

RES-E Regions

WP 1: Regional Targets & Strategy



GOVERNMENT OF NAVARRE

In the light of the data yielded by the latest energy audit (2003) and of the objectives set for 2010 in the recent Renewable Energy National Plan for 2005-2010 adopted by the Government of Spain within the Council of Ministers of 26 August, it can be stated that Navarre is a Community playing a relevant role in the development of Renewable Energies, as displayed in the following table.

Renewable Energy Plan for 2005 – 2010	Spain			Navarre		
	Primary Energy Production (ktoe)			Primary Energy Production (ktoe)		
	2004	Base scenarios for Renewable Energies		2004	Base scenarios for Renewable Energies	
		2005	2010		2005	2010
Total electrical areas	5,973	7,846	13,574	258	274	427
Total thermal areas	3,538	3,676	4,445	88	88	87
Total biofuels	228	528	2,200	0	14	49
TOTAL RENEWABLE ENERGIES	9,739	12,050	20,220	345	375	564
<i>Energy Scenario: Base</i>						
Primary Energy Consumption (ktoe)	141,567	166,900	167,100	2,560	2,650	3,904
Renewable Energies / Primary Energy	6.9%	7.2%	12.1%	13.48%	14.2%	14.4%
<i>Energy Scenario: Efficiency</i>						
Primary Energy Consumption (ktoe)	141,567	159,807	160,007	2,560	2,647	3,780
Renewable Energies / Primary Energy	6.9%	7.5%	12.8%	13.48%	14.2%	14.7%

Table: Summary of energy scenarios and renewable energy scenarios in Spain and in Navarre

These data account for the fact that in 2004 Navarre had already attained the objectives set by the EU for 2010 regarding the share of Renewable Energies in primary energy and electricity, whose reference values can be found in the following publications:

- White Paper (1997) adopted by the EU, the objective being for renewable energies to meet 12% of the overall energy demand.
- Directives 2001/77/EC, setting the target for the contribution of electricity produced from renewable energy sources to gross electricity consumption by 2010, the target for Spain being 29.4%.

However, the target set for biofuels has not been met yet.

- Directive 2003/30/EC, on the promotion of the use of biofuels, setting the target of a 5.75% consumption of biofuels with respect to petrol and diesel consumption.

These successful achievements have resulted from social consensus, from the efforts and dynamism of promoting enterprises who made substantial investments and took on significant risks and from the support of public institutions and authorities.

That being said, the informations collected during the elaboration of the Energy Plan, together with the suggestions made by the three tables on Renewable Energies, provide the grounds to conclude the diagnosis of renewable energies in Navarre, whose strengths and weaknesses can be summarised as follows:

STRENGTHS:

- An advanced and committed society where renewable energies enjoy a high level of social acceptability.
- A high rate of self-supply relying on the use of renewable energies.
- A proportionate and diversified share of use of renewable resources.
- An emerging industrial fabric connected with renewable energy technologies.
- Presence of the National Centre of Renewable Energies (CENER-CIEMAT) and the National Centre for Vocational Training on Renewable Energies (CENIFER).

WEAKNESSES:

- Renewable energies still depend to a far too large extent on grants and subsidies to subsist.
- Renewable energies are not intrinsically cost-effective due to the opportunity cost and the low prices of fossil fuels, which none the less are still “cheap” for users.
- Renewable energies are not integrated into regular energy consumption, but remain a separate business, i.e. electricity sold under feed-in tariff schemes.

The Government of Navarra feels the overall need to establish the adequate conditions favouring:

- ❖ The increase of contribution share of renewable energies to the energy architecture of Navarra.
- ❖ The development of the industrial fabric connected with renewable energy technologies.
- ❖ The continuing support to R&D&I initiatives on consolidated and emerging renewable energy technologies.

1.1.1 DEVELOPMENT STRATEGY FOR RENEWABLE-ENERGY-BASED POWER PRODUCTION

The power generation mix in Navarra is significantly diversified. The beneficial contribution of renewable resources generation facilities, where special mention should be made of wind generation and, to a lower extent, mini-hydraulic generation, is well-balanced thanks to the continuing generation based on natural gas combined cycles and natural gas, biogas or biomass-based co-generation and generation facilities. This mix is further completed by photovoltaic solar generation, an increasingly expanding sector.

External limitations:

Environmental limitations

Renewable energies feature a very low level of atmospheric emissions, but may involve other types of impacts likely to affect the balance of certain ecosystems.

Energy transport capacity of the electricity grid.

