RENEWABLE ENERGY

Wind Energy

Wind Energy in Spain 2005

Current Status and Prospects

MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO

IDAE Instituto para la Diversificación y Ahorro de la Energía

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The Institute for the Diversification and Saving of Energy (*Instituto para la Diversificación y Ahorro de la Energía,* IDAE) is a public business entity attached to the Ministry of Industry, Tourism and Trade. Its mission and goals are to promote energy efficiency, rational energy use, energy supply diversification and increased use of renewable sources of energy in Spain.

IDAE
Instituto para la Diversificación y Ahorro de la Energía

C/ Madera, 8
E - 28004 - Madrid

comunicacion@idae.es
www.idae.es

Cover photo: *"La Florida" wind farm* (Canary Islands, Spain)

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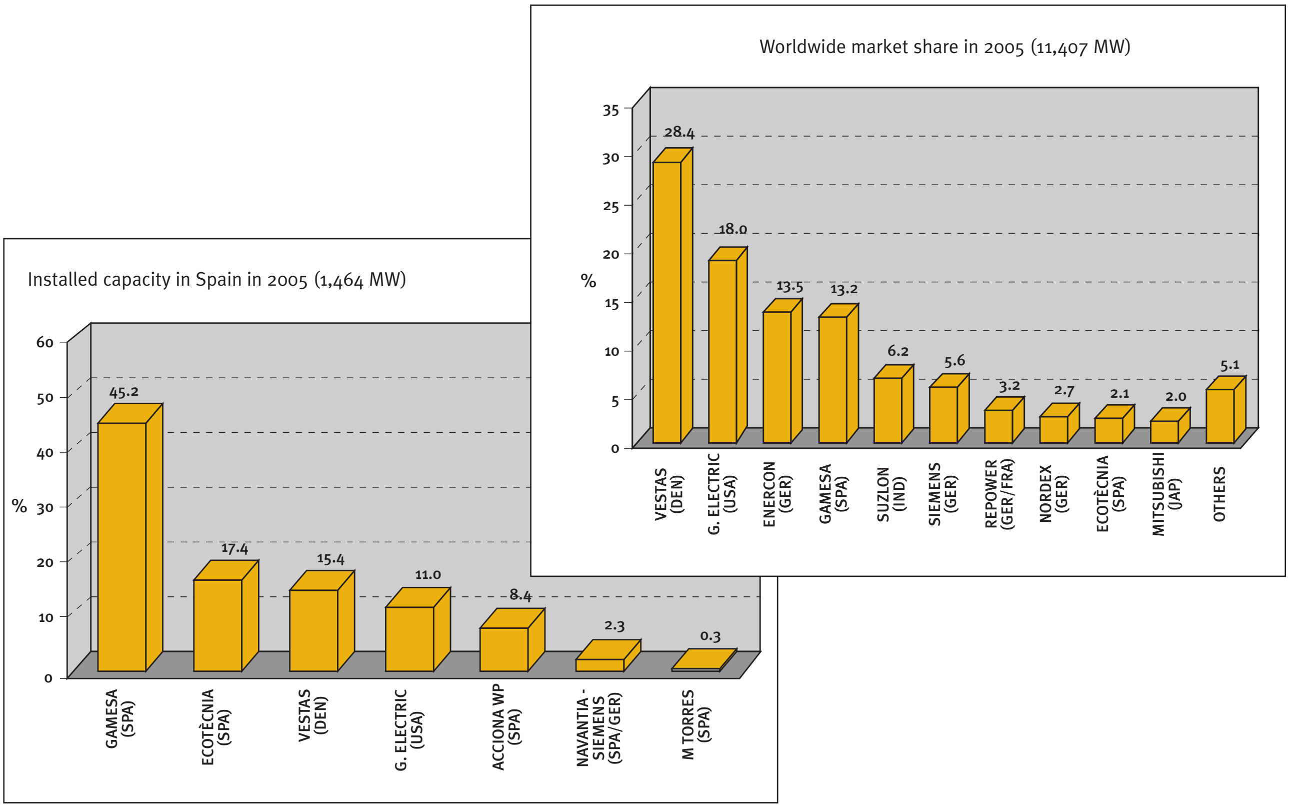
State of the technology in Spain

General points	• Two Spanish companies – GAMESA and ECOTÈCNIA – were among the world's ten largest manufacturers in 2005. Both represented 15% of the global market.
Wind turbine manufacturers using Spanish technology	• GAMESA, ECOTÈCNIA, ACCIONA WP*, M. TORRES: which together account for 74% of total installed capacity.
Foreign technology	• VESTAS, GENERAL ELECTRIC, ...: 22%.
Spanish manufacturers with technology transfer agreements	• NAVANTIA – SIEMENS, ...: 4%.
Domestic manufacturing capacity	• More than 2,000 MW per year.
Companies in the sector	• More than 550.
Average rated power	• 1,160 kW per new unit installed in 2005.

