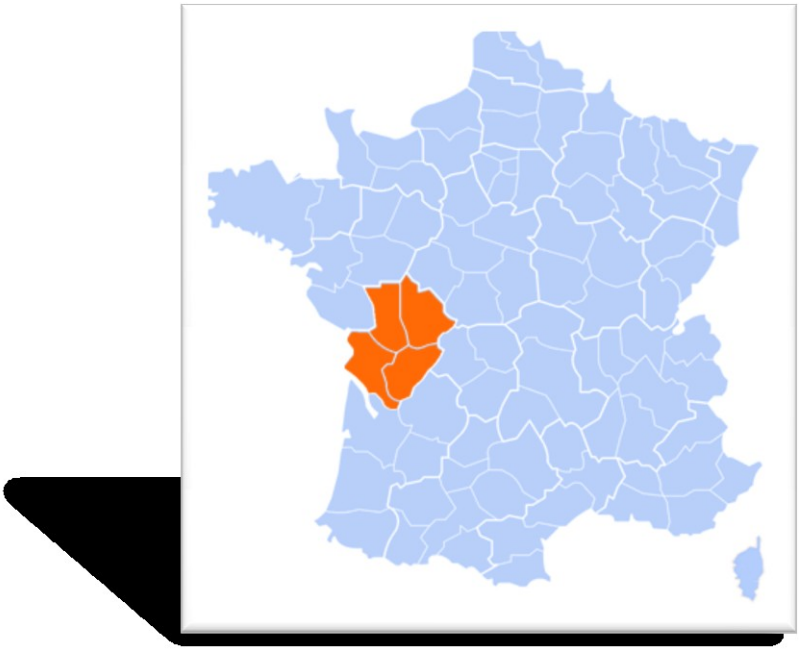
GENI Global Energy Network Institute

Is 100% Renewable Energy Possible in Poitou Charente by 2020?



August 2012

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Abstract

This report focuses on the question “Is 100% energy renewable possible in Poitou-Charente by 2020?”. France as a nation wants to have 23% renewable energy by this date. The region Poitou-Charentes has the goal of reducing greenhouse gas emissions by 30 % by the target date and of tripling the power production from renewable sources before 2020. That means it’s goal is to reach 26 % consumption of energy from renewable energies in the region.

After much research, reading numerous reports on the region Midi-Pyrenees and treatment of several years of data on energy production, I can say that technically, 100% renewable energy in Poitou-Charente is entirely possible. But France and Poitou-Charente are far too dependent on nuclear. It will be very difficult to close all nuclear power plants and install enough renewable energy resources, especially from an economic standpoint.

But to achieve this goal, in addition to developing production facilities of green electricity, we have to work on reducing our consumption (conservation) and on the interconnection of networks to make renewable energy always available.

Quotes, ideas, figures, and tables are cited at the bottom of each page for ease of reference.

Poitou Charente

Presentation

Poitou Charentes is one of the 22 regions of France. It includes four departments: Charente, Charente-Maritime, Deux-Sèvres and Vienne.

It has for regional capital Poitiers which is also the biggest city and the largest urban area of the region. Her inhabitants are Picto-Charentais.

Situated in the Big French Southwest, it is lined by Centre regions and Pays de la Loire in the North, Limousin in the East and finally Aquitaine in the South. Its west wall gives onto the Atlantic Ocean.

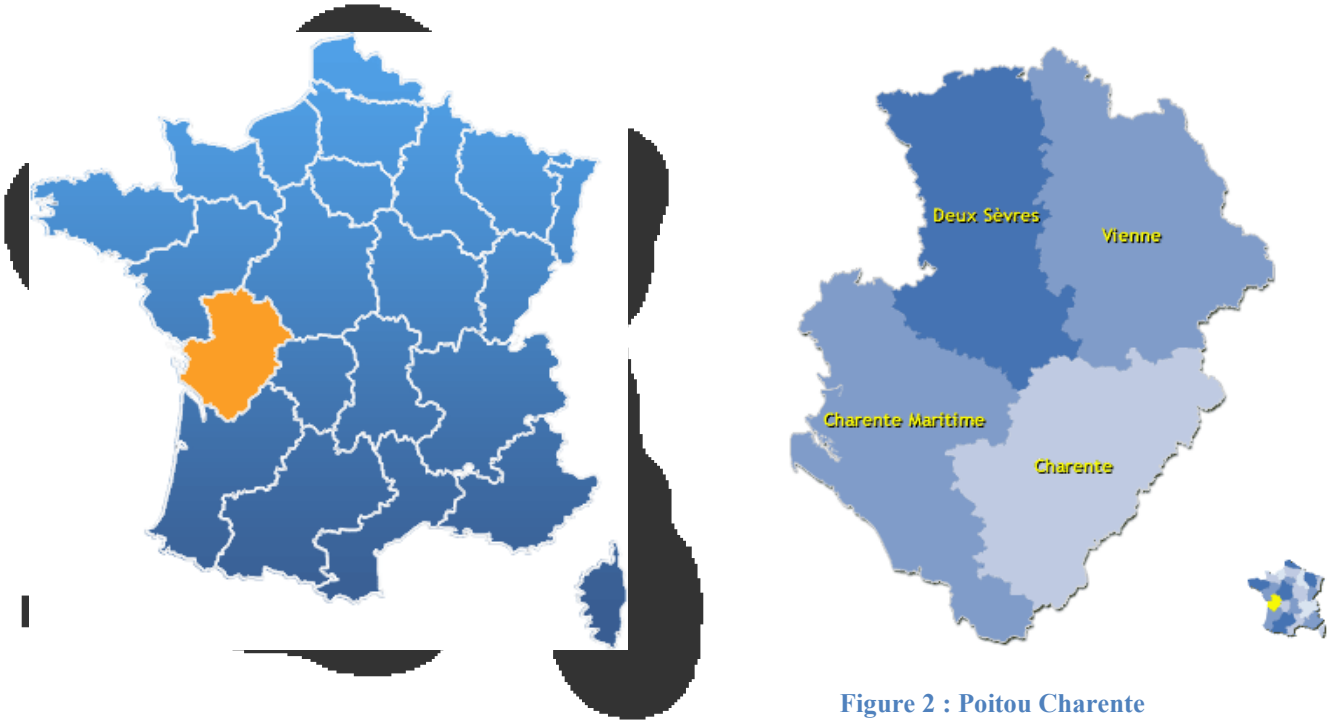


Figure 2 : Poitou Charente

Population

In 2011, Aquitaine had more than 1,780,379 inhabitants; this figure is expected to reach the 2,062,000 inhabitants by 2040. The majority of the population is concentrated in three major areas: Angouleme, La Rochelle, Niort and Poitiers.

