RENEWABLE ENERGY

Wind Energy

Wind Energy in Spain 2004

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.

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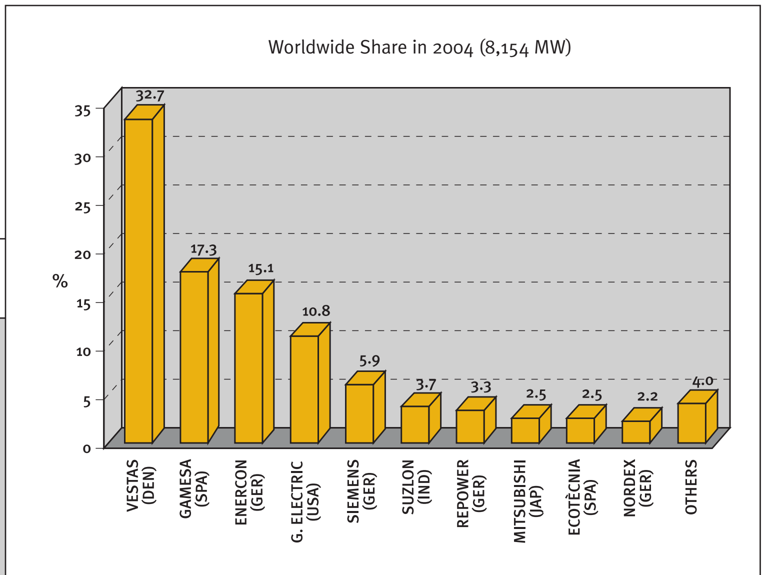
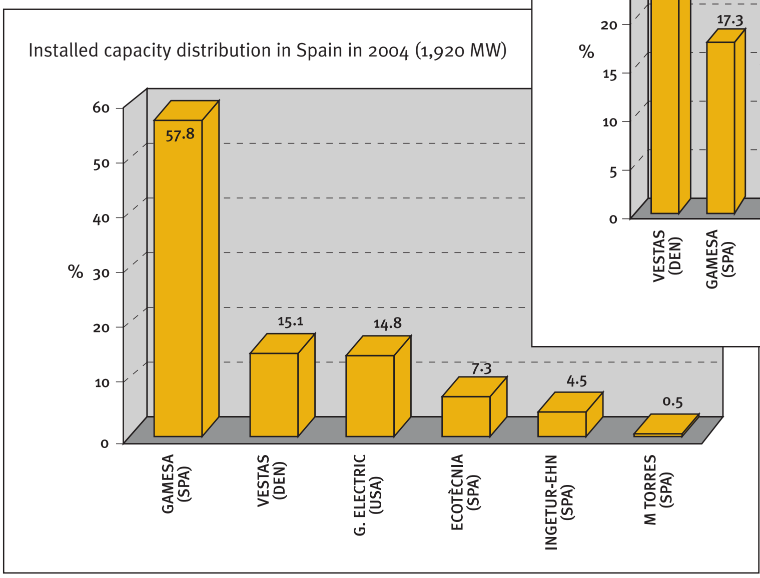
State of the technology

General points	• Two Spanish companies – GAMESA and ECOTÈCNIA – were among the world's ten largest manufacturers in 2004. Together they accounted for 20% of the global market.
Wind turbine manufacturers using Spanish technology	• GAMESA, ECOTÈCNIA, INGETUR (EHN)*, M. TORRES: which together account for 74% of total installed capacity in Spain.
Spanish manufacturers with technology transfer agreements	• NAVANTIA – SIEMENS**: 4%.
Foreign technology	• VESTAS***, GENERAL ELECTRIC, ...: 22%.
Domestic manufacturing capacity	• Domestic manufacturing capacity in the wind power industry is more than 2,000 MW per year.
Companies in the sector	• More than 500 companies are involved in wind power in Spain.
Average installed power	• 1,110 kW per unit in Spain in 2004.

* ACCIONA Group subsidiary.
** until 2004 IZAR-BONUS.
*** NEG MICON merges with VESTAS in 2004.