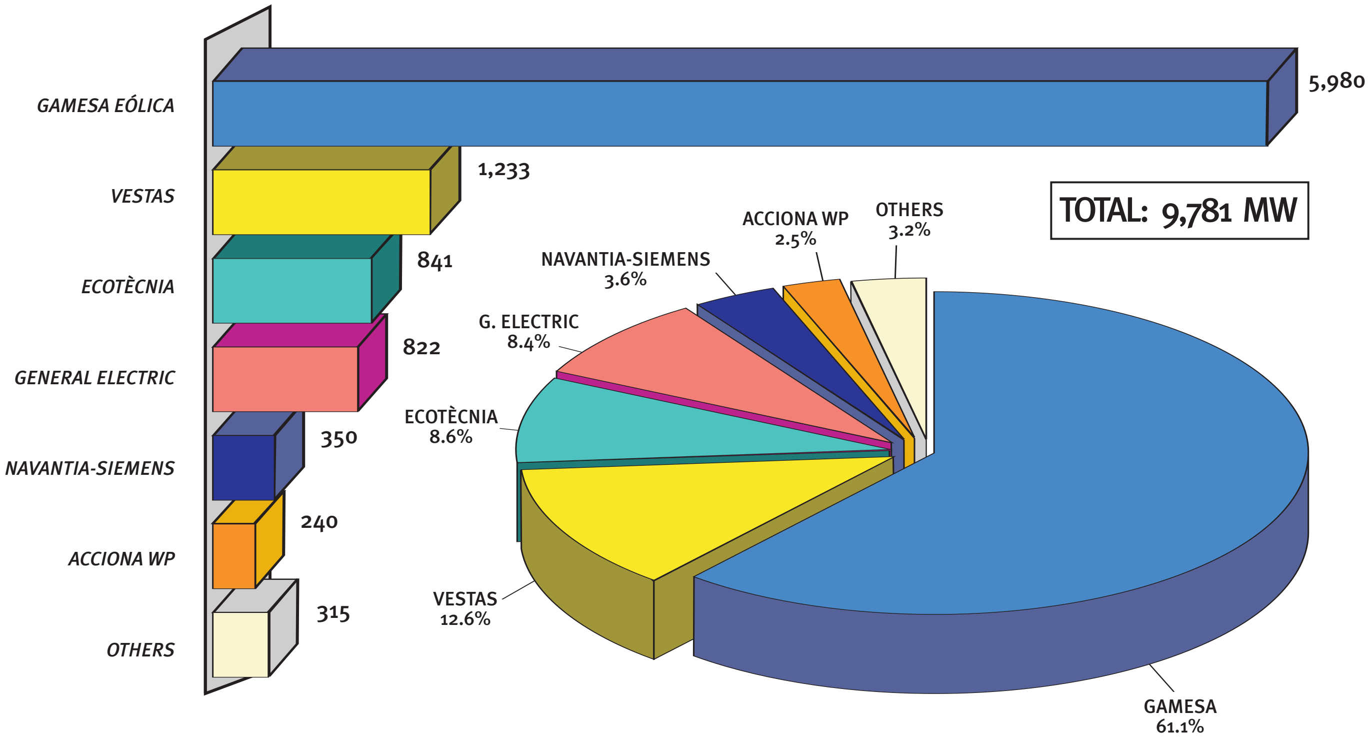
* until 2005 INGETUR (EHN).

Percentage distribution per manufacturer



Provisional data *Source: IDAE and BTM Consult ApS*

Accumulated installed capacity (MW) per technology in Spain on 31/12/2005



Provisional data *Source: IDAE*

Regulatory framework in the European Union (EU-15)

White Paper (Dated December 1997)	
Overall target	• Contribution from Renewable Energy Sources (RES) of 12% of primary energy consumption in the European Union by 2010.
Wind Power target	• Reach 40,000 MW by 2010.
Campaign for Take-Off	• Encompassing the period 1999-2003, it acted as a catalyst for the development of the key RES sectors. • Wind Energy: More than 20,000 MW installed in the period, doubling the foreseen figure.