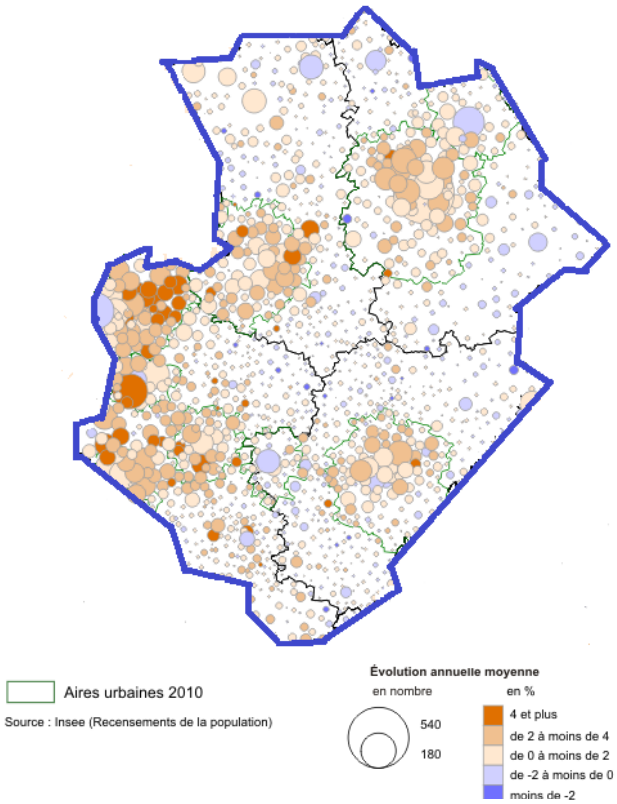


Figure 3 : Distribution of the population

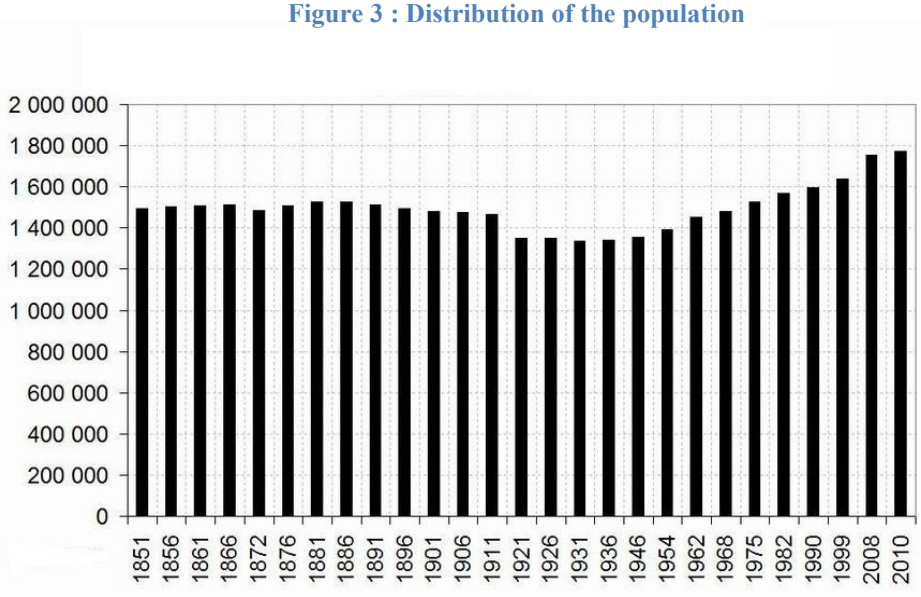


Figure 4 : Density

Energetic consumption

Energy consumption is dominated by petroleum products which constitutes 58% of energy consumption. Petroleum products are used for transportation fuel or for heating needs in industry or buildings.

The final energy consumption in Poitou-Charente is 4 865 ktep.

Second energy consumed (19% of total), electricity has a variety of uses (heating, hot water, cooling, cooking, etc..) And for some specific (lighting, office, etc.)[1]

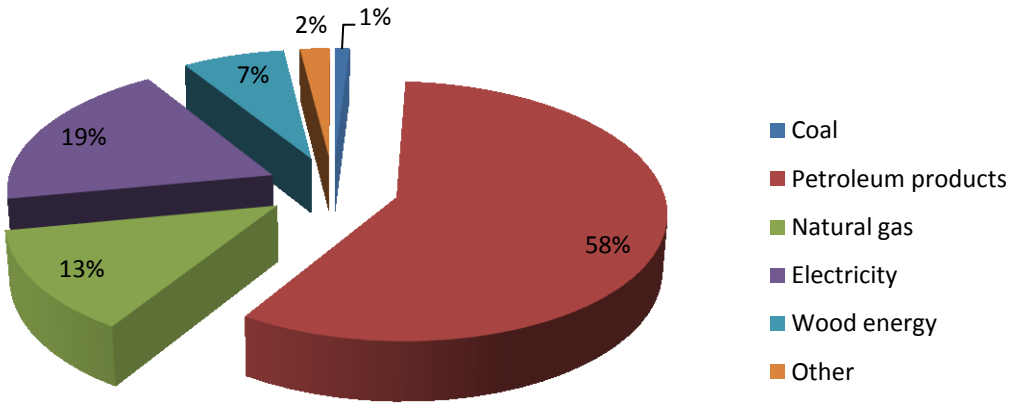


Figure 5 : Energy consumption mix

[1] http://www.arecpc.com/c__13_31__Chiffres_cles_regionaux.html

Electricity consumption

In 2011, the total consumption of electricity in Poitou-Charentes decreased by 6.7 %, from 12 TWh in 2010 to 11,2 TWh.[2]

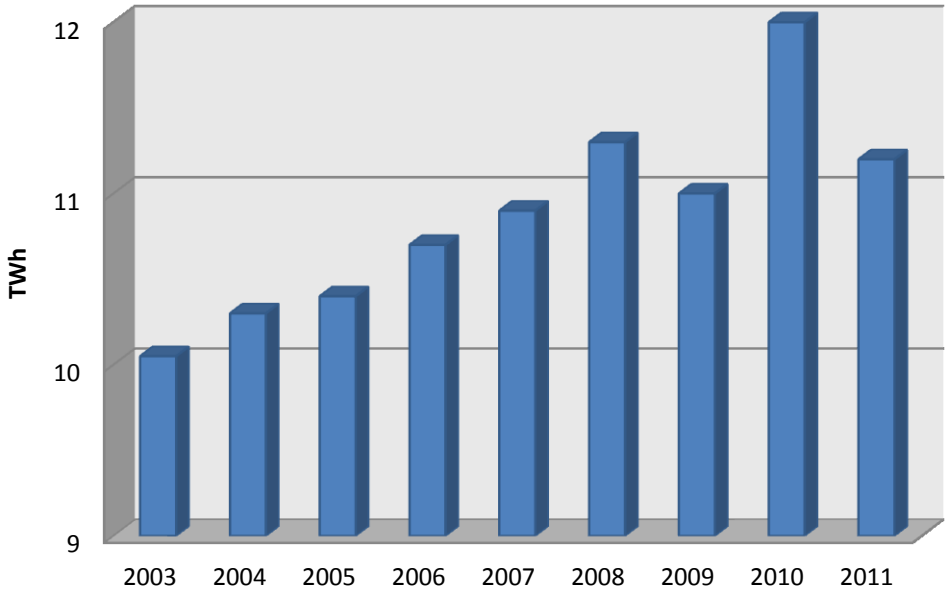


Figure 6 : Electricity consumption evolution

In 2011, a reduction identical to the national average. The reasons of this recoil are essentially meteorological. After particularly cold year 2010 in metropolitan France, year 2011 shows to be the warmest year which France knew since 1900, with an annual average temperature exceeding 0,5°C the normal. Every month of year 2011 were so warmer as the normal for the considerable exception of July.

[2] http://www.rte-france.com/uploads/media/pdf_zip/presse/dp-2012/2012_05_09_DP_RTE_Ouest_Bilan_Poitou-Charentes.pdf

Distribution of electricity consumption

In Poitou-Charentes, the consumption of the professionals and the private individuals decreased in a significant way in 2011 (-11,6 %), just like the national trend(tendency) (-10,2 %). Its interpretation is delicate because of the scale of the climatic distance observed between 2010 and 2011.

The electric consumption of SMEs/SMIs is as for her in light increase of 2 %, contrasting the trend (tendency) on the national level (-2,3 %).

The consumption of the heavy industry linked directly with the network RTE decrease when to her of 5,7 %, that is a recoil(drop) a little less marked than on the national level (-7,7 %).[3]

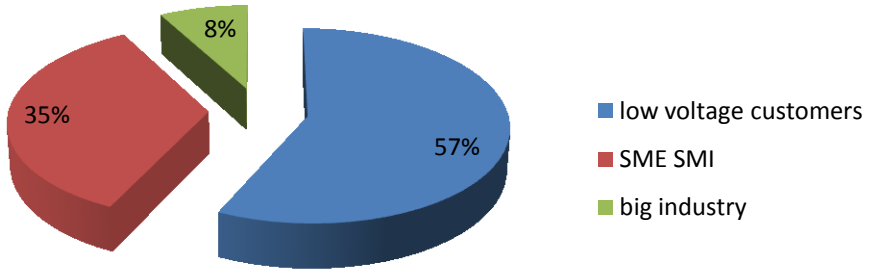


Figure 7 : Distribution amongst customers

[3] http://www.rte-france.com/uploads/media/pdf_zip/presse/dp-2012/2012_05_09_DP_RTE_Ouest_Bilan_Poitou-Charentes.pdf

Nature of electricity production in Poitou Charente

The region Poitou-Charentes in the objective to reduce the greenhouse gas emissions of 30 % to the horizon 2020 and to triple the power production of renewable sources before 2020, that is to reach 26 % of renewable energies in the regional consumption of energy, encourages the actions of decrease of the consumptions of fossil energy: the oil, the gas and the uranium, by the promotion of energy-efficient operations, the support for the development of the renewable energies and for the production decentralized by electricity (solar and wind).

