export-import between the two countries, will enable to transport energy from a 500 MW wind farm (already authorized by the Albanian government) that Moncada intends to build with an investment of 750 million €.

The Leitner Technologies Group has continued work on the Leitwind gearless wind turbines with rated powers between 1.2 and 1.5 MW, featuring a 62 m rotor diameter for wind class I as well as 70 and 77 m rotor diameters for wind classes II and III. The core of the Leitwind machines is a variable-speed generator with permanent magnets guaranteeing optimal energy yield and higher availability with less maintenance and noise emission.

In 2007, the company sold its first lots of LTW 77 turbines in Austria and India. Two other units have been installed in Bulgaria at the beginning of 2008, but a higher number of 1.5 MW turbines, with a rotor diameter of 70 m and 77 m, are expected to be erected in 2008. Moreover, already in 2008, Leitner will install a new model named LTW 80, a machine 80 m in tower height and rotor diameter, with new blades.

3.3 Economic details

Since 2004, the cost of installed wind turbines and other plant items has steadily been increasing, but in 2007 the effect of the shortage of wind turbines together with higher prices of raw materials like steel, copper and carbon, accelerated this rise considerably, so that the average specific installed plant cost at a site of medium complexity can at present be evaluated at up to 1,800 €/kW. This rise has partly been due also to the heavy weight of project development costs, which in the worst cases reached up to 500 €/kW. The purchase cost of wind turbines alone in 2007 was about 1,300 €/kW.

The total cost of an average wind farm (average not only in dimensions, but also considering the complexity of the site terrain), electrical grid-connection included, could be divided as follows:

Development costs	10%-20%
Turbines	65%-70%
Civil-engineering works	15%
Connection to grid	5%

Maintenance and operational costs were also higher in 2007 than in 2006 by about 20%, with an average weight of about 12-13 €/MWh.

The income wind plant owners can get by selling energy on the wholesale market or, as they generally choose, to the grid operator itself, varied through 2007 depending on many factors, such as the hour and area of production. On average, it could be put tentatively around 80 €/MWh.

The latest measure bearing upon the sale of wind-generated electricity was Provision 280 of 6 November 2007 issued by the Regulatory Authority for Electricity and Gas, which, among other

measures, established GSE (body also in charge of managing all RES support schemes) as the sole counterpart to wind producers wishing to have their energy bought by grid operators. To make their business more profitable, wind energy producers can get additional income from RES support schemes in different ways, depending on the date when plant operation began or is going to start. The characteristics and amounts of incentives available in 2007 and recent developments affecting coming years will be explained at length in the following section.

4.0 National Incentive Programs

4.1 Major RES support instruments

In 2007, the instruments supporting electricity produced from renewable energy sources (RES) were run along the same lines as previous years. It was not until the end of the year that the 2008 Financial Law (Law 244 of 24 December 2007) introduced a number of changes, which went effect at the beginning of 2008.

For the convenience of the reader, we briefly recall the main features of the support instruments still operating during 2007 (see also previous Annual Reports).

Alongside the main support scheme based on tradable green certificates (TGC), in 2007 a number of wind plants still benefited from the former system of "feed-in tariffs" granted by CIP Provision 6 of 29 April 1992. These tariffs are different for the various RES and "RES-assimilated" technologies and consist of the base price, paid over the full plant lifetime, and an incentive, available over the first eight years of plant operation only. The maximum preliminary value of the full 2007 tariff for wind-generated energy was 163.7 €/MWh in the best case, i.e. for plants feeding all their energy output to the grid.

More recent wind plants have instead been supported by the current scheme, which is based on a compulsory quota of RES electricity to be supplied, and tradable green certificates (TGC) intended to certify the fulfillment of this obligation. This scheme was first set up by Legislative Decree 79 of 16 March 1999 (restructuring the electricity market), confirmed by Legislative Decree 387 of 29 December 2003 (implementing EU Directive 2001/77/EC on RES promotion) and further adjusted by legislation in 2005 and 2006.