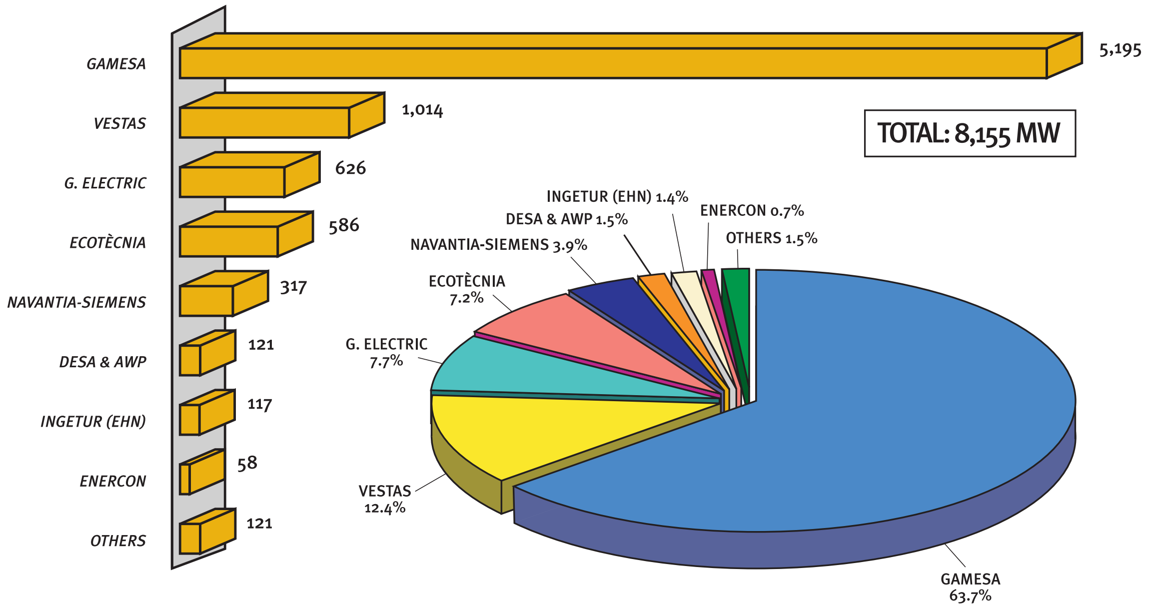
Wind turbine production per manufacturer





Provisional data *Source: IDAE and BTM Consult ApS*

Accumulated installed capacity (MW) per technology in Spain on 31/12/2004



Provisional data *Source: IDAE*

The framework of reference in the European Union (EU-15)

White Paper (Dated December 1997)	
Overall target	• Contribution from renewable sources of energy of 12% of primary energy supply in the European Union by 2010.
Wind Power target	• To 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 (E.U.)	• Contribution from renewable sources of energy of 22% relative to the annual electricity consumption of European Union in year 2010.
National target	• In Spain implies that electricity generated with Renewable Energy Sources (RES) represents a percentage of 29.4% of the scheduled total in year 2010.

The framework of reference at national level

Spanish Electric Power Act 54/1997 (Dated November 27th)	
Main goal	• Liberalization of the electrical market (reached on Jan 2003).
Establishes	• Special Regime for Renewable Energy Sources (< 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 2006). • Penalty for deviations above 20% (option (1)). • Transitory period for former plants (until 1st Jan 2007).