In 2010, 93% of the electricity produced in the Poitou-Charente region was of nuclear origin, 6% of biomass (wood energy) and 1% from hydro. These figures show that Poitou-Charente is still far too dependent on nuclear energy.[4]

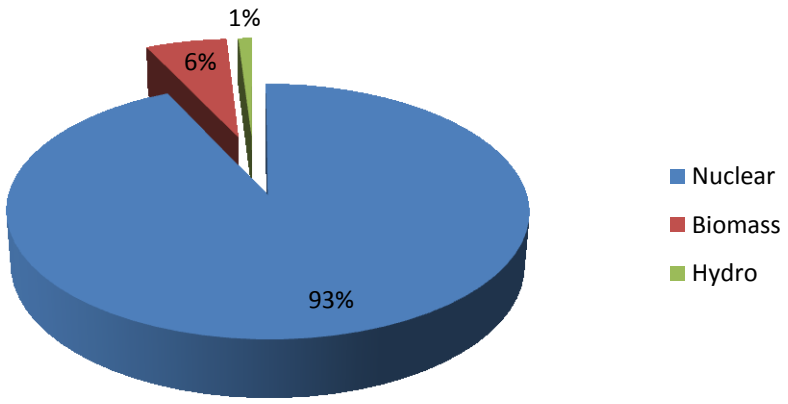


Figure 8 : Electricity production mix

[4] http://www.arecpc.com/c__13_30__Production_d_energie_en_Poitou_Charentes.html

Nuclear

Current situation

Located in the town of Civaux in Vienne, the Civaux nuclear power plant has two generating units of 1450MW each, giving a net production of 21TWh in 2008, a total that represents 4.4% of electricity production of France.

In 2011, production totaled 20 TWh, or 150% of consumption in Poitou Charente. This production is intended to supply the national grid electricity transmission and is not consumed in its entirety on the Poitou Charente region.. [5]

Figure 9 : Civaux nuclear pant

[5] http://fr.wikipedia.org/wiki/Centrale_nucl%C3%A9aire_de_Civaux

Geothermal

During the last decades which preceded the oil crisis of 1973, the geothermal science did not retain a big interest.

This is due to several factors, as the fact that the energy is not easily transportable, she can be transformed into electricity only beyond a certain threshold of temperature and the initial investments are very high.

From the beginning of this energy crisis, the geothermal operations multiplied.

What uses in Poitou Charente

In region Poitou-Charentes exist only two geothermal drillings, to Jonzac (17).

The first one was realized in 1979 and confirmed the existence of geothermal water in 65°C (+/-5°C) between 1670 and 1860 meters deep. This first drilling covers water requirements warm of the health resort of the city of Jonzac today and covers the need in heating of its premises.

The second drilling, realized in 1993, is the main source of energy of the aqua-playful complex " The Antilles of Jonzac " (at the level of 90 % of the total energy consumption).

The use of the geothermal science allows to avoid the consumption of 3 million liters of fuel a year in Poitou-Charente.

Potential in Poitou Charente

The biggest part of the geothermal potential in the region Poitou-Charentes is constituted by a single ground-water, that contained in the deposits of Lias subordinate and of Trias.

In the south part of the region, the temperature of the water is from 140 to 149 °F. Somewhere else, even if the temperatures do not reach this threshold value admitted for a present admitted to a direct use of waters, the possibilities of use remain rather numerous by using hot air pumps

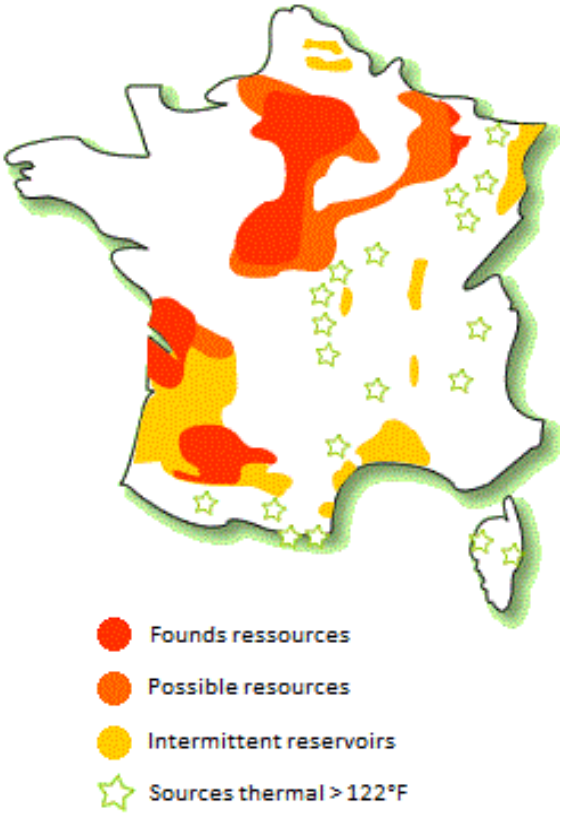


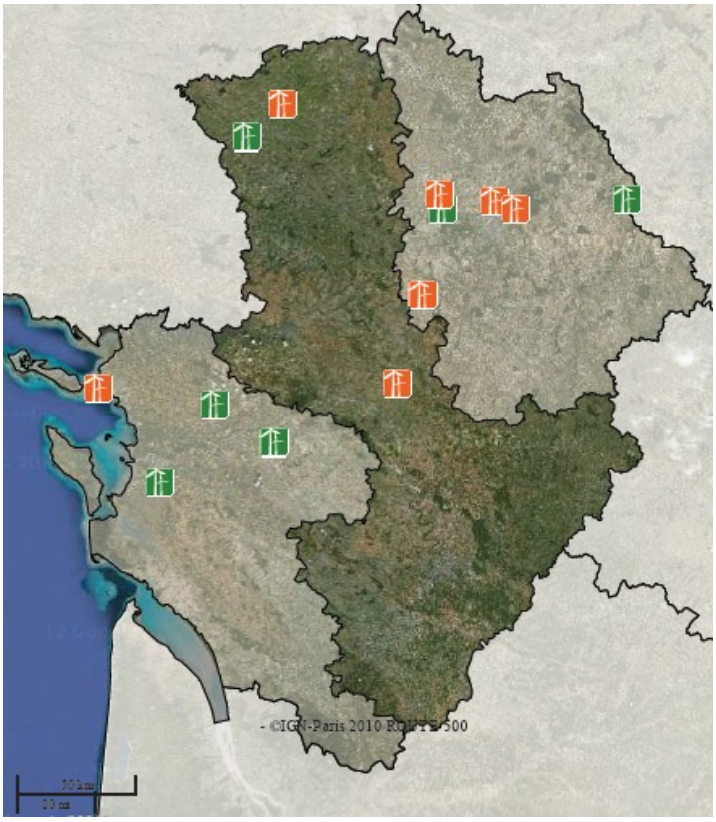
Figure 10 : Energy potential

Wind Power

The Region Poitou-Charentes is attached to the development of the wind energy within the framework of an energy autonomy of the territory, the decentralized production, and the consideration of the technological evolutions which do not limit themselves to the only wind energy of major power or macro wind energy.

If on September 1st, 2011, the wind farms of major power situated on the regional territory represent a total power of 242 MW, the Region Poitou-Charentes supports the projects of average and small power of communities, associations, companies and private individuals.

Since 2009, more than 44 projects, power accumulated by 155 kW, were accompanied by the Region within the framework of the Excellent Regional Fund Environmental Poitou-Charentes for an amount of helps of more than 220 000 euro.