Directive 2001/77/CE (Dated September 27th)	
Overall target	• Contribution from RES of 22%* relative to the annual electricity consumption of European Union in year 2010.
National target	• In Spain implies that electricity generated with RES represents a percentage of 29.4% of the scheduled total in year 2010.

* updated to 21% for EU-25 (“Accesion Treaty” signed on 16th April 2003).

Regulatory framework of reference at national level

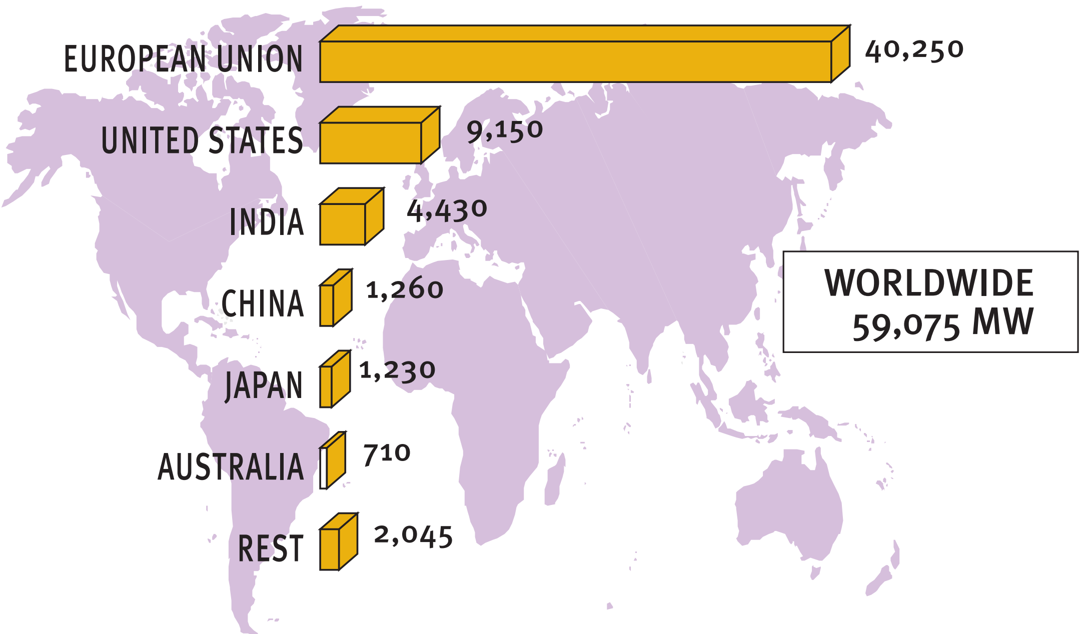
Spanish Electric Power Act 54/1997 (Dated November 27th)	
Main goal	• Liberalization of the electricity market (reached on Jan 2003).
Establishes	• Special Regime for Renewable Energy Sources (P < 50 MW). • Guaranteed grid access. • A premium for electricity from RES. • Territorial and environmental matters are competence of the Regional Governments.
Requires	• A Promotion Plan for RES.

Royal Decree on Special Regime 436/2004 (Dated March 12th)	
Object	• Legal and economic scheme for Special Regime.
Methodology	• Feed-in tariff system (guaranteed along life-time): (1) Regulated price (determined by the capacity and year of starting up) *or* (2) Sale in the free market: Pool price + Incentive + Premium ± Extras • Payment with reference to yearly average electrical tariff (regulated maximun evolution until 2010). • Production forecast for P > 10 MW (since 1st Jan 2007). • Penalty for deviations above 20% (option (1)). • Transitory period for former plants (until 1st Jan 2007).

Environmental Impact Assessment Act 6/2001 (Dated March 8th)

