The Economics of Renewables in Europe
Focus on France, Italy, and Spain

Executive Summary
June 30, 2009

Contents:

The growth in renewable energy sources experienced in Europe has, to a large extent, been based upon the political will at the European Union (EU) level and the leadership of some countries such as Germany and Spain in terms of policy incentives.

The new EU legislative package – the so-called "EU 20-20-20 by 2020 Climate Change and Energy Package" - passed at the end of 2008 will confirm Europe as the leading area in implementing carbon trading, renewable-energy subsidies, and the other necessary legislation for getting the green industry moving.

Ultimately, the key variables in a country's ability to develop renewable energies are not only environmental and climate conditions but also a strong government commitment to support investment in renewables. Subsidies explain why Germany has been the largest solar market for the past several years. Until grid parity can be reached, subsidies will play a key role in getting renewables-based businesses started.

Besides Germany, three markets have emerged this past year as capable leaders in the cleantech sector: France, Italy and Spain. Because most investors have limited information about these countries, we have created this comprehensive guide covering the incentives available for renewable energy projects in these three promising markets.

European Union

2008 Wind market size: 8,447.1 MW
2008 PV market size: 4,592.3 MW
2007 Thermal Solar for H&C market size: 2,000 MW_{th}
2007 Biodiesel market: 5,7 MToe*
2007 Bioethanol market: 1,1 MToe

* million tons equivalent oil. 1 ton of bioethanol = 0.64 toe; 1 ton of biodiesel = 0.86 toe.

Understanding the EU renewable targets

"The EU 20-20-20 by 2020 Climate Change and Energy Package"

To provide the business community with the long-term stability needed to make rational investment decisions, the new European Union (EU) legislative package sets the following mandatory targets:

- an independent EU commitment to achieve a **reduction of at least 20% in the emission of greenhouse gases** by 2020 compared to 1990 levels and the objective of a 30% reduction by 2020, subject to the conclusion of a comprehensive international climate change agreement;
- a **mandatory EU target of 20% share of renewable energies** from around 8.5% today in the overall EU energy consumption by 2020, including a **10% binding minimum target to be achieved by all Member States for the share of biofuels** in overall EU transport petrol and diesel consumption;
- a **mandatory 20% increase in energy efficiency** by 2020.

In order to meet the new ambitious targets, the package comprises a set of key policy actions that are closely linked. They include:

(1) a Directive amending the EU Emissions Trading System (EU ETS) ;

(2) a Directive relating to the sharing of efforts to meet the European Union's independent greenhouse gas reduction commitment in sectors not covered by the EU emissions trading system (such as transport, buildings, services, smaller industrial installations, agriculture and waste);

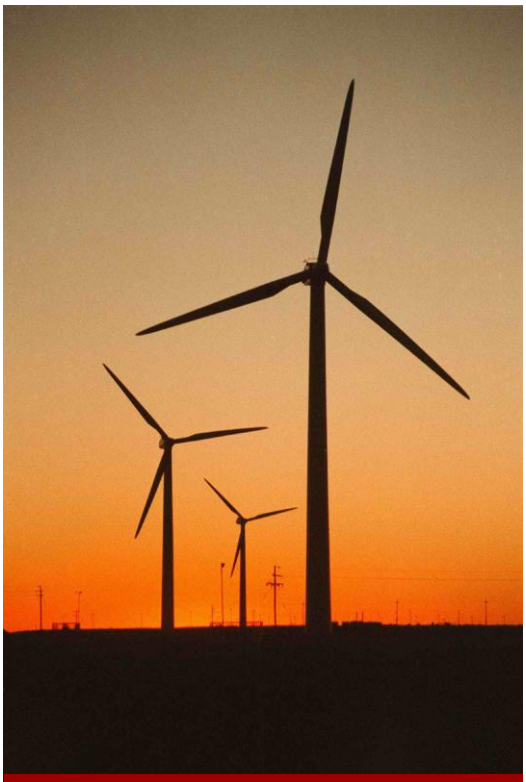
(3) a new comprehensive Directive on the promotion of the use of energy from renewable sources, setting member states' targets.