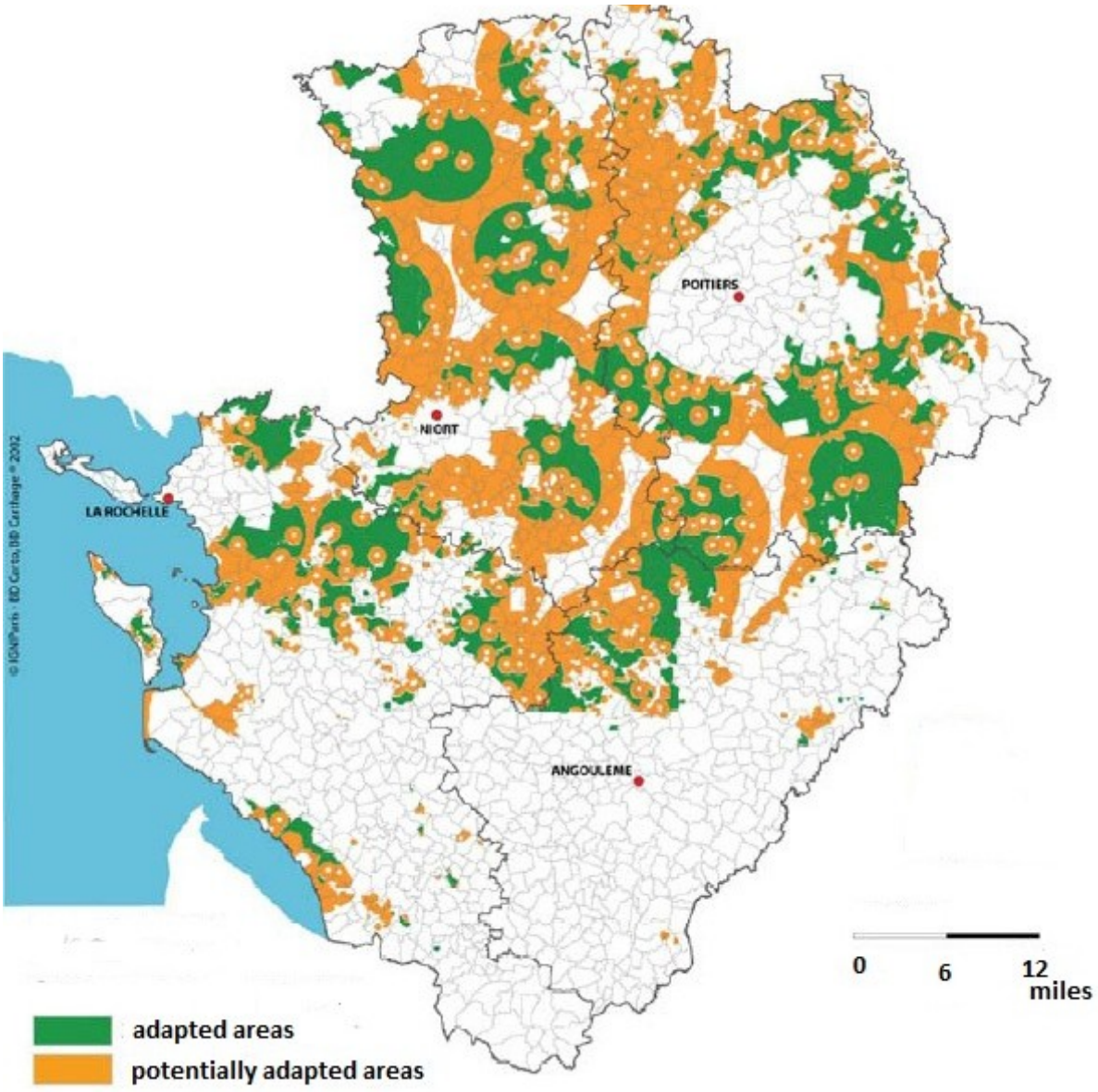
This image show the wind farms installed in the Poitou-Charente.

Figure 11 : Wind farms installed

Some regions in Poutou-Charente are more suitable for wind farm installation.

The department of Deux-Sèvres benefits from the most favorable field for the setting presence of wind farms (45,4 % of its territory is subjected to winds of more of 20feet/s). On the other hand, the Charente appears as the least adapted department.

Figure 12 : Potential for wind farms

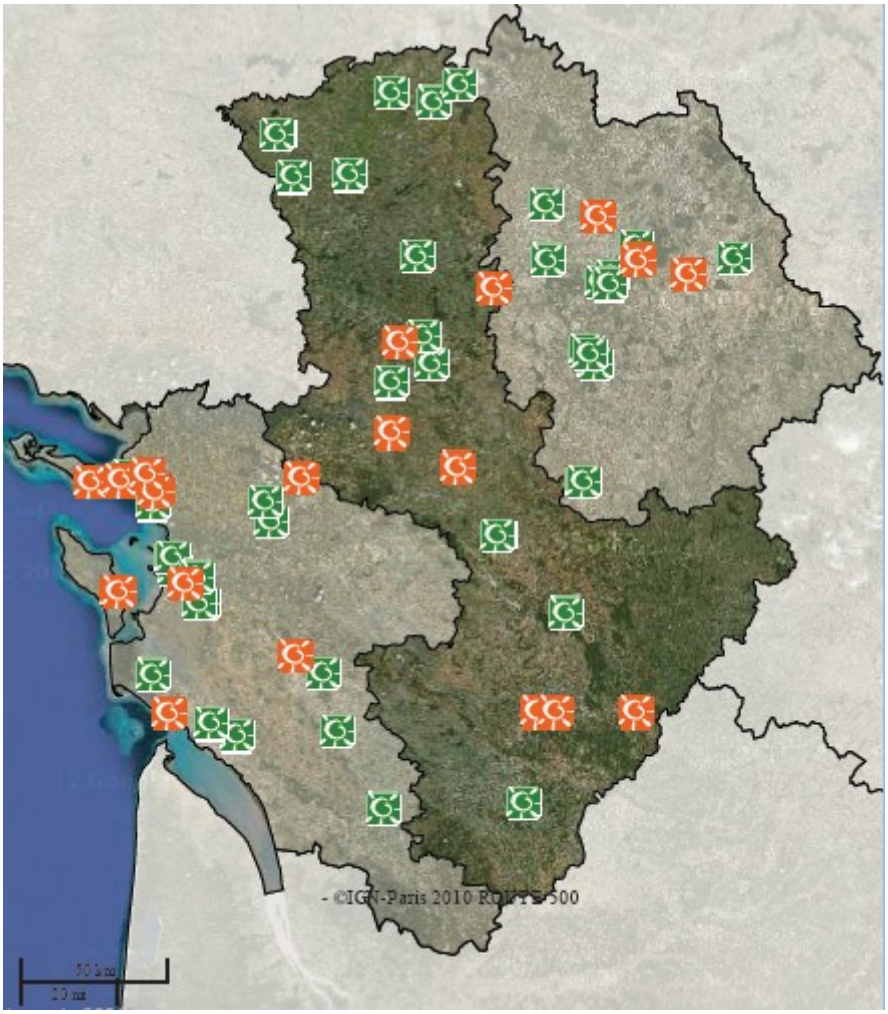


Solar power

Thermal solar

Benefiting from a period of sunshine equivalent to that of certain zones of the South of France, the Region Poitou-Charentes leads an active policy of promotion of the thermal solar energy with the private individuals for the installation of individual solar water heater and supports the development of projects carried by communities or companies such as the collective sanitary solar equipments and the solarization of swimming pools.

Since 2004, the Region supported more than 6 200 projects of individual solar water heater and 400 collective projects for an amount of 13,5 million euro assistants.



This image shows the installed thermal solar equipment in Poitou-Charente.

Figure 13 : Thermal solar equipment installed

Having known a development mattering between 2002 and 2006, the installed annual surfaces are henceforth stabilized between 6 000 and 8 000 m ². However, targets evolve because the CESI Particular which represented the majority of the market in 2006 moves back sharply while the Collective ECS progresses regularly.[7]