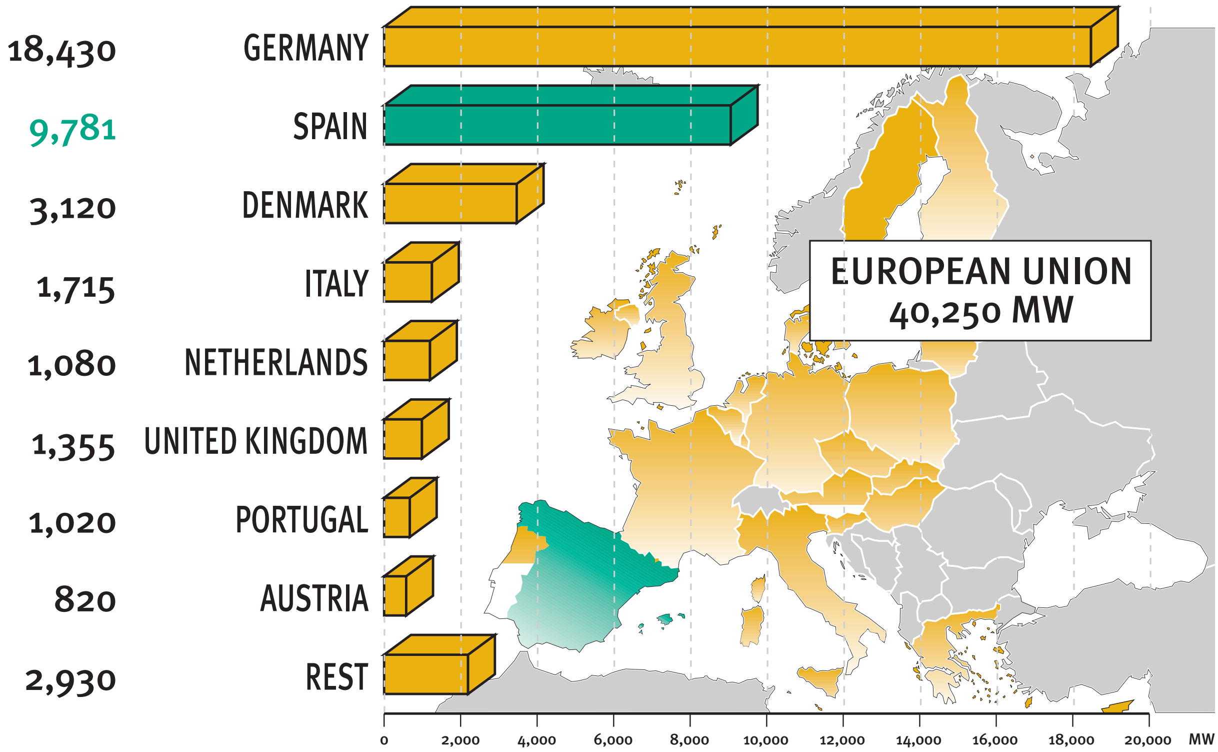
The Spanish Renewable Energy Plan 2005 - 2010. Wind Energy Area. (Approved by the Council of Ministers on 26/08/2005)	
Main overall targets	• Meet: - 12.1 % of primary energy consumption, and - 30.3 % of gross national electricity consumption, from RES by 2010. • Estimated investment (2005-2010): € 23,600 m.
Wind power target	• Have ready an installed capacity of 20,155 MW at the end of the year 2010.
Main measures	• Development of transport grid. • Updating of the regulatory procedures regarding grid access and operating conditions. • Establishment of a single Operation Centre for the Special Regime. • Development of control centres grouping wind farms belonging to the same owner (or within the same geographical area). • Investment subsidies are not envisaged.

Installed wind energy capacity (MW) worldwide on 31/12/2005



Provisional data *Source: IDAE and GWEC*

Installed wind energy capacity (MW) in the European Union (EU-25) on 31/12/2005



Provisional data *Source: IDAE and EWEA*

Outstanding figures in wind energy sector in Spain (updated at the end of the year 2005)

General	
Overall Capacity Installed	9,781 MW
Accumulated Investment	€ 8,774 m
Energy Sold	21,000 GWh
Electricity Market Share	7.5%
Equivalent Consumption	6 million households

Social Benefits

- **More than 550 companies involved in the sector.**

Accumulated Employment

- **Design, Construction and Erection.**

127,000 men-year → Direct 31,750; Non Direct 95,250

- **Operation and Maintenance.**

1,950 permanent jobs (all direct)

