

**THE
LIVING ENERGY
BOOK**

by *edp*



IBERIAN DATA
2017



ENERGY BALANCE

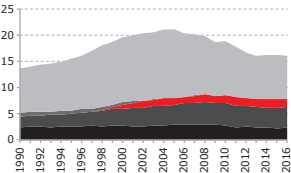
	PORTUGAL			SPAIN		
ktep	2015	2016	Δ	2015	2016	Δ
Primary Energy Consumption	22 060	21 684	-2%	122 236	123 242	1%
Oil	9 447	9 157	-3%	52 434	54 633	4%
Coal	3 259	2 848	-13%	13 686	10 442	-24%
Natural Gas	4 097	4 340	6%	24 533	25 035	2%
Nuclear	0	0	0%	14 934	15 260	2%
Electricity ⁽¹⁾	195	-437	-324%	-11	659	-5883%
Renewables + Other	5 062	5 776	14%	16 660	17 212	3%
Domestic Production	5 243	5 949	13%	33 638	32 903	-2%
Oil	0	0	0%	236	144	-39%
Coal	0	0	0%	1 246	686	-45%
Natural Gas	0	0	0%	54	48	-11%
Nuclear	0	0	0%	14 934	15 260	2%
Renewables + Other	5 243	5 949	13%	17 168	16 765	-2%
Energy Dependency	76%	73%	-5%	72%	73%	1%
Final Energy Consumption	16 398	16 121	-2%	84 627	85 875	1%
Oil	7 137	6 870	-4%	40 323	41 266	2%
Coal	14	13	-6%	1 515	1 340	-12%
Natural Gas	1 618	1 604	-1%	13 218	13 446	2%
Electricity	3 940	3 986	1%	19 955	20 115	1%
Renewables + Other	2 273	2 321	2%	5 306	5 384	1%
Non-energy use	1 416	1 326	-6%	4 310	4 324	0%
Final Energy / Primary Energy	68%	68%	0%	66%	66%	1%
GDP (x10 ⁹ € ₂₀₁₀)	172	174	1%	1 068	1 103	3%
Primary Energy / GDP (ktoe/x10 ⁹ € ₂₀₁₀)	128	124	-3%	114	112	-2%
Final Energy / GDP (ktoe/x10 ⁹ € ₂₀₁₀)	95	93	-3%	75	74	-2%
% Renewables (Directive) ⁽²⁾	28.0%	28.5%	2%	16.2%	17.3%	7%

⁽¹⁾ Electric energy balance (Imports - Exports)

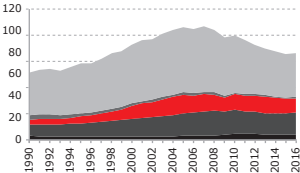
⁽²⁾ Directive 2009/28/CE

FINAL ENERGY CONSUMPTION

PORTUGAL
Mtoe



SPAIN
Mtoe



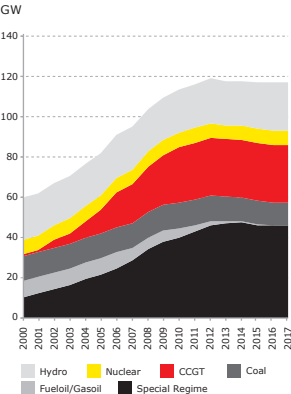
Oil Coal Natural Gas Electricity Renewables + Other