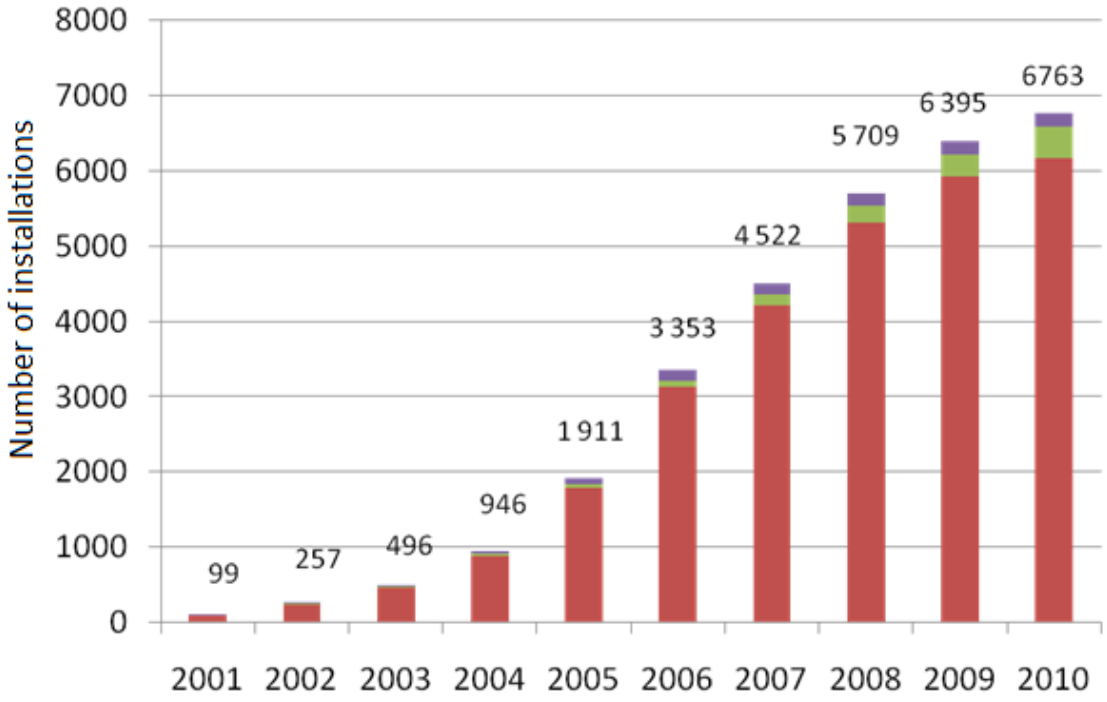


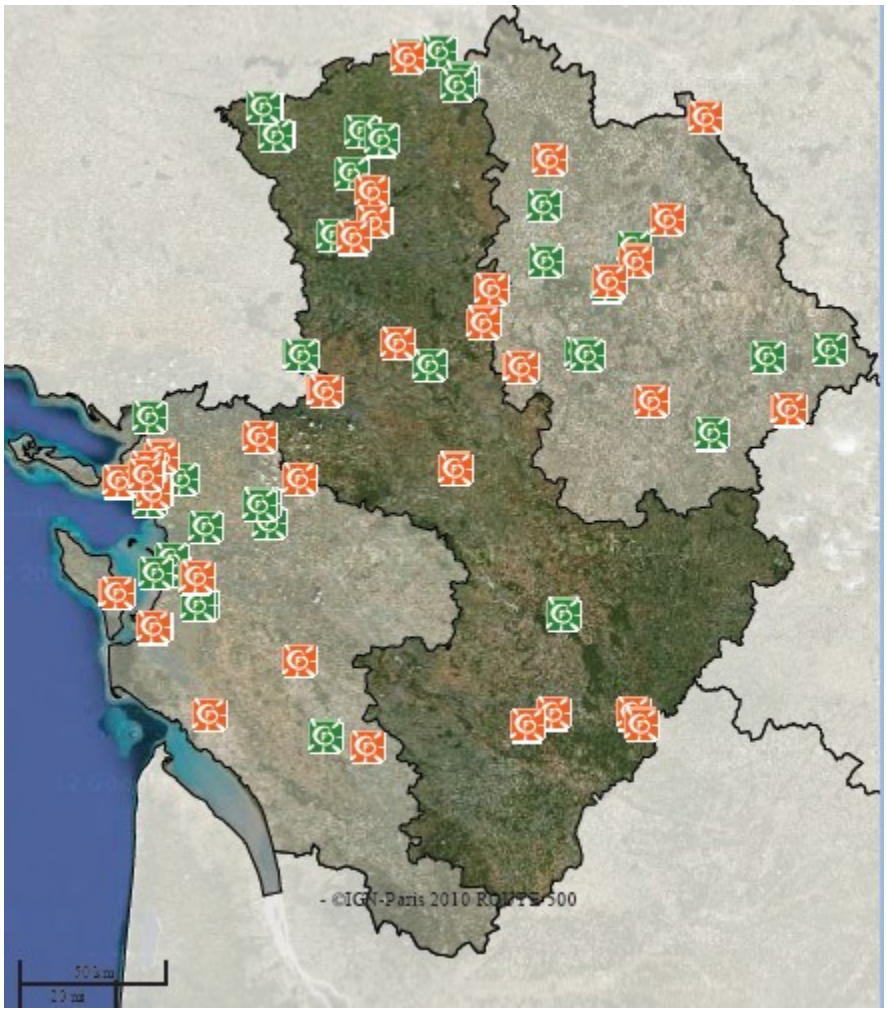
Figure 14 : Number of solar thermal equipment

[7] http://www.arecpc.com/c__20_13_Fiche_452__1__Solaire_thermique.html

Solar photovoltaic

Endowed since 2009 with a Regional Solar Energy Plan to increase the decentralized production of renewable energy, to develop the not relocatable use and the photovoltaic sector in region, the Region Poitou-Charentes fixed new objectives : reach, by 2015, a power installed of 270 MW and 1 000 MW in 2020 within the framework of the Regional Plan of Development of the Renewable energies 2020.

Since 2004, more than 1 300 private individuals projects and more than 500 projects carried by companies or communities were supported by the Region within the framework of the Excellent Regional Fund Environmental Poitou-Charentes, that is more than 51 MW accumulated for an amount of 25,5 million euro assistants.



This image shows the installed solar panels in Poitou-Charente.

Figure 15 : Solar panel installed

Because of the fast development of the photovoltaic sector, the AREC (Regional Agency of evaluation Environment and Climate) realizes a current situation of the regional photovoltaic plants all the quarters. The data for the 4th half-year 2011 are:

- Accumulated power linked with the network : 133.7 MW (twice more than 1st half-year 2011)
- Installed power : 25.9 MW (the most seen on a half-year)
- Number of installation : 8 924 (among which 469 on the 4th half-year 2011)
- Total surface : 1 010 000 m²
- Electricity production : 147 GWh (equivalent of the electricity domestic consumption of 65 100 inhabitant)
- Avoidance of greenhouse gas : 13 007 tons[8]

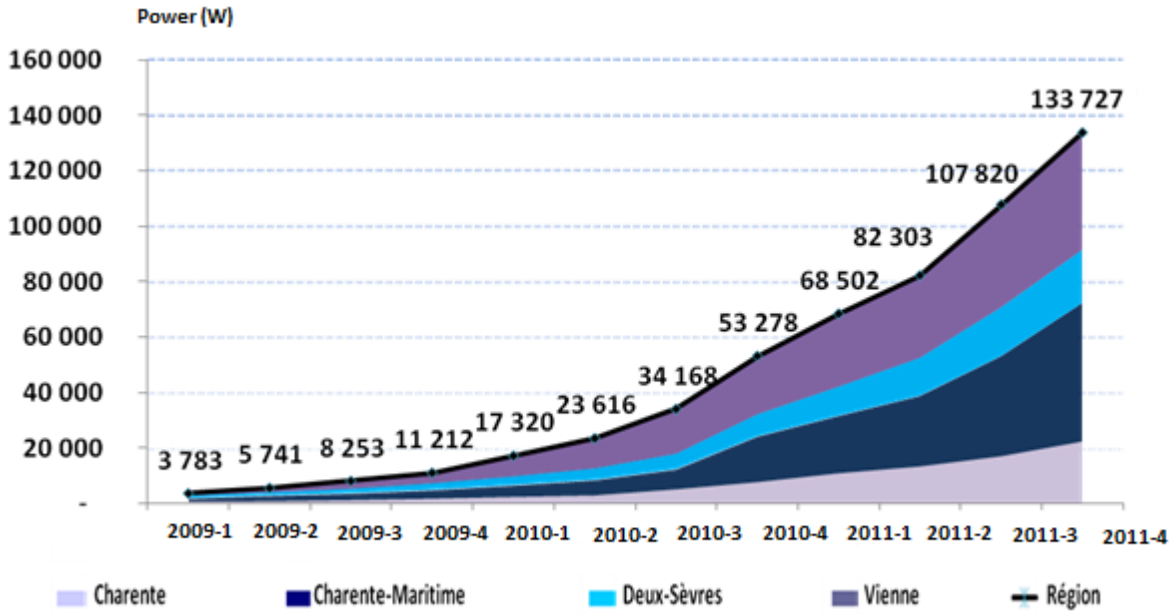


Figure 16 : Evolution of thecumulated power of solar panel

[8] http://www.arecpc.com/c__20_13_Fiche_559__1__Solaire_photovoltaique.html

On December 31st, 2011, with a power linked by 133.7 MW, the million of m² of photovoltaic panels was exceeded. The trend observed previously continues: important linked quarterly power and doubling of the park approximately every 9 months. Nevertheless, the collapse of the number of connecting indicates that the growth of the park in power is not the reflection of the dynamism of the current market and announces difficult year 2012.