Other legislative acts that are also part of the package include a Directive for a legal framework on carbon capture and storage, a Communication on the demonstration of carbon capture and storage and new guidelines for environmental state aid.

In particular, the report will focus on the new Directive for the use of all renewable energy resources since it sets the framework for the national support systems and has therefore a more direct impact on the investment projects in the four sectors the report will analyze: solar photovoltaic, thermo solar, wind and biofuels.

The Directive on the promotion of the use of all renewable energy resources contains provisions such as:

• Member States' mandatory renewable national targets;
• National Action Plans containing sectoral targets and measures to meet them; and
• Criteria and provisions to ensure sustainable production and use of bioenergy and to avoid conflicts between different uses of biomass.



Country Focus France

France

2008 Wind market size: 945 MW
2008 PV market size: 105 MW
2008 Thermal Solar for H&C market size: 1,314 MW_{th}
2007 Biodiesel market: 1,161,277 Toe
2007 Bioethanol market: 272,937 Toe

As the second world producer of **nuclear power**, France produces all of its electricity needs and is a net exporter to its neighbors. In 2007, beside hydropower – representing the second largest source of electricity (larger than fossil fuels) – the other **renewable sectors** only represented **1.5%** of total electricity production. France still has a huge potential in renewables – especially **wind** and biomass – that the government intends to develop in the coming years. The "**Grenelle Roundtable for the Environment**" sets targets to 2012 and 2020 even beyond EU targets with a long-term commitment towards green energy. Feed-in tariffs, competitive solicitations for large projects, tax credits, accelerated depreciation and reduced VAT are available for **wind and PV**; **thermal solar for H&C** benefits from tax credit, reduced VAT and investment subsidies. France has also decided to move ahead of the EU schedule setting the targets of 5.75% of **biofuels** in total fuel consumption by 2008 and 10% by 2015, respectively two years and five years ahead of the EU schedule. And it kept course on the schedule actually reaching the incorporation target of 5.75% of biofuels blend in 2008. This positive trend should continue in the coming years reinforced by the Government declaration that it will maintain the 7% biofuels incorporation target in 2010. Excise rebates with production quotas and the General Tax on Polluting Activities (TGAP) reduction will also contribute once again to the successful attainment of the 2010 target. The TGAP, introduced in 2005, is applied to petrol blends containing less than 6.25% biofuels in 2009. The limit will rise to 7% in 2010.

French renewable targets

Onshore Wind: 10,500 MW by 2012
Offshore Wind 1,000 by 2012
PV: 1,100 MW by 2012
Bioethanol production quota: 1,091,000 Metric Tons (MT) in 2009
Biodiesel production quota: 2,727,000 MT in 2009

Solar Photovoltaic

France has conceived a very specific model for the application of the feed-in tariff, having chosen to support building-integrated PV modules (BIPV) with a much higher financial incentive (€601/MWh) than for other PV installations. Attractive income tax credit of 50% on the equipment costs for the residential market is also in place. The further simplification of administrative procedures for residential customers should help sustain the market development in 2009.

2009 PV Feed-In Tariffs		
	Base Tariff	Premium for Building Integration
Continental France	€328.23/MWh	€273.53/MWh
DOM and Corsica	€437.82/MWh	€163.94/MWh

Wind Energy: A Boom Paves Its way

Despite the evident growth (945 MW newly installed in 2008) and a €85/MWh feed-in tariff, the French market for wind is still struggling considering the country's excellent wind potential. Part of the reason is the set up of the wind power reserved zones that have to be identified by regional and local authorities, together with already existing extensive bans on wind turbines in radar zones, nature conservation areas and bird corridors. The suppression of 12 MW size limit to access feed-in tariff will favor larger wind farms.