The growing capacity is conditioned by the capacity of the energy transport and distribution grids. Because of their transregional nature, these grids may not always adapt to the energy transport needs of one single Autonomous Community. Therefore, the transport grid system operator, i.e. Red Eléctrica Española (REE), in addition to the transport demands of power generated in Navarra, needs to integrate the needs of bordering Autonomous Communities sharing the same “territorial axis”, i.e. La Rioja, Aragon, Basque Country and Cantabria.

These general guidelines are described in the recent Energy Plan of Navarra - 2010 Horizon - The current situation of renewable energies in Navarra. Using this general framework as a starting point, a case-by-case approach needs to be applied for each technology.

1.2 WIND/MINI-WIND POWER

1.2.1 CURRENT STATE OF WIND POWER IN NAVARRE

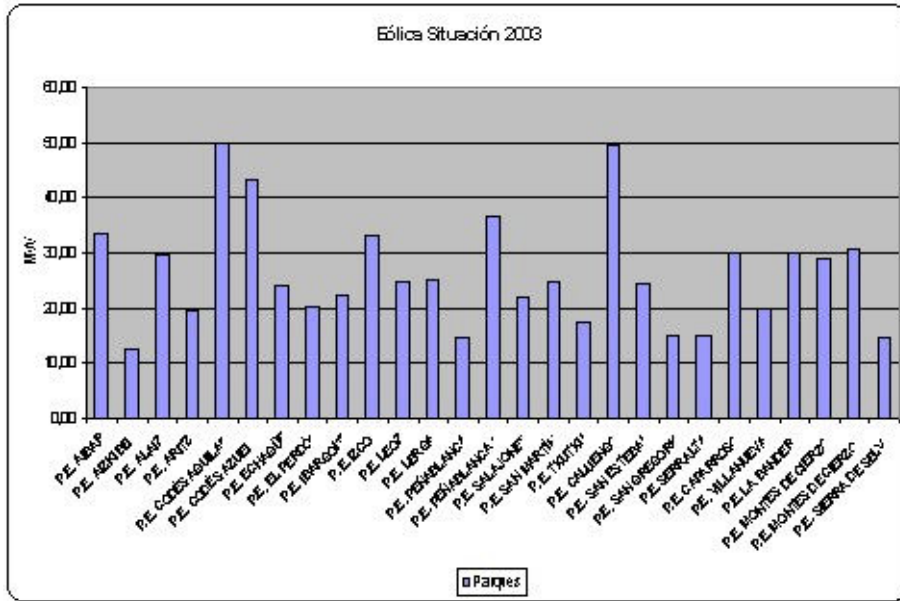
Wind power is as of today the flagship power generation sector among renewable sources, considering its input capacity to the system. It has undergone a larger development and has made the largest contribution to increase the self-supply level of the Community of Navarre.

However, the further development of this technology is limited by the inexistence of new wind farm facilities, except for experimental farms and the replacement of obsolete equipments by new ones, insofar as this is possible in compliance with environmental restrictions and subject to the adaptability of the capacity of the transport grid.

The installed capacity in Navarre in 2004 has increased by 18% compared with 2003, which means an increase from 715.21 MW to 849.47 MW. Current maximum authorised capacity in the Community of Navarre amounts to 936 MW, to be attained in 2006.

The wind farm map of Navarre for 2003 consists of 27 conventional wind farms and 1 experimental farm, amounting to a total of 1,004.5 wind turbines¹ and 715.21 MW of installed capacity. These facilities contributed with a share of approximately 37.2% of the final energy consumption in Navarre for that year. The following graph displays the installed capacity of each farm.

¹ The Sierra de Selva Wind Farm is co-owned by the Autonomous Communities of Aragon and Navarre; the number of wind turbines has been calculated according to the capacities assigned.



Graph : Installed capacity per Wind Farm in Navarre

Source: Drawn up with data from Government of Navarre and own data.

Wind Power Generation - 2003

The Community of Navarra has almost reached the limit of admissible wind facilities under current circumstances – environmental restrictions and limitations due to the saturation of transport lines.

1.2.2 OBSTACLES

1.2.2.1 Environmental

From an environmental perspective, the main factors conditioning the installation of new wind farm regard their impact on the avifauna, alterations of existing soils and impacts on the landscape².

1.2.2.2 Transport grid

The major current restriction from a transport grid viewpoint is the limited capacity of the grid, affecting mostly the Communities of Navarra and La Rioja, and then to a lower extent to the Northern axis, i.e. Navarra, La Rioja, Aragon, Basque Country and Cantabria.

1.2.2.3 Objectives

The Renewable Energies National Plan for 2005-2010 envisages in the case of Navarra an increase in the installed capacity up to 1,400 MW. The Grid Infrastructures Planning Paper foresees the possibility of increasing the transport capacity up to 1,536 MW, although these figures are set for a 2011 horizon.