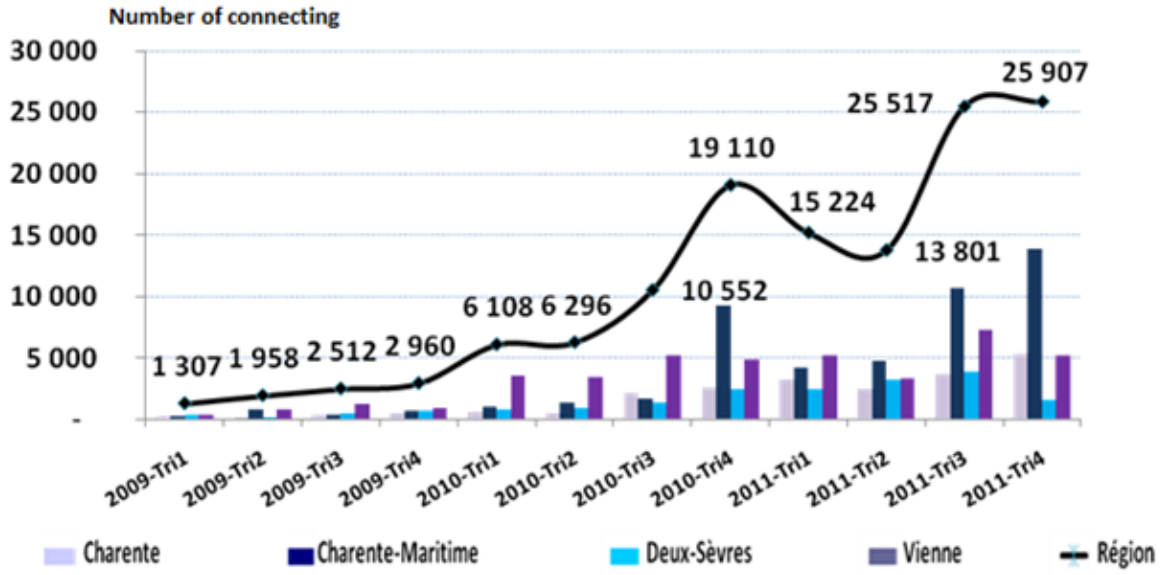


Figure 17 : Evolution of the connecting

With 469 connecting this quarter, the rhythm of connecting pursues its decline and falls again at its level of the end 2009, 3 times lower than that of the beginning of 2011. This fall is the consequence of the slowing down of the demand by private individuals, destabilized by economic factors (fluctuating tariff situation, reduction in the tax credit) and techniques (bankruptcy of the fitters). All the departments are impacted. The department of Charente-Maritime, traditionally directed on the sudden market of the private individuals the strongest retreat in volume but rest nevertheless, the most active department.[9]

[9] http://www.arecpc.com/c__20_13_Fiche_559__1__Solaire_photovoltaique.html

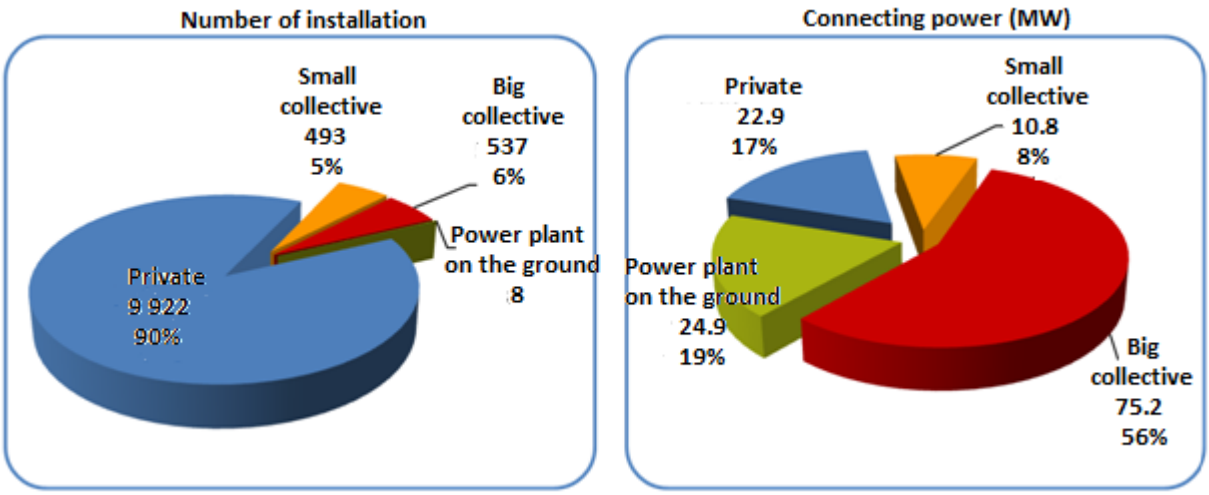


Figure 18 : Repartition by target

On the whole park, the installations of the private individuals (power < 6 kWc) constitute 90 % of the installations but a part less raised in power (17 %). Over the last months, the part of the private individuals does not stop falling.

Conversely, the collective installations represent 11 % of the installations but the main part of the power. The clients are three quarters of the private investors, mainly the farmers using the surfaces of roof of their sheds. The collective installations divide up between the said installations " Small collective " of power included between 6 and 36 kW and those say " Big collective " of a power > 36 kW. Power plants on the ground hold henceforth an important part in the installed power (19 %). There are at present 8 power plants on the ground in functioning.

Hydro power

The region possesses 30 installations of hydraulic electricity production in functioning. The regional installations are classified between small hydraulics, (power included between 500 kW and 10 MW), micro hydraulic (between 100 and 500 kW) and pico hydraulics (< 100 kW).

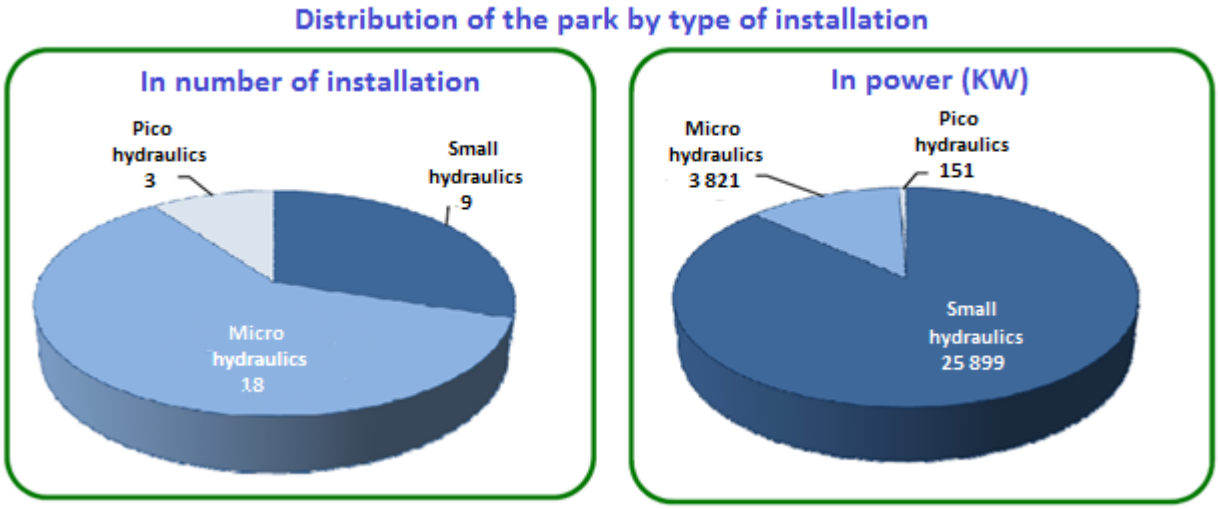


Figure 19 : Distribution by type of installation

The regional park consists of 4 main dams on Vienna (Jousseau, The Rock, Chardes and Châtellerault) and of 26 power plants of modest powers. The installations are concentrated on the streams of Vienna (85 % of the power), the Charente (8 %) and Dronne (5 %). The power in service is stable to 29,9 MW (among which 25 MW in the department of Vienna). With an annual production on 2010 of 130 GWh, the contribution of the hydraulics in the mix of electricity production of even decreasing, renewable origin, represent another third part of the production.