2009 Wind Power Feed-In Tariffs	
Onshore	€85.6/MWh
Offshore	€135.8/MWh

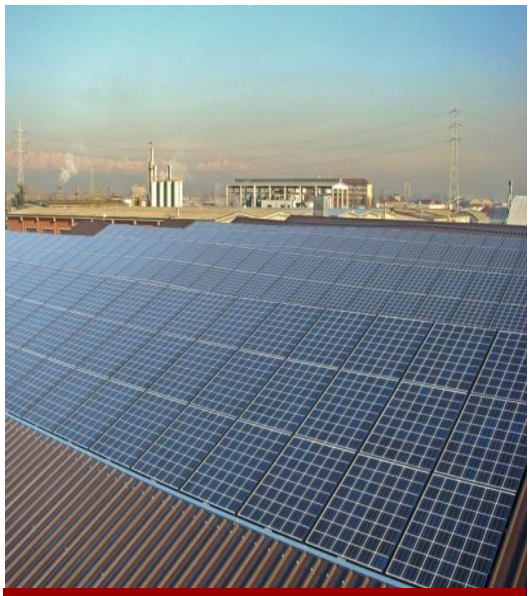
Thermal Solar for H&C

The implementation of the Grenelle Plan should allow 900,000 homes to be equipped with thermal solar panels by the year 2012 and 4.2 million by 2010. Those targets will be reached through a 50% income tax credit and a TVA reduction for PV systems. The French market is expected to grow at interesting rates in the coming years.

Biofuels

Supporting measures for biofuels in France are based on a mixed system: incorporation targets, production quotas, detaxation and tax penalties. Two main sectors have been developed in France, the agricultural ethanol sector for petrol and the vegetable oils sector for diesel. Support for second and third generation biofuels is gaining momentum.

2009 Biofuels Excise Exemption	
Biodiesel	€0.15-0.21/lt
Bioethanol	€0.21/lt



Country Focus
Italy

Italy

2008 Wind market size: 1010 MW
2008 PV market size: 197 MW
2008 Thermal Solar for H&C market size: 280 MW_{th}
2007 Biodiesel market: 139,350 Toe
2007 Bioethanol market size: 0

Unlike France, **Italy imports 85% of its energy needs** and cannot count on nuclear power since all its nuclear plants were decommissioned after a referendum in 1987. Italy is the most important producer of **geothermal electricity** in Europe. With 5.6 TWh generated in 2007, this production represents 1.8% of total production.

Hydropower is by far Italy's principal source of renewable electricity (with a 12.5% share). Even so, **poor rainfall** in recent years has had a negative impact on hydro output. In the future, other renewable energy technologies will need to fill the gap if Italy is to meet EU renewable targets. The **photovoltaic** sector, helped by an incentive system that was positively modified at the beginning of 2007, **is emerging very rapidly**. According to the Italian agency for electricity, Gestore dei Servizi Elettrici (GSE), in 2008 the Italian market grew by almost 180% compared to 2007, reaching 197 MWp in terms of newly installed capacity and 317 of cumulative capacity at the end of 2008 (it increased by 94.5% in 2007). In spite of these encouraging figures, in 2007 this sector only represented 0.03% of total electricity production and will not make it possible to meet the ambitious targets set by the European Union (i.e. reaching 25% of renewable origin electricity by 2010 (currently 14.6%)).

Italy will need to count more on **wind** power and **biomass** if it wants to meet the EU targets. According to the most recent data by Enea and GSE, 1.010,4 MW of wind power capacity has been installed in Italy in 2008. In this way, the wind power sector climbed by 35% between 2007 and 2008, which is a considerable growth rate but still below the average annual growth rate of 42.4% since 1997. In 2008 it reached a production of 6 TWh (almost 2% of gross national consumption, still far from 11% in Spain). The Italian government has defined an objective of 16,000 MW of wind power capacity by the year 2020 (vs. currently 3,736 MW in 2008). The biomass sector, divided between solid biomass (46%), renewable municipal waste (28%) and biogas (26%), has had an average annual growth of 25.5% since 1997.