1.2.3 MEASURES

The following are basic premises adopted to consider when installing new wind turbines, in any case these shall be construed within the scope of competences held by the Autonomous Community of Navarra:

- Admitting the revamping (increase of installed capacity) of existing wind farms, provided that minimum requirements regarding minimisation of environmental impacts as laid down in regional legislation are duly respected, by virtue of the above environmental limitations.
- Granting permission to experimental wind farms in admissible areas pursuant to the acceptability map, subject in any case to an EIA (Environmental Impact Assessment) procedure and to the taking of the necessary corrective measures.

² A research was carried out on the landscapes of Navarra; the study assessed the quality of the landscape as well as synergic and cumulative effects of wind infrastructures, and ultimately defined the areas having a larger level of visual saturation due to wind farms.

- Favouring the administrative procedures of facilities destined to self-consumption (mini-wind farms), provided they are connected with economic activities and encountering no environmental obstacles due to their location.
- Studying the need and possibilities of developing coordination centres for wind farms and of setting up routines allowing to improve the predictability of and communication among grid managers, the operation and production of power generating facilities.
- Promoting, through the implementation of aid ceiling set out within the regulatory framework for the Promotion of R&D, the collaboration between the Wind Power Association of Navarre (AENAV), the National Centre for Renewable Energies (CENER) and Universities in the development of R&D projects aiming at:
 - Optimising processes and reducing costs
 - Developing new applications for power surpluses
 - New developments for the making of two-blade and three-blade wind turbines for offshore wind farms
 - Developing new applications in the field of mini-wind power generation in combination with other energy sources allowing to complement the energy supply for a large number of users.

Wind Power	End 2003	2010	
		Likely	Optimistic
<i>Installed capacity (MW)</i>	715.21	1,400	1,530
<i>Energy produced (ktoe)</i>	133.2	261.8	287.3
<i>Emissions avoided (kt CO₂)</i>	228.5	397.2	435.75
<i>Related cumulative investment (M€)</i>	-	467.9	583.5

1.3 HYDRAULIC/MINI-HYDRO POWER

Hydraulic power plants >10 MW

Hydraulic >10 MW	End 2003	2010	
		Likely	Optimistic
<i>Itoiz Dam (MW)</i>	-	50	50
<i>Navarre Canal (MW)</i>	-	30	30
<i>Energy produced (ktoe)</i>		15.1	15.1
<i>Emissions avoided (kt CO₂)³</i>		22.9	22.9
<i>Related cumulative investment (M€)</i>		24.8	24.8
<i>Public Aid 10% General Deduction</i>		2.48	2.48

Table. Summary of energy scenarios in hydropower plants

Drawn up with data from Government of Navarre and own data

³ Avoided emissions refer to cumulative emissions in the 2005-2010 period for base scenarios #1 and #2

Hydraulic power plants <10 MW

Hydraulic<10 MW	End 2003	2010	
		Likely	Optimistic
<i>Installed capacity (MW)</i>	195.128	225.128	255.128
<i>Energy produced (ktoe)</i>	40.53	42.6	48.3
<i>Emissions avoided (kt CO₂)</i>	69.49	64.6	73
<i>Related cumulative investment (M€)</i>		31.8	63.6
<i>Public Aid 10% General Deduction</i>		3.18	6.36

1.4 SOLAR POWER

Thermal solar	End 2003 ⁴	2010	
		Likely	Optimistic
<i>sq m of panels</i>	3,024	77,405	100,000
<i>Energy produced (ktoe)</i>	0.157	4.025	5.2
<i>Emissions avoided (kt CO₂)</i>	0.369	9.454	12.21
<i>Related cumulative investment (M€)</i>	-	31.71	43.11
<i>Public Aid (average aid: 50%)</i>		15.85	21.55

1.4.1 SOLAR THERMAL ELECTRIC POWER

Scenario	End 2003	2010	
		Likely	Optimistic
<i>Installed capacity (MW)</i>	-	10	60
<i>Energy produced (ktoe)</i>		1.3	7.7
<i>Emissions avoided (kt CO₂)</i>		1.96	11.74
<i>Related cumulative investment (M€)</i>		30	180
<i>Public aid 20% Tax deduction⁵ (R&D aids not included)</i>		6	0

1.4.2 SOLAR PHOTOVOLTAIC POWER

Total installed capacity in Navarre (4.5 MWp) in this technology in 2003 amounted to 16.7% of the total installed capacity in Spain (27 MWp), proof that Navarre is witnessing a substantial expansion of this type of facilities known as “Huertas Solares” (literally meaning “Solar Gardens”).