Biomass

Potential Poitou Charente

According to our estimations, the energy contents of the mobilizable biomass in Poitou-Charentes are of the order of 427 000 tep.

In a first approach, 30 % of this energy could be put at the disposal in the form of biogas stemming from the methanation, and 70 % directly in the form of heat in adapted boilers.

As an example, the mobilizable biomass in Poitou-Charentes could warm approximately 5 300 old people's homes (average power: 300 kW) and allow the production of biogas on approximately 2 000 farms possessing a herd of 200 brood cows.

Supply of electricity using biomass

The biomass represents 91 % of the energy production of renewable origin of the region. This resource is established(constituted) by wood (logs, granules, plaques), of agricultural residues and animal excrement, household waste or targeted cultures (colza, sunflower).

The heat production from biomass is 3 662 GWh and is made by means of boilers (collective, industrial or particular) or of incinerators. Two main resources used to produce this heat are the wood (valued in boilers) and household waste or other waste. For the wood, two types(chaps) of fuels are taken into account: the wood in plaques and in granules which feeds the automatic boilers, and the wood slogs(slogs away).

The wood slogs away is only consumed by the private individuals. The wood in plaques and granules is intended for three targets:

- The sector domesticates for the wood-fired heating of the private individuals,

- The collective and tertiary sector (local authorities, associations, social services, companies of services(departments)),

- The branch of industry (every type(chap) of industry, including those auto-consuming their related products).

At the origin of 85 % of the power production stemming from the biomass, the wood slogs away, mainly used by the private individuals, is the most productive and most used fuel in term of energy.

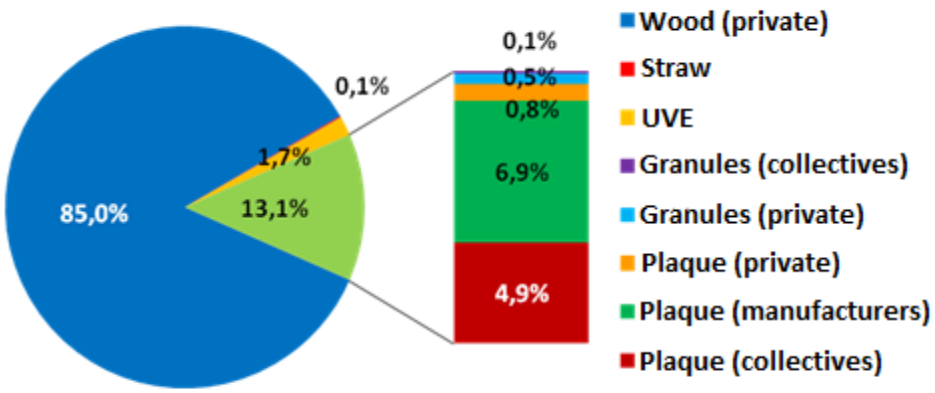


Figure 20 : Distribution of biomass

The heat produced from biomass is a renewable heat which comes mainly in substitution of fossil fuels, as the fuel (in 72 %) and the natural gas (in 5 %).

Exchanges with others countries:

Current situation

For France the balance of contractual exchanges with foreign countries still exporting and reached 29.5 TWh in 2010, it is up 19% over 2009. This balance is the difference between exports (66.6 TWh) and imports (37.1 TWh).

This increase reflects the flow of trade with neighboring countries of France through the 46 existing interconnection lines. The year 2010 recorded 72 days of net imports contractual, against 57 in 2009.

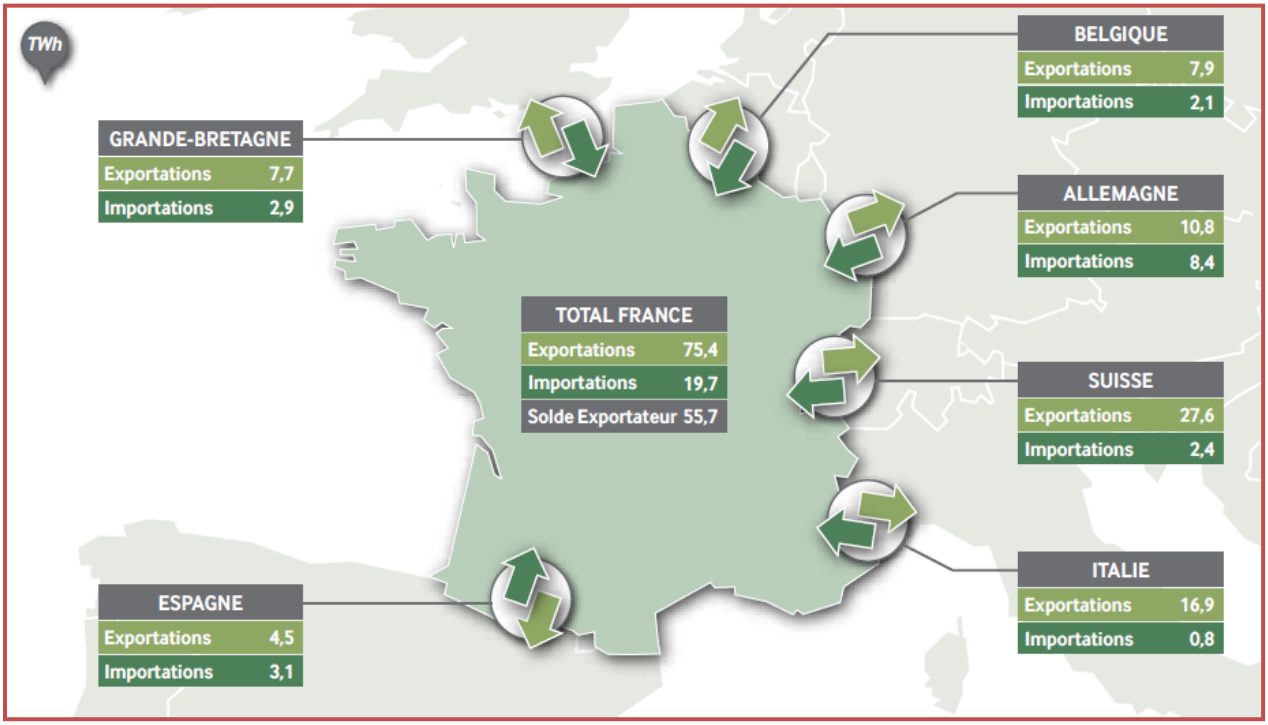


Figure 21 : Electrical exchange

Interconnected grids

The first year plan network development (TYNDP) 19 forms a solid basis for setting priorities in the sector of electricity infrastructure. The plan however does not take full account of investment in infrastructure resulting significant new production capacity at sea, mainly wind in the northern seas, and does not guarantee the implementation on time, especially for cross-border interconnectors.

To ensure the rapid integration capabilities of renewable energy production in the northern and southern Europe, and the further integration of markets, the European Commission proposes to focus attention on the following priority corridors, which will prepare the European electricity networks to the 2020 deadline:

1. Offshore grid in the northern seas and connection to the Northern and Central Europe - to integrate and connect the power generation capacity in the seas septentrionales21 to load centers in northern and central Europe and hydroelectric storage facilities in the Alpine region and the Nordic countries.

2. Interconnections in the southwest of Europe to support wind power, hydropower and solar energy, especially between the Iberian Peninsula and France, and additional connections with Central Europe, to the best use of renewable energy sources in North Africa and the existing infrastructure between North Africa and Europe.

3. Connections in Central and Eastern Europe and South-East Europe - strengthening the regional network as the North-South and East-West energy flow in order to promote market integration and renewable energy, including connections to storage capacities and the integration of "energy islands".

According to the Commission for Energy Regulation (CER), "make an intelligent network" is to "integrate distributed renewables on a large scale" and "to promote an offer adapted to the demand by providing consumers end tools and services enabling it to know his own consumption, and therefore to act on it. " With new information technologies and communications, intelligent networks allow greater interaction between consumers and electricity suppliers, and better integration of renewable energy in the European energy networks.