The EU Renewable Targets For Italy

Under the EU's 2020 energy targets, Italy will need to generate **17% of its total final consumption of energy from renewable energy sources by 2020**. In 2005 Italy generated only 5.2%. The target for **biofuels** is set at 5.75% of petrol and diesel use for transport in 2010 and 10% of biofuels of final consumption of energy in transport in 2020.

2009 Biofuels Excise Exemption	
Biodiesel	€0.33/lt
Bioethanol	€0.45/lt

In 2008 The Renewable Market Finally Took Off

In 2008, the renewable energy market finally took off in Italy but not as quickly as originally forecast. The global economic downturn diminished the extent of the growth. Yet, the numbers remain promising: 317 MW for photovoltaic, more than 3700 MW for wind energy, and 1,400,000 m2 (1040 MWth) of thermal solar for heating and cooling were cumulatively installed by the end of 2008. The output capacity of biodiesel reached 1,900 tons per year, the second largest in Europe after Germany. The question is whether Italy is on a virtuous track to the 2020 EU targets or is this just a short-lived exploit that will be bogged down by chronic red tape, regulatory instability and sluggishness of the administration at the Regional level.

In 2008, feed-in tariffs for small renewable plants were introduced and producers can now choose between the new regulated tariff and the green certificates. The green certificate system has been revised and the wholesale prices of green certificates should stabilize around €90/MWh (not including the selling price of electricity).

In 2010 and 2011 Italy is expected to become one of the top market worldwide for photovoltaic

The Photovoltaic Market

The short-term outlook for 2009 for the photovoltaic market is good -- but not as good as anticipated. Italy is paying the price of the current economic slowdown now that all the right conditions from the regulatory and administrative standpoints are in place. In Q1 2007 a new incentive law was passed with high feed-in tariffs – one of the most generous in the EU. A front runner niche market demand finally started to seize higher returns on the investment of PV. However, the financial crisis hit the Italian economy, preventing the long awaited development of a mass market expected in 2008 through 2009 (like in Spain). Italian banks put on hold many large projects during Q3 2008. Most likely, the results of the new incentive law for PV will only be seen in 2010 and 2011, when the Italian market is expected to become one of the top markets worldwide.

2009 PV Feed-In Tariffs			
	Not Integrated and Ground-Based	Partially Building Integrated	Fully Building Integrated
$1 \leq P \leq 3$	€392/MWh	€431/MWh	€480/MWh
$3 < P < 20$	€372/MWh	€412/MWh	€450/MWh
$P > 20$	€353/MWh	€392/MWh	€431/MWh

Thermal Solar Electricity (or Concentrating Solar Power)

Q4 2008 saw the approval for the first time of a feed-in tariff for thermal solar electricity. The only CSP project in Italy that will benefit from the new incentive is the so-called "Archimedes' Project" in the Sicily region. New plants could be built in the near future driven by the new feed-in tariff.

2009 Thermal Solar Power Feed-In Tariffs
From €220/MWh to €280/MWh depending on the fraction of integration of the plant with other renewable energy sources

The Wind Power Market

The Italian market for large wind farms is becoming a saturated market given that in the last 3-4 years project developers have already filed requests for almost 180,000 MW in the most exploitable regions and there is a backlog in the authorization process. Due to the strict landscape and cultural heritage protection rules, only 10% of the 180,000 MW in the pipeline is expected to be authorized and actually installed. For **small installations** the outlook is different since the recently passed feed-in tariff for small wind installation provides a generous €300/MWh allowance (including the selling price of the electricity).

2009 Wind Power Green Certificates (GCs)		
	Technology Coefficients	GC price
Onshore	1.00	€70/MWh - €100/MWh
Offshore	1.10	
2009 Feed-In Tariff for Wind Power < 0.2 MW		
€300/MWh		

Biofuels

Biodiesel: an annual quota of 250,000 tonnes of biodiesel would benefit from an excise duty rate of 20% of the rate applicable to diesel oil used as automotive fuel.