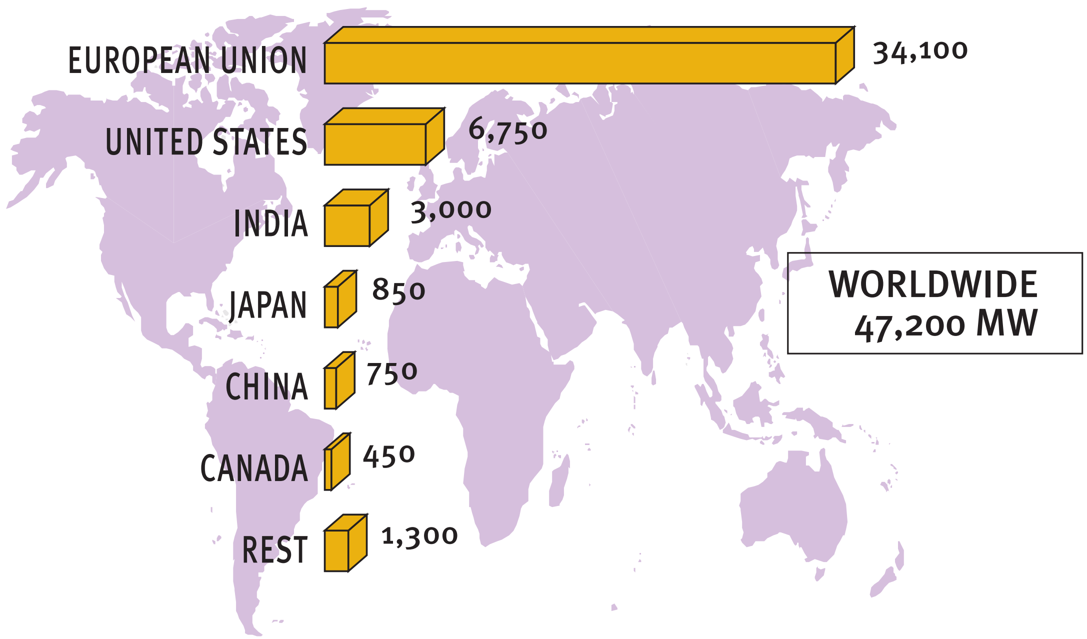
Environmental Impact Assessment Act 6/2001 (Dated March 8th)

The framework of reference at national level (continued)

Plan for the Promotion of Renewable Energy. Wind Energy Area. (Approved by the Council of Ministers on 30/12/1999)	
Overall target	• Meet 12% of total primary energy consumption from RES by 2010.
Wind power target (*)	• Have ready an installed capacity of 13,000 MW at the end of the year 2011.
The main measures include	• Adequate remuneration for each kWh generated. • Development of infrastructure to transport power away from point of supply. • Standardization, official type approval and certification of wind turbines. Consolidation of the technology. • Support for research, development and demonstration of applications before the commercialization stage. • Investment subsidies are not envisaged.

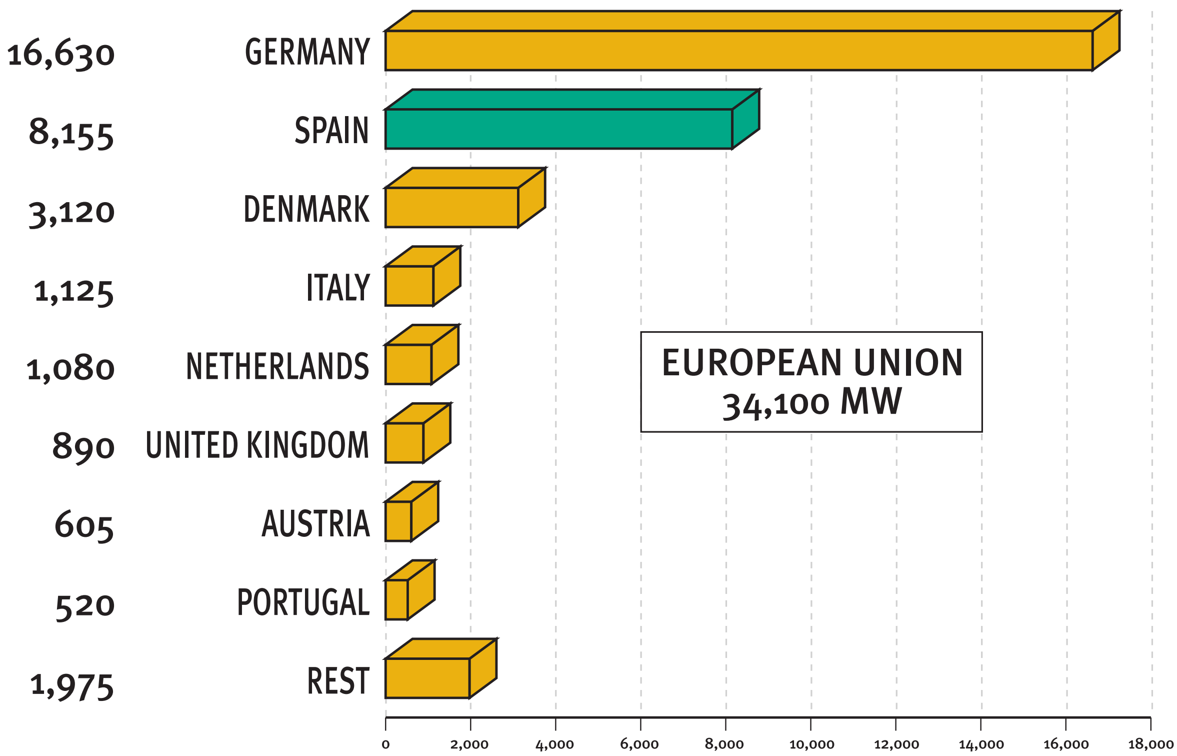
(*) Plan for the Promotion of Renewable Energy modified by "PLANNING OF THE UTILITY & GAS SECTORS. EXPANSION OF TRANSPORT GRIDS 2002-2011" (Approved by the Council of Ministers on 13/09/2002).