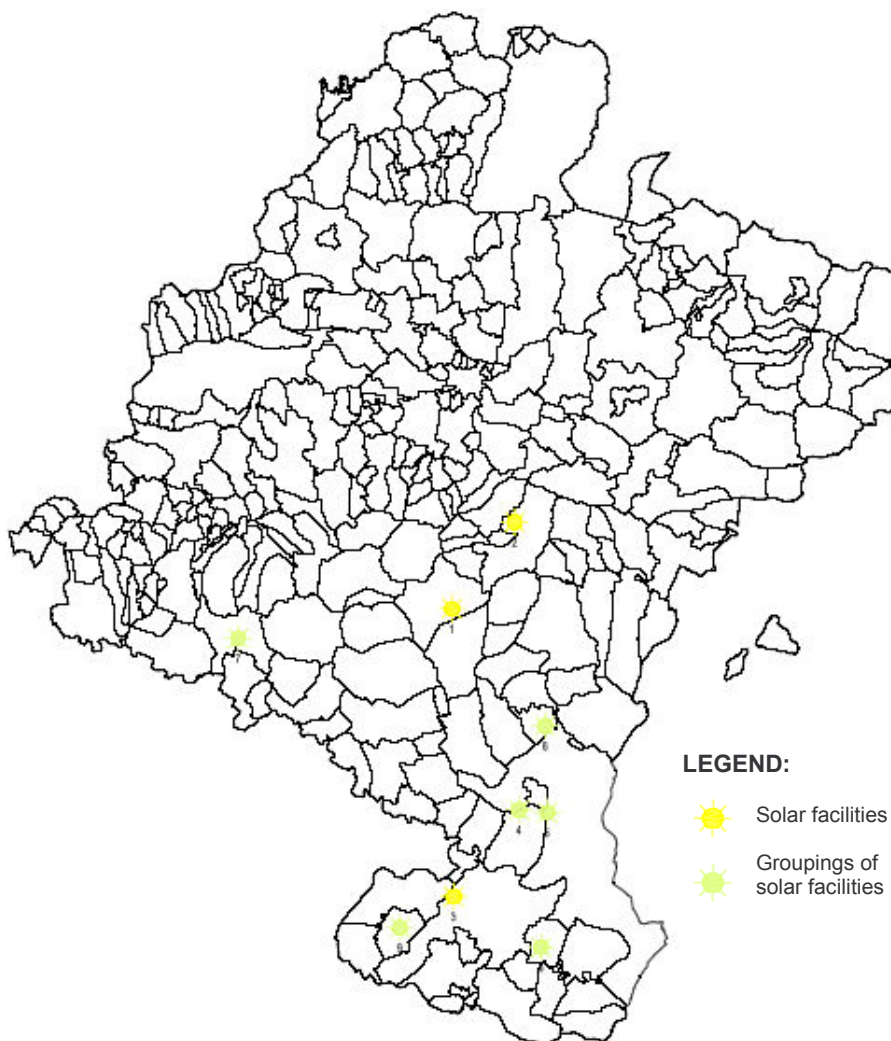
The reasons for this current development are the following:

⁴ 2003 values only include public funded facilities

⁵ Aid schemes in force end as of 31 December 2006

- A change in the legislation⁶ governing grid connections of photovoltaic facilities both regarding the improvement of power generation allowances⁷ and the amendments to the rules on low tension.
- Existence of promoters fully involved in the development of this technology, creating added value in the Community of Navarra and exporting their work to other Autonomous Communities.

Additionally, it needs to be mentioned that there is a specialization branch on Renewable Energies and postgraduate programmes on remote power generation systems available at the Universidad Pública de Navarra, as well as training programmes at different levels available at the National Centre for Vocational Training on Renewable Energies (CENIFER).



Map: Solar photovoltaic installations

Drawn up with data from Government of Navarra and own data.

⁶ Royal Decree 1663/2000 of 29 September 2000, on the connection of photovoltaic installations to the low tension grid.

⁷ Royal Decree 436/2004 of 12 March 2004, governing the methodology to update and systematize the legal and economic regime of special-scheme power generation activities.