For bioethanol and ETBE, the excise duty rate of slightly less than 50% of the normal rate applicable to petrol:

- Bioethanol derived from agriculture: €289.22/1,000 liters.
- ETBE derived from alcohols from agriculture: €298.92/1,000 liters.
- Additives from biomass:
  - Mixed with unloaded gasoline: €289.22/1,000 liters.
  - Mixed with diesel oil: €245.32/1.000 liters.

2009 Biofuels Excise Exemption	
Biodiesel	20% of the rate applicable to diesel oil
Bioethanol	€0.289/lt
ETBE	€0.298/lt
Additives from biomass	€0.289-€245/lt

The budget for the tax reduction over the scheme's total duration of four years (2007-2010) is estimated at €384 million.

Also, a supply obligation for biofuels of 2% (1% in 2007) of the previous year's total supply volume applies. Non-compliance is subject to penalties. The excise reduction is a temporary measure to facilitate the transition into a pure supply obligation regime after 2010.

For small wind installations the outlook is positive due to the recently passed feed-in tariff of €300/MWh

Country Focus
Spain

Spain

2008 Wind market size: 1,609 MW
2008 PV market size: 2,670 MW
2007 Thermal Solar for H&C market size: 183 MW_{th}
2007 Biodiesel market: 260 580 Toe
2007 Bioethanol market: 112 640 Toe

Spain is characterized by a relatively higher **dependency on energy imports** and a higher energy intensity of the economy when compared with its major EU partners. Due to these issues, security and diversification of the energy mix have driven the renewable energy policy since 2005 when the **Plan for Renewable Energies for 2005-2010** (Plan de Energías Renovables) was passed. So far, the objectives of the Plan in terms of supporting the development of renewable energies, especially solar, biomass and wind power, have been achieved. The sectors all had substantial growth rates in 2008, in the continuity of that of 2007. The **wind power sector is advancing robustly** with an average annual increase of 43.3% since 1997, to reach production of 31 TWh in 2008 delivering more than 11% of the country's electricity demand. Spain is the world's third largest wind energy market, with 16,754 MW of total installed capacity. New installations in 2008 totaled 1,609 MW, in line with previous years. The developments in 2007, with over 3.5 GW of new capacity installed, must be considered an exception, as pending regulatory change brought about a higher than usual installation rate. The sector could very soon become Spain's number one renewable electricity source, moving ahead of hydropower. **Hydroelectricity** (30.5 TWh produced in 2007) is subject to weather conditions and has not seen a rise in importance since 1997. The sector represents 9.9% of total production. Electricity production from **biomass** increased by 38.2% in 2007 (with a 3.7 TWh output). The sector is essentially based on municipal waste with a 90.2% increase in 2007 and biogas with a 86.94% increase. **With a 350% increase, the photovoltaic market was by all measures the most dynamic in 2008**, amounting to newly installed capacity of 2,670 MWp. Its average annual growth rate has been 40.9% since 1997. With 3,400 MW of total installed capacity at the end of 2008, Spain is in second position at the European level in terms of photovoltaic electricity producers, behind Germany, the unquestionable leader. The photovoltaic sector has been helped by very generous feed-in tariffs these last few years. But sector development has exceeded forecasts, and the Spanish government decided to reduce aid to photovoltaic energy at the end of 2008.

Source: Reuters

Despite recent regulatory adjustments, in general, the feed-in tariff scheme in Spain has provided a stable framework for investments in renewable energies. Together with Regional support for planning, simple administrative procedures (especially in the case of wind energy) are the key elements for the rapid growth of renewables in Spain.

The so-called "**special regime**" facilitates access to the grid and provides the **opportunity to chose between a regulated feed-in tariff and the spot market plus a premium**. Premium and fixed tariffs are available indefinitely but after the first 15, 20 or 25 years (depending on the technology) the level of support is reduced.