Installed wind energy capacity (MW) worldwide on 31/12/2004



Provisional data *Source: IDAE and GWEC*

Installed wind energy capacity (MW) in the European Union (EU-25) on 31/12/2004



Provisional data *Source: IDAE and EWEA*

Outstanding figures in wind energy sector in Spain (updated at the end of the year 2004)

General	
Overall Capacity Installed	8,155 MW
Accumulated Investment	€ 7,205 m
Energy Sold	16,000 GWh
Electrical Market Sharing	6.5%
Equivalent Consumption	4,500,000 households

Social Benefits

- **More than 500 companies involved in the sector.**

Accumulated Employment

- **Design, Construction and Erection.**

106,000 men-year
- Direct 26,500
- Non Direct 79,500

- **Operation and Maintenance.**

1,630 permanent jobs (all direct)

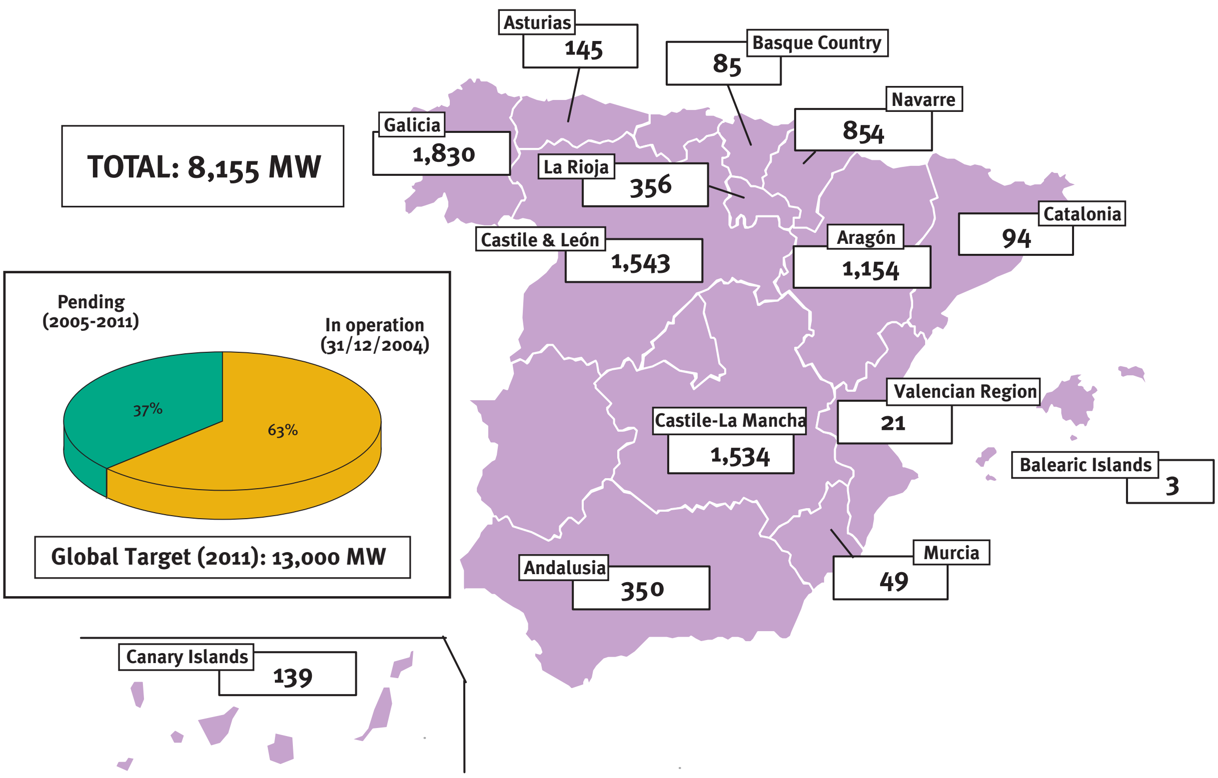
Environmental Issues

POLLUTANT	AVOIDED QUANTITY (t) *
SO_2	110,000
NO_x	60,800
CO_2	15,000,000

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

Provisional data

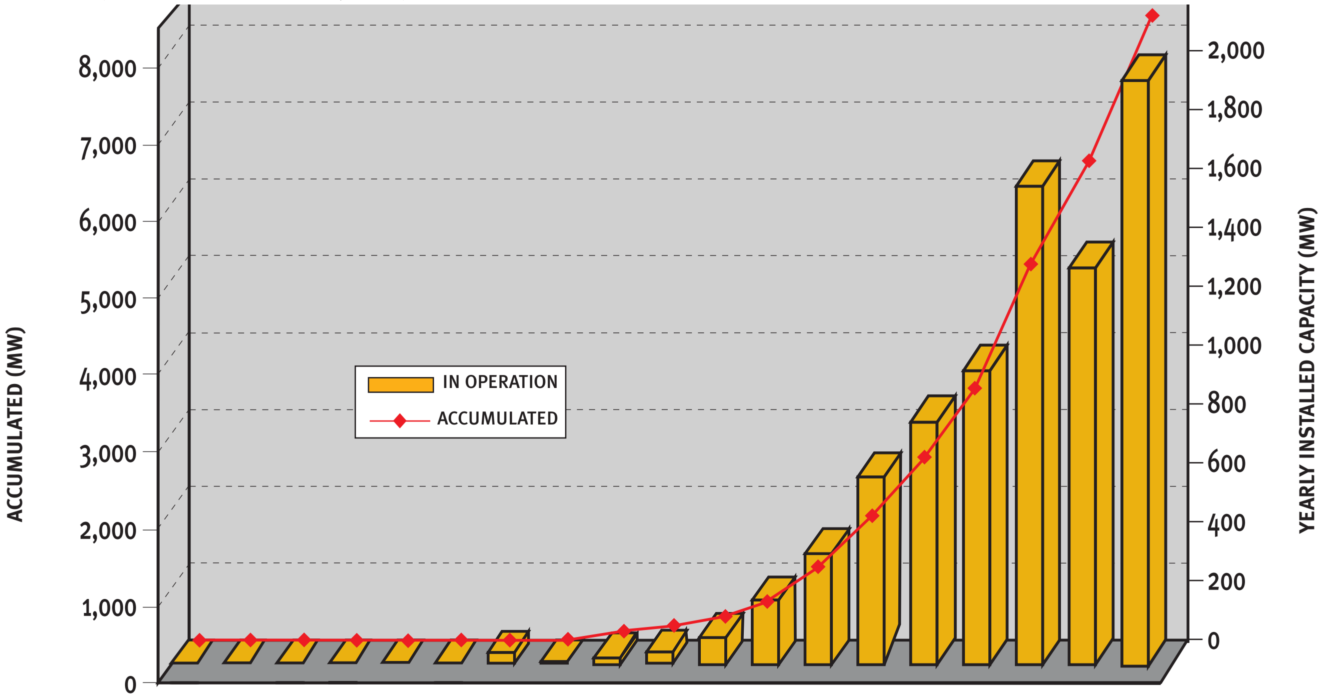
Installed generating capacity (MW) in each Spanish Region on 31/12/2004