Every year, the RES electricity quota obligation is laid on operators who, in the previous year, produced or imported electricity generated from non-renewable sources. These operators must feed into the Italian grid at least as much RES-electricity as the mandatory percentage of their non-renewable electricity in the previous year. This percentage was originally fixed at 2%, but was subsequently raised by 0.35 percentage points a year, thus becoming, for 2007, 3.05 % of the energy produced from conventional sources in 2006. Imported RES-generated electricity (provided it has been certified by a Guarantee of Origin) can be taken into account in meeting the RES requirement.

Operators subject to the obligation have to prove compliance by handing in, after the end of the year, a corresponding number of TGC granted to RES electricity by GSE, the body in charge of running support schemes (in 2007 one TGC equaled 50 MWh). TGC can either come from one's own RES plants or be bought from other RES electricity producers. TGC-entitled RES producers (named IAFR producers) can thus have further income in addition to that from energy sales.

Plants that began operating from 1 April 1999 to 31 December 2007 are given TGC over the first 12 years (formerly 8 years). TGC are valid for 3 years from issue.

TGC can also be bought from GSE, at a price that is fixed every year depending, among other factors, upon CIP 6/92 feed-in tariffs. This price had been growing steadily in previous years and, for 2007 production, was set at 137.49 €/MWh. Depending on the TGC market situation, GSE certificates can either set a price cap on the TGC trading price or help sustain this price at a more rewarding level.

In this respect, it should be pointed out that, unlike previous years when GSE's TGC were needed to meet demand, in 2006 and 2007 the whole TGC demand was covered by IAFR producers, mainly with hydro, wind and geothermal plants. The ensuing competition pulled the actual TGC trading price somewhat below that of GSE's TGC, reportedly even down to around 120 €/MWh in 2007. These worse conditions have been blamed, among other factors, on the RES obligation percentage rising at too slow a rate, which did not allow TGC demand to grow enough. This has been seen as a particularly serious problem because Italy does not look to be on track towards meeting its RES-electricity target set in EU Directive 2001/77/EC (22-25% of gross domestic consumption by 2010), at least if only domestic production is considered, neglecting RES electricity imports.

This framework has now been changed significantly for future years by the 2008 Financial Law (Law 244 of 24 December 2007). The main new features of Italy's support system can be summarized as follows:

- the yearly increase of the mandatory quota of RES-electricity has been raised from 0.35 to 0.75 percentage points in the period 2007-2012;
- the size of all TGC has been reduced to 1 MWh from 1 January 2008 onwards;
- RES plants that have come online after 1 January 2008 will get TGC for a period of 15 years (instead of 12 as older plants), in a number equaling the number of produced MWh multiplied by a coefficient, which is specific for each technology (e.g. 1 for onshore wind, 1.1 for offshore wind);
- RES plants not exceeding 1 MW capacity can also opt for a fixed feed-in tariff, available for a period of 15 years; specifically for wind plants below 200 kW capacity, the tariff is 300 €/MWh;
- from 2008 onwards, the price of TGC bought from GSE will be calculated as the difference between 180 €/MWh and the annual average price of RES electricity sold according to article 13/3 of Legislative Decree 387/2003 (in 2007 roughly about 80 €/MWh);
- the above reference values and coefficients may be updated every 3 years;
- until Italy has reached its RES electricity target according to Directive 2001/77/EC, GSE shall buy all TGC that IAFR producers will not have sold to obliged operators before their expiration date, at a price equaling the average TGC price of the previous year.

It is worth recalling here that photovoltaic (PV) plants are actually outside the scope of legislation concerning TGC, as they are the subject of dedicated measures providing them with feed-in tariffs depending on size and type (the latest provision about PV feed-in tariffs was the Ministerial Decree of 19 February 2007).

5.0 RD&D Activities

5.1 National RD&D efforts

In the megawatt-class turbine sector, the Leitner group, after developing the LTW 62, LTW 70 and LTW 77 (see above), is currently working on a larger 1.5 MW machine, the LTW 80 with a rotor diameter of 80 m and a tower of the same length. This is an evolution of the previous models and probably will be available even with a 70 m rotor diameter for sites in class IA. As anticipated, after a testing period, the LTW 80 should become ready for sale in the second half of 2009.