Spain's Photovoltaic Lead Position At Risk

The sheer growth - **2,661 MW** newly installed in 2008 - in the Spanish **photovoltaic market**, came mainly due to high subsidies, the increase of global silicon output, mainly from China, and the **speeding-up of solar projects in Spain before an announced reduction of subsidies** introduced in September 2008. In fact, after great uncertainty in the Spanish solar market, the government has passed the new feed-in tariffs just a few days before the previous law expired. The expected decline in the tariffs level has led to a rush in applications for new projects and an investigation is undergoing by Spanish authorities for alleged irregularities, creating some uncertainty in the 2009 market outlook. The market will need to adjust to considerably lower tariffs for new systems and an annual limit of 500 MW with the provision that two thirds are **rooftop mounted** and no longer free-field systems.

2009 PV Feed-In Tariffs	
Rooftop $P \leq 0.02$ MW	€340/MWh
Rooftop 0.02 MW< $P \leq 2$ MW	€320/MWh
Ground-Mounted P< 10	€320/MWh

Thermal Solar Electricity

The available solar resources, the technology experience gained in Spain from past research and development projects, the support in the form of a feed-in tariff, and the presence of companies such as Abengoa interested in the technological development of the sector, make the solar thermal technology for electricity production a promising technology for Spain.

At the beginning of 2009 around 2,000 MW of solar thermal energy were provisionally registered in the Register of renewable installations, a pre-requisite for the construction under the special regime.

2009 Thermal Solar for Electricity Production Feed-In Tariffs	
Fixed Price	Premium on top of market price (with upper and lower limits)
€269.375/MWh	€254/MWh

Wind Power Has Developed Impressively

Wind farms are mainly developed and owned by consortia formed by utilities, regional institutions involved in local development, private investors and sometimes manufacturers. Potential barriers to further growth in wind capacity are deployment and grid connection. The Spanish wind power market is expected to continue its steady growth in 2009, with an estimated addition of 1,600 MW. Nonetheless, the sector will face two significant challenges: the uncertainty created by the economic crisis and the upcoming general review of the compensatory scheme in 2010. The Spanish Wind Energy

Spanish renewable targets by 2010

Wind: 20,115 MW
PV: 400 MW
Thermal Solar for H&C: 4,900,805 (m^2)
CSP: 500 MW
Biofuels production: 2,220 Ktoe

Association (AEE) has urged the government to come up with a clear, stable and predictable remuneration framework for the wind sector.

2009 Wind Power Feed-In Tariffs		
	Fixed Price	Premium on top of market price (with upper and lower limits)
Onshore	€73.228/MWh	€29.291/MWh

Biofuels

Until the end of 2012, the Hydrocarbons Tax for biofuels will be zero (instead of €0.278/liter for diesel and €0.371/liter for gasoline). In June 2007, the Spanish government passed a new law (Disposición Adicional Decimosexta de la Ley 34/1998 del Sector de Hidrocarburos) making the blending of biofuels into petroleum fuel mandatory. It has set an interim target for 1.9% of biofuels to be blended into regular fuels in 2008 (not mandatory), which has become mandatory with proportions of 3.4% in 2009 and 5.83% in 2010.

2009 Biofuels Excise Exemption	
Biodiesel	Totally Exempt
Bioethanol	Totally Exempt

This executive summary is part of a report compiled by Fabiana Di Paola, an analyst with Noventi Ventures, under guidance from Giacomo Marini and with the contribution of Simone Rizzi.
To obtain a copy of the full report please

contact admin@noventivc.com

About Noventi Ventures

Noventi Ventures is an early-stage, technology

venture capital firm, based in Silicon Valley.

Noventi Ventures
535 Middlefield Road, Suite 100
Menlo Park, CA 94025

U.S.A.

Telephone: +1 (650) 325-6699

noventivc.com