Provisional data

Source: IDAE

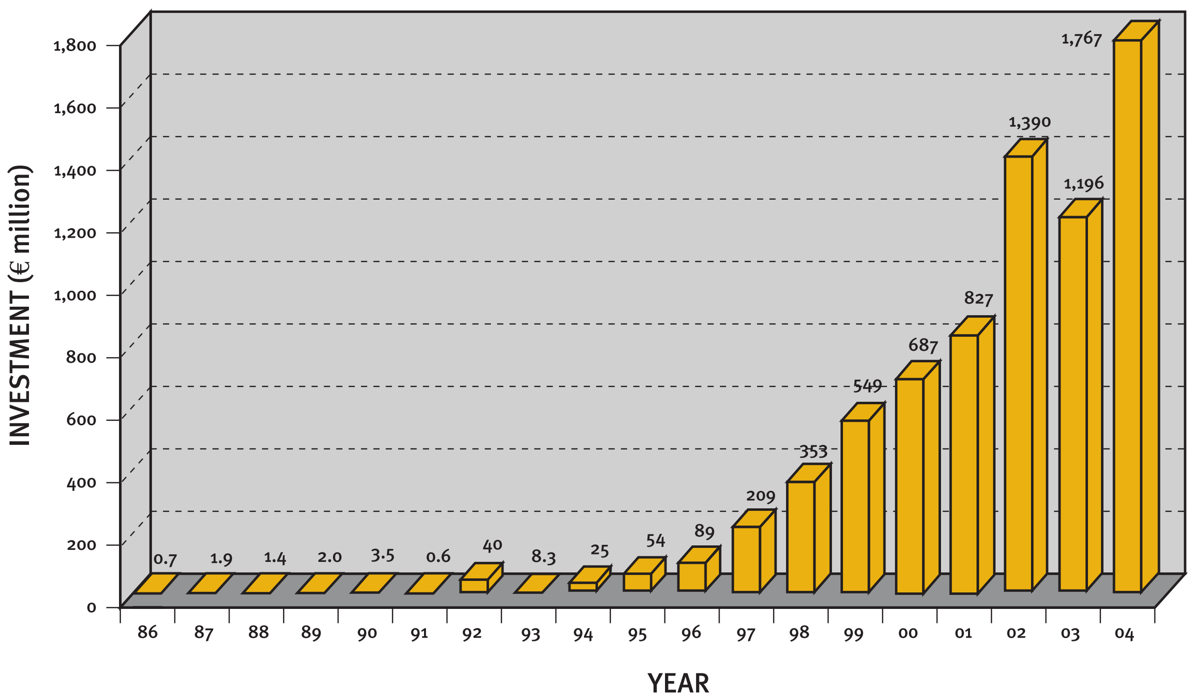
Development of wind energy in Spain (MW)



	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
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	1,920
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	8,155