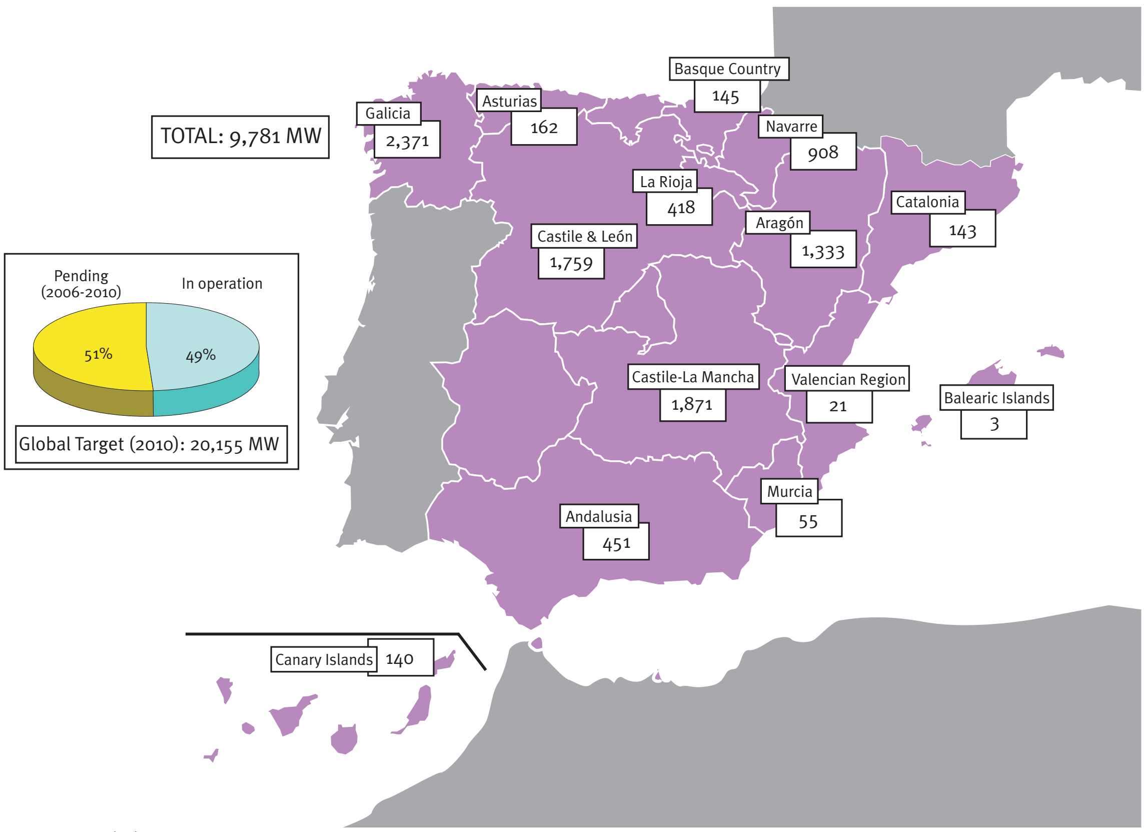
Environmental Issues

POLLUTANT	AVOIDED QUANTITY (t) *
SO_2	144,500
NO_x	79,800
CO_2	19,690,000

* In relation to electricity generated by means of national hard coal-fired power plants [CIEMAT and CNE (2001)]