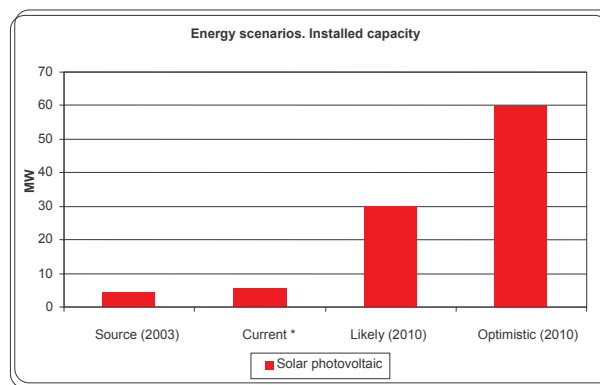
1.4.2.1 Obstacles

Major obstacles encountered by photovoltaic collection technology are summarised below:

- As regards the conversion of input energy into electric power, the low energy performances attained by this type of technology, and the impacts this entails for investment needs.
- The shortfall of raw materials and the resulting rise in prices.
- The environmental impact of large solar facilities (“solar gardens”).

1.4.2.2 Objectives

The National Plan on Renewable Energies envisages for Navarre an increase in the installed capacity of up to 19.64 MWp. However, in the light of the promising prospects under the current allowance scheme, the Energy Plan envisages reaching an installed capacity of 30 MWp (likely scenario) and 60 MWp (optimistic scenario).



Graph 1.4.1. Energy scenarios of solar photovoltaic installed capacity

Drawn up with data from Government of Navarre and own data.

1.4.2.3 Measures

Plan proposals for the development of solar photovoltaic power focus on:

- Architectural integration of photovoltaic panels in at least one newly-built public building not included in the Building Technical Code (minimum construction standards).
- Training of technical fitters and maintenance staff.
- Reasonable extension of municipal ordinances in other municipalities in Navarre beyond the scope of specifications of the Building Technical Code.
- Promoting the development and research of photovoltaic panels using new materials and technologies and supporting projects up to the aid ceiling as per R&D regulations.
- Developing the law governing the conditions for low tension grid connections, and speeding up administrative procedures for points of outlet to power distribution grids.

- From an environmental viewpoint, regulations shall be adopted governing solar photovoltaic facilities in non-development land.

1.4.2.4 Related investments

Investments related to the installation of panels strictly speaking are estimated at 153 M€ in the 30-MWp “likely” scenario and at 333 M€ in the 60-MWp “optimistic” scenario, using the starting census figure of 2005 (5.5 MWp).

Solar photovoltaic	End 2003	2010	
		Likely	Optimistic
<i>Installed capacity (MW)_p</i>	4.5	30	60
<i>Energy produced (ktoe)</i>	0.39	3.87	7.7
<i>Emissions avoided (kt CO₂)</i>	0.67	5.87	11.74
<i>Cumulative related investment (M€)</i>	-	153	333
<i>Public aid (Tax deduction and allowances to remote power facilities)</i>		15.3	33

Table: Summary of solar photovoltaic energy scenarios

* Substantial aid schemes end as of December 2006



However, the measures adopted by Public Administrations shall make it possible to attain and exceed these objectives, in the light of the KWp installed, i.e. connected, during 2004-2006:

2004	619.00 KWp
2005	45.3 KWp
2006	8,412.2 KWp

4,932 applications regarding photovoltaic installations were filed in 2006 in Navarra, most of which are still pending completion as of the reporting date.

Foreseen investments for these installations amount to EUR 907.4 M, whilst fiscal aids amount to EUR 195.19 M.

1.5 BIOMASS

Electric biomass	2003	2010	
		Likely	Optimistic
<i>Installed capacity (MW)</i>	25	40	60
<i>Energy produced (ktoe)</i>	14.644	24.08	36.1
<i>Emissions avoided (kt CO₂)</i>	25.112	36.52	54.78
<i>Related cumulative investment (M€)</i>	-	22.50	52.5
<i>Public aid (10% special deduction and aids to small facilities. R&D aids to research of new modalities not included)</i>		2.2	5.2

1.6 BIOFUELS

Biodiesel	End 2003	2010	
		Likely	Optimistic
<i>Yearly production (ktoe)</i>	30.62	61.25	87.5
<i>Energy consumption (ktoe)</i>		50.3	70.2
<i>Emissions avoided (kt CO₂)⁸</i>		156	222.8
<i>Related cumulative investment (M€)</i>		24	48
<i>Public aid (10% deduction: hydrocarbon tax exemptions not included)</i>		2.4	4.8

1.7 BIOGAS

Biogas	End 2003	2010	
		Likely	Optimistic
<i>Installed capacity (MW)</i>	1.6	7	9
<i>Energy produced (ktoe)</i>	0.85	4.816	6.2
<i>Emissions avoided (kt CO₂)</i>	1.46	7.3	9.39
<i>Related cumulative investment (M€)</i>		8.64	11.84

⁸ Emissions avoided due to biofuel consumption, not production