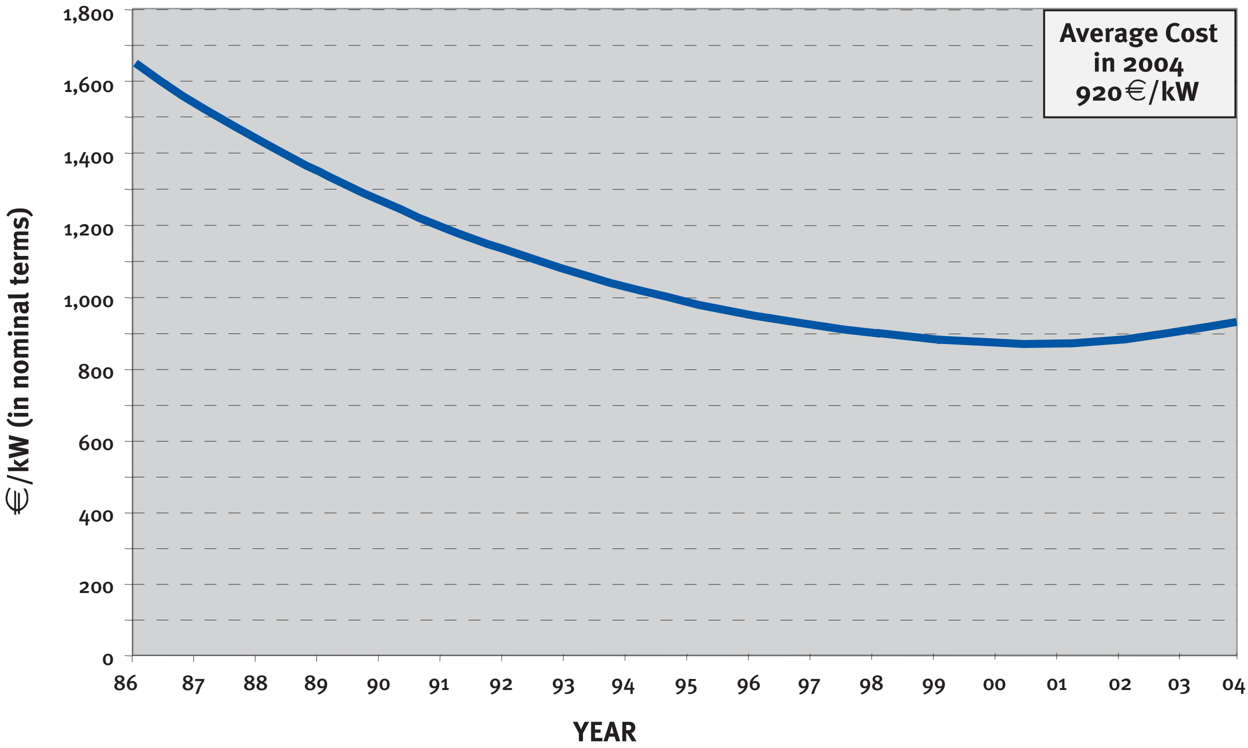
Provisional data *Source: IDAE*

Yearly investment in the wind energy sector in Spain



Provisional data *Source: IDAE*

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



Estimated value for 2004 *Source: IDAE*

Key points to current and future development

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

Mission and activities of IDAE in the wind energy sector

Mission	• Promote energy efficiency and the rational use of energy. • Diversify energy sources. • Promote the use of renewable sources of energy. • Promote 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 05/2005)

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
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
Aragón	EVESA	La Muela II and III	29.70		24.77	24.0	1997/99
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	2.00	7.25	10.0	00/01/02/05
Castile & León	A. DEL VOLTOYA, S.A.	Altos del Voltoya I-IV	62.04	29.04	93.76	7.5	2000/04/06
Aragón	ARVISA	Sancho Abarca		10.50	9.44	40.0	2006
Total for shareholding			**221.66**	**41.54**	**254.50**	**€ 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.A.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
Navarre	ECOTÈCNIA	ECOTÈCNIA 1250	1.25		2.87	40.0	2002
Navarre	M. TORRES	M. TORRES 1500	4.50		5.11	40.0	2001/03
Aragón	GAMESA EÓLICA	GAMESA 850/2000	2.85		2.27	92.7	2000/02
Navarre	M.TORRES D.E., S.L.	La Fraila	4.95		5.00	90.0	2004
Total for technology development			**16.13**	**—**	**19.80**	**€ 11.90 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	2006
Total for third-party financing			**18.75**	**15.00**	**30.25**	**€ 28.26 m**	
TOTAL			**276.15**	**56.54**	**320.22**	**€ 62.24 m**	

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