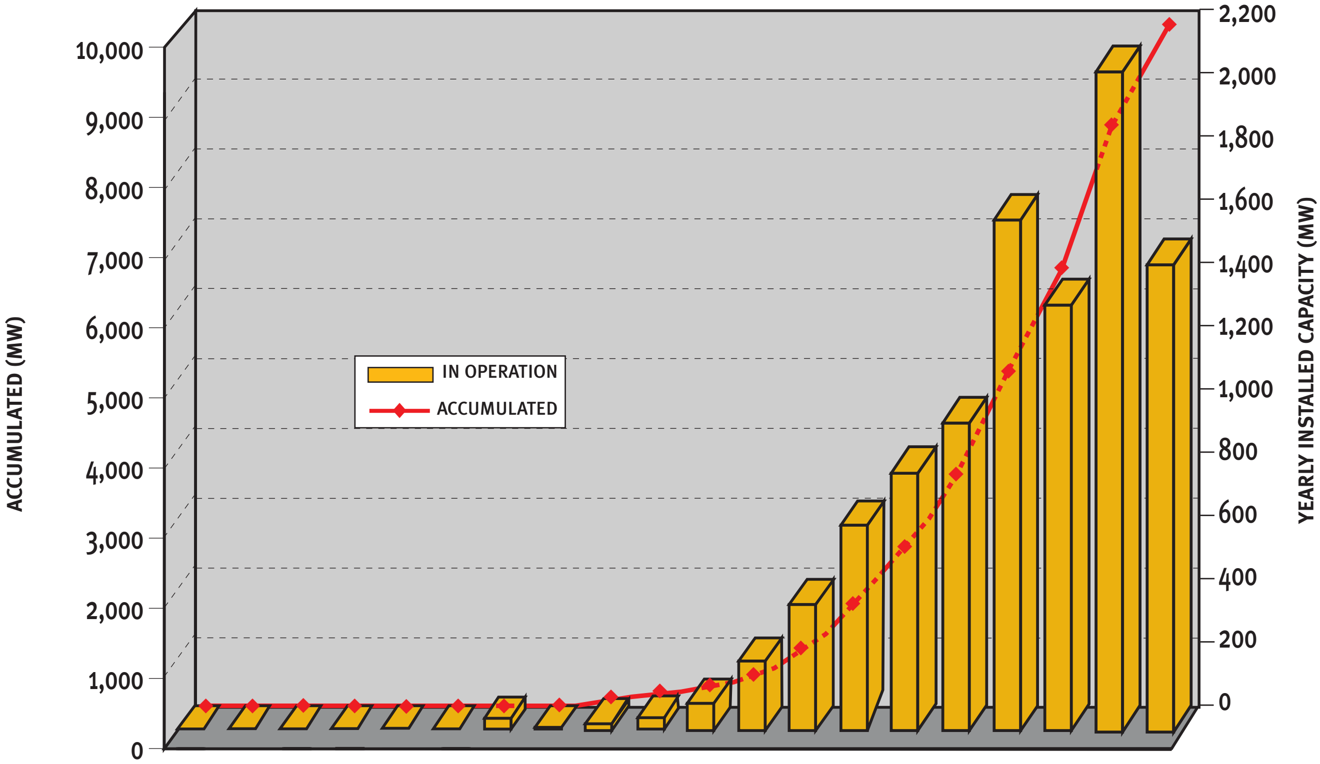
Provisional data

Installed generating capacity (MW) in each Spanish Region on 31/12/2005



Provisional data *Source: IDAE*

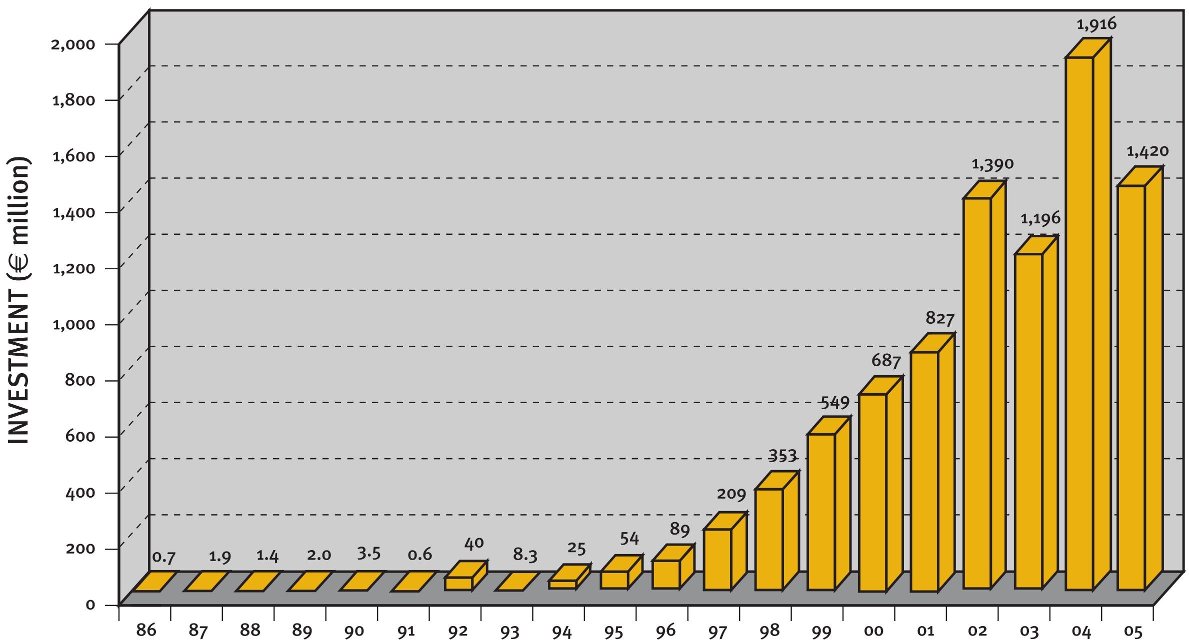
Development of wind energy in Spain



	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
IN OPERATION	0.4	1.2	0.8	1.5	2.7	0.7	38	6	24	40	96	229	393	642	815	985	1,615	1,344	2,082	1,464
ACCUMULATED	0.4	1.6	2.4	3.9	6.6	7.3	46	52	75	115	211	440	834	1,476	2,292	3,276	4,891	6,235	8,317	9,781