Should we still be able to integrate renewable energy like wind and solar products that depend on weather conditions, and invest in research on electricity storage? The most ambitious scenarios envisage that consumers are becoming in turn, producers and distributors of electricity. But before that, customers will learn to better manage their electricity consumption. Eventually, smart grids should enable households to reduce their annual energy bill by 10%.

Several projects of interconnection networks are under way between Europe and its neighbors. These projects aim in 2020 or 2030. And Europe could be connected to North Africa and the Middle East to take advantage of the intense solar radiation, thereby reducing production costs for the same installed surface, the yield would be much higher.

Currently, wind turbines are a regular stop during periods of high electricity supply, to give priority to nuclear and coal, which is a bad decision for the planet. Winning the "Battle of electrical networks" will require priority access for renewables to European networks, including the priority interconnections between countries. Indeed, excess production of a country may be exported to other regions with a clear demand.

Two examples of projects that, if complete, will cover much of Europe's needs and producing countries:

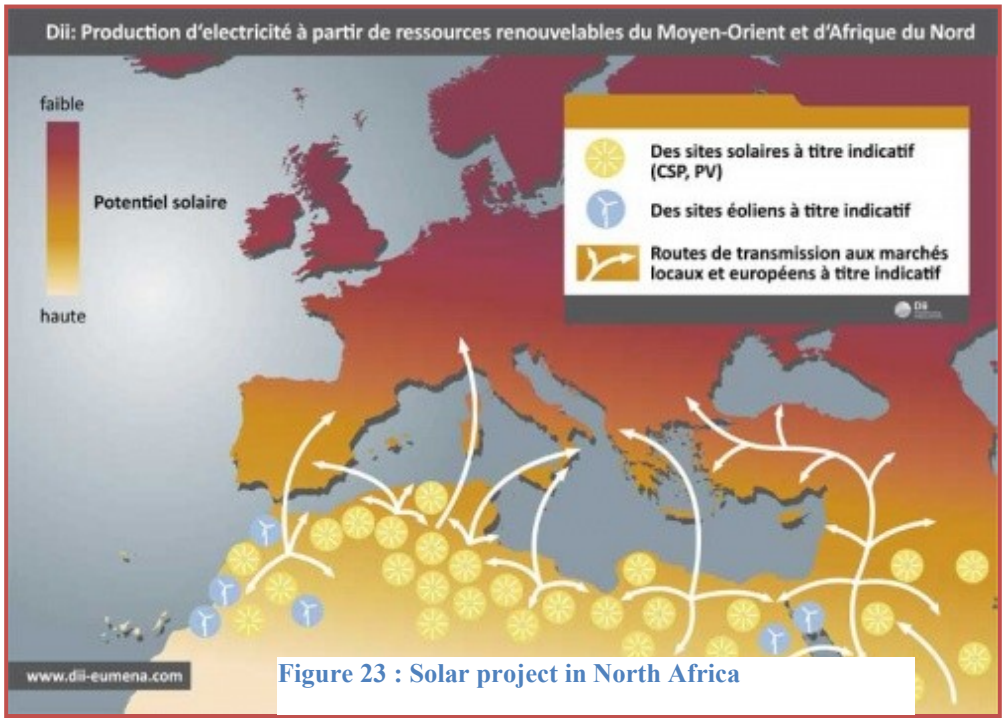


Figure 23 : Solar project in North Africa

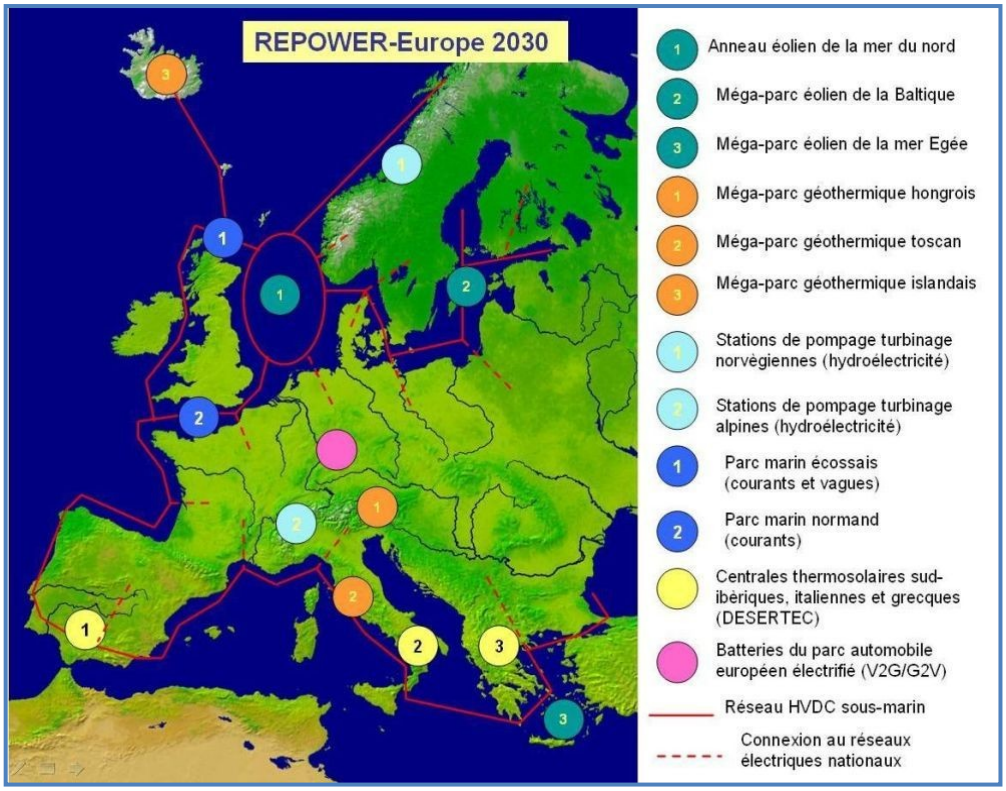


Figure 22 : Grid project in Europe

Conclusion

Replacing nuclear power plants in France is not an easy thing, but there are some regions like the Midi-Pyrenees that wish to develop renewable energies quickly.

Technically, 100% renewable energy in Aquitaine is entirely possible. But France and Aquitaine are presently far too dependent on nuclear, it will be very difficult to close all nuclear power plants and install enough renewable energy resources, especially for an economic standpoint.

But to achieve this goal, in addition to developing production facilities of green electricity, we have to work on reducing our consumption and on the interconnection of networks to make renewable energy always available.

It is possible to use green energy imported from Spain to respond to higher demand when there is underproduction. To maintain the percentage of renewable energy, the region can sell its surplus production during periods of overproduction.

For this authors opinion, Poitou-Charente has the potential to become a 100% renewable energy region, but we should first reduce energy consumption and as an example to other regions in France. Then we could make plans to develop our renewable energy to make Poitou-Charente less dependent of the nuclear power.

A lot of regions in France would like to become 100% renewable energy, so maybe if we all work together it could be easier to make France a green country.

Bibliography

http://fr.wikipedia.org/wiki/Centrale_nucl%C3%A9aire_de_Civaux

http://objectifterre.over-blog.org/article-27626931.html

http://www.arecpc.com/c__13_30__Production_d_energie_en_Poitou_Charentes.html

http://www.arecpc.com/c__13_31__Chiffres_cles_regionaux.html

http://www.arecpc.com/c__20_13_Fiche_452__1__Solaire_thermique.html

http://www.arecpc.com/c__20_13_Fiche_559__1__Solaire_photovoltaique.html

http://www.arecpc.com/c__20_76__Geothermie.html

http://www.hotels-france.fr/hotel-poitou-charentes-region-20-fr.html

http://www.observatoire-environnement.org/ore2010/Le-schema-regional-eolien.html

http://www.poitou-charentes.fr/environnement/air-energie-dechets-transports/energie/

http://www.poitou-charentes.fr/environnement/air-energie-dechets-transports/energie/per/cartographie.html

http://www.rte-france.com/uploads/media/pdf_zip/presse/dp-2012/2012_05_09_DP_RTE_Ouest_Bilan_Poitou-Charentes.pdf

http://www.tunisiefocus.com/economie/s-renouvelebles-13062/