As a positive consequence of recent legislative measures, a renewed interest has been shown also by manufacturers and potential customers of small wind turbines.

The Bolzano-based firm Ropatec, manufacturing small-sized vertical-axis turbines (**Figure 7**), inaugurated its largest product, the Big Star, in the presence of the Italian Minister of the Environment. The Big Star is a 20 kW vertical-axis turbine, which was installed in a mineral water factory in the province of Trento. The main characteristics of the Big Star are: flexible use of the

energy generated (connection to the grid through an inverter, battery charging and water heating), very silent operation and reduced maintenance.



Figure 7 – A Ropatec small-sized vertical-axis turbine on Monte Casale in the Italian Alps near Trento (courtesy of Ropatec)

The University of Trento has been actively operating in its wind test field in order to identify and document the characteristics of three machines in the 1.5 to 20 kW range that are currently being tested. The information collected will be posted on a web site and serve as a technical and scientific reference database of the small turbine sector. Since turbine testing began in July 2007, several turbine features have been identified for possible technological improvement.

As to offshore technology, some activities have been carried on in the academic world, particularly at the Universities of Bologna and Genoa, which are still involved in studies on offshore foundations and assessment of the offshore wind potential, respectively. Another feasibility study on a Sicily site started at the end of 2007 through a joint initiative between ENEA and the University of Catania.

The CESI RICERCA company, after completing its new Wind Atlas of Italy (see the 2006 Report), has undertaken further studies into some aspects of Italy's wind potential, particularly offshore potential. Offshore capacity could in principle supplement the limited onshore resources in meeting the country's ambitious RES targets, but still needs to be assessed more deeply taking into account all factors (windiness, technology, costs etc.) that can influence its exploitation.

Since most of the best offshore resources have turned out to be located in waters that are too deep for the current technology, in 2007 CESI RICERCA started investigating the feasibility of plants based on floating foundations, with a consultant assisting on more specific marine issues. A dynamic computational model has been under development for studying the behavior and stresses of wind turbines mounted on floating structures under normal and extreme operating conditions. The goal is to identify preliminary criteria for choosing the best promising floating structure, taking into account both technical and cost aspects.

Interest in offshore applications has also been shown by a few important industrial companies, like Enel and Gamesa, which have plant projects in the authorization process and under study. For the time being, however, their in-field activities have been limited to data acquisition.

Mention should also be made of an offshore project managed by the company Blue H. In January 2007, this company obtained authorization to install its floating platform prototype in waters off the Apulia coasts, facing the town of Tricase, and then applied for authorization to build a 90 MW wind farm in the same area, 20 km from shore in waters 100 – 120 m in depth. The project seems to have support from the regional government of Apulia and the local population.

In December 2007, Blue H launched the prototype, with an 80 kW turbine mounted on a floating foundation named SDP (Submerged Deepwater Platform). In 2008 the prototype will be anchored in 108-m-deep waters at a distance of 10.6 nautical miles from the coastline and experimental tests will start.

6.0 The Next Term

Considering the Position Paper presented by the Italian government in Brussels in September 2007 and the support provided by the 2008 Financial Law to renewable energy, there is some reason for optimism about the future of wind energy in the country. Moreover, other investors, in addition to those already operating in the wind sector, have planned ambitious projects for the coming years. An important political aspect that still has to be fully settled in order to achieve Italy's renewable energy targets, is to secure the strong commitment of all Regions, as has further been stressed in the 2008 Financial Law. In fact, Article 2/167 of this law states that the Minister of Economic Development, in agreement with the Permanent Conference for relations between the state and regions, shall establish within 90 days the minimum regional shares of increase of electricity from renewable sources that are needed to reach Italy's current renewable energy targets as well as the new national targets that will shortly be agreed within the European Union.

Within a favorable political framework, considering the current situation of the wind sector, it would seem realistic to envisage the achievement of a cumulated wind capacity of at least 5,000 MW by 2010, through an annual average growth rate of about 800 MW/year.

References:

(1) Energy: issues and challenges for Europe and for Italy. Position paper of the Italian Government, 10 September 2007.

Authors: Luciano Pirazzi (ENEA) and Claudio Casale (CESI RICERCA), Italy.