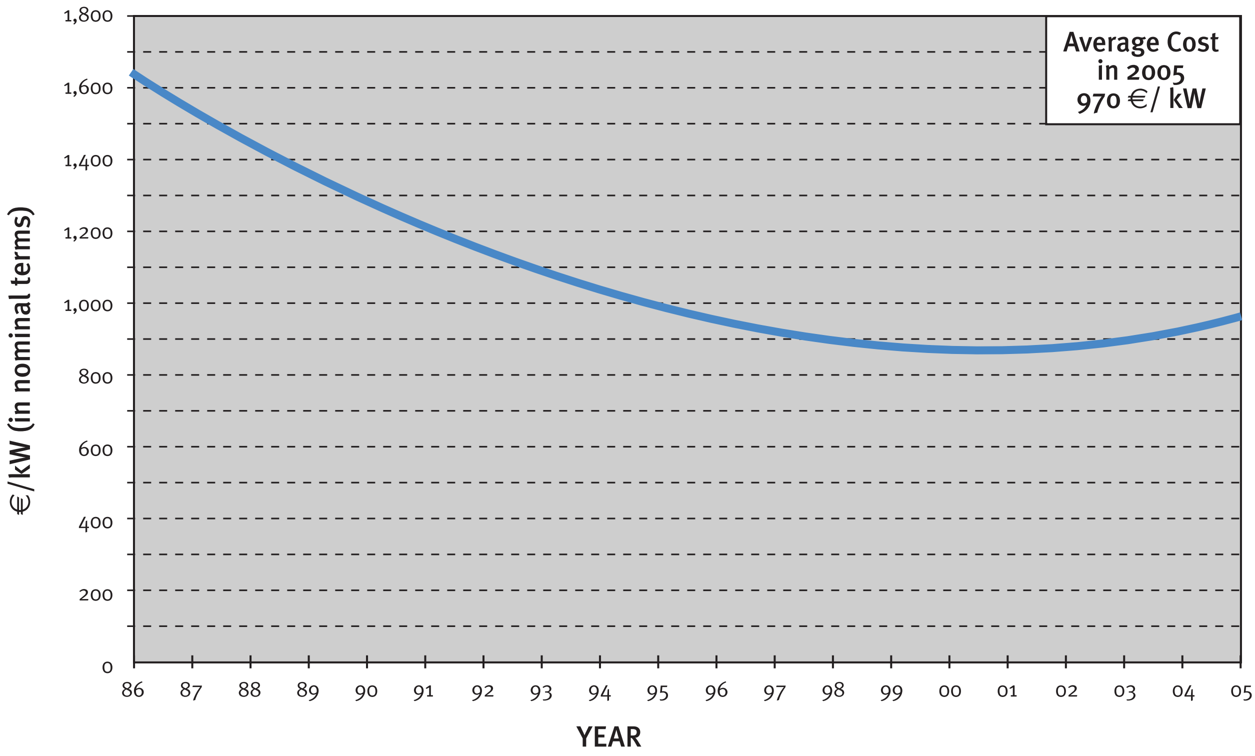
Provisional data *Source: IDAE*

Yearly investment in the wind energy sector in Spain



Provisional data *Source: IDAE*

Evolution of cost per kW of installed capacity in Spain (Tendency curve)



Estimated value for 2005 *Source: IDAE*

Key points to current and future development

CURRENT DEVELOPMENT	FUTURE DEVELOPMENT
• Existence of significant wind resources.	• Long-term price guarantee.
• Stable regulatory framework for electricity generation.	• Development of grid infrastructure. Enable international interconnection.
• Administrative procedures for the authorization of wind power installations in the Regions.	• Wind energy integration into national power grid. Contribution to stability. Predictability.
• Expertise, consolidated technology and economies of escale.	• Easier, faster and more objective administrative procedures.
• Reduction in costs of both construction/installation and operation/maintenance.	• Enhanced technology (enlarged efficiency, manufacturing cost reduction and improvement of reliability).
• Reasonable return on investment.	• Increase international competitiveness and worldwide spread.

General mission of IDAE and activities in the wind energy sector

General mission	• Promote energy efficiency and the rational use of energy. • Diversify energy sources. • Boost the use of renewable sources of energy. • Foster technical and financial innovation.
Activities	• Monitoring and analysis of the sector. • Promotional activities. • Collaboration with public bodies. • Participation in projects. • Technical Consultancy. • International Cooperation.

IDAE investment in the wind energy sector (updated 05/2006)

Region	Owner	Wind Farm or WTG model	Capacity (MW)		Investment (€ m)	IDAE share (%)	Start-up (year/s)
			In oper.	In exec.			
Andalusia	SEASA *	Tarifa	30.48		32.45	6.7	1993
Catalonia	PEBESA	Bajo Ebro	4.05		4.62	25.3	1995
Aragón	EVESA	La Muela II and III	29.70		24.77	24.0	1997/99
Galicia	PEMALSA	Malpica	16.58		15.68	27.2	1997/02
Murcia	ELECDEY ASCOY, S.A.	Sierra de Ascoy	7.64		6.93	18.5	1998/03
Andalusia	SELL, S.A.	Los Lances	10.68		9.05	20.0	1999
Catalonia	SEESA	Trucafort	29.85		27.95	10.0	1999
Canary I.	PEGASA	Punta Gaviota	6.93		6.76	30.0	2000
Galicia	SOTAVENTO G., S.A.	Sotavento	17.56		15.84	20.5	2000/01
Aragón	S.E. LA PLANA, S.A.	La Plana I and R&D	6.15		5.65	10.0	2000/01/02
Castile & León	A. DEL VOLTOYA, S.A.**	Altos del Voltoya I-IV	62.04	29.04	93.76	7.5	2000/04/07
Aragón	ARVISA	Sancho Abarca		10.50	9.44	40.0	2007
Total for shareholding			**221.66**	**39.54**	**252.90**	**€ 7.02 m**	
Murcia	P.E. LA UNIÓN, S.L.	La Unión	5.28		3.93	88.0	2000
Canary I.	AGRAGUA, S.A.	Montaña Pelada	4.62		3.69	100.0	2001
Canary I.	ECASA	Montaña Francisco	1.13		0.96	100.0	2001
Castile & León	P.E. C. NUEVO, S.L.	Corral Nuevo	5.28		4.26	96.8	2001
Galicia	ENGASA	Peña Galluda	0.66		0.57	100.0	2002
Canary I.	SOSLAIRES C., S.L.	La Florida	2.64		2.25	100.0	2002
Total for ERDF-IDAE programme			**19.61**	**—**	**15.67**	**€ 15.06 m**	
Andalusia	ECOTÈCNIA	ECOTÈCNIA 150/225/600	0.98		2.06	50/100/50	1989/92/96
Andalusia/Galicia	MADE	MADE 800	1.60		2.49	40.0	2000/01
Aragón	GAMESA EÓLICA	GAMESA 850/2000	2.85		2.27	92.7	2000/02
Navarre	M. TORRES	M. TORRES 1500	4.50		5.11	40.0	2001/03
Navarre	ECOTÈCNIA	ECOTÈCNIA 1250	1.25		2.87	40.0	2002
Navarre	M.TORRES D.E., S.L.	La Fraila	4.95		5.00	90.0	2004
Undetermined	ECOTÈCNIA	ECOTÈCNIA 3000		3.00	5.47	40.0	2007
Undetermined	ACCIONA Windpower	ACCIONA AW-3000		3.00	7.00	40.0	2007
Total for technology development			**16.13**	**6.00**	**32.27**	**€ 16.89 m**	
Aragón	ELECDEY TARAZONA, S.A.	Tarazona Sur	9.60		8.18	95.5	2002/04
Balearic I.	CONSORCIO RSU MENORCA	Es Milá	3.20		3.25	96.7	2004
Asturias	P.E. PENOUTA, S.L.U.	Penouta	5.95		5.07	90.3	2004
Castile - La Mancha	EÓLICA MONTESINOS, S.L.	El Romeral		15.00	13.75	92.7	2007
Total for third-party financing			**18.75**	**15.00**	**30.25**	**€ 28.28 m**	
TOTAL			**276.15**	**60.54**	**331.09**	**€ 67.25 m**	

* repowering up to 74 MW is planned to be commissioned during 2008.
** in 2004 “Altos del Voltoya, S.A.” acquired 17% of “P.E. Las Navas, S.A.”, with additional 48.84 MW in operation.

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Madera, 8. E-28004 Madrid
Tel.: +34 91 456 49 00. Fax: +34 91 523 04 14
e-mail: comunicacion@idae.es
http://www.idae.es