ELECTRICITY INSTALLED CAPACITY

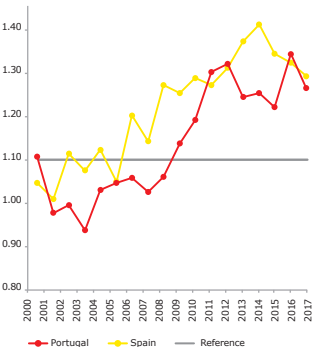
	PORTUGAL			SPAIN		
MW	2016	2017	Δ	2016	2017	Δ
Ordinary Regime	12 111	12 359	2%	59 118	59 118	0%
Nuclear	0	0	0%	7 001	7 001	0%
Hydro	6 526	6 774	4%	17 685	17 685	0%
Thermal	5 585	5 585	0%	34 432	34 432	0%
- CCGT	3 829	3 829	0%	24 911	24 911	0%
- Coal	1 756	1 756	0%	9 521	9 521	0%
Special Regime	7 590	7 659	1%	38 546	38 480	0%
Hydro	419	419	0%	1 648	1 644	0%
Wind	5 236	5 236	0%	22 726	22 768	0%
Solar	422	524	24%	6 905	6 909	0%
Thermal	1 513	1 480	-2%	7 262	7 154	-1%
- Cogeneration	1 205	1 156	-4%	5 361	5 252	-2%
- Biomass and Waste	308	324	5%	1 901	1 901	0%
Total Capacity	19 701	20 018	2%	97 664	97 597	0%
Firm Capacity ⁽¹⁾	10 952	11 098	1%	53 609	53 556	0%
Annual Peak Load	8 142	8 771	8%	40 489	41 381	2%
Reserve Margin	1.35	1.27	-6%	1.32	1.29	-2%

(1) Firm capacity determined based on reference availabilities from Red Eléctrica de España

IBERIAN PENINSULA INSTALLED CAPACITY



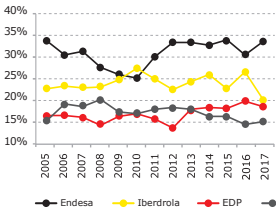
RESERVE MARGIN



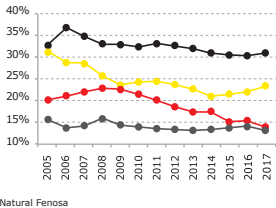
MARKET SHARES IN THE IBERIAN PENINSULA

%	2016	2017	Δ (p.p.)
Electricity Generation - Ordinary Regime (TWh)			
Endesa	30%	34%	3
Iberdrola	27%	20%	-7
EDP	20%	19%	-1
Gas Natural Fenosa	14%	15%	1
Other	9%	12%	4
Electricity Regulated Retail (TWh)			
Endesa	40%	29%	-11
Iberdrola	28%	34%	6
EDP	13%	22%	10
Gas Natural Fenosa	18%	12%	-6
Other	1%	2%	1
Electricity Free Retail (TWh)			
Endesa	28%	29%	1
Iberdrola	21%	22%	1
EDP	15%	14%	-1
Gas Natural Fenosa	13%	12%	-1
Other	23%	24%	0
Natural Gas Retail (TWh)			
Endesa	15%	17%	1
Iberdrola	5%	4%	-1
EDP	4%	4%	0
Gas Natural Fenosa	44%	37%	-8
Galp	9%	11%	2
Other	22%	27%	5

ELECTRICITY GENERATION SHARES (ORDINARY REGIME)



ELECTRICITY TOTAL RETAIL SHARES



NATURAL GAS BALANCE AND NETWORK

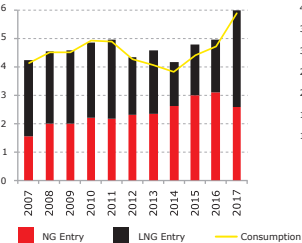
	PORTUGAL			SPAIN		
Bcm ¹	2016	2017	Δ	2016	2017	Δ
Contracts	5.8	5.8	0%	51.6	51.1	-1%
NG (pipeline)	2.4	2.4	0%	17.6	17.6	0%
LNG	3.4	3.4	0%	34.0	33.5	-1%
Entry points	5.2	6.2	20%	31.9	33.8	6%
NG (pipeline)	3.1	2.6	-17%	18.2	17.6	-3%
LNG	1.9	3.5	83%	13.1	15.8	20%
Underground Storage Withdrawal	0.2	0.2	-2%	0.6	0.4	-28%
Exit points	5.2	6.2	19%	31.9	33.5	5%
Conventional Consumption	3.4	3.6	4%	22.4	23.6	5%
Power Sector Consumption	1.3	2.4	79%	5.1	6.5	27%
Export Markets	0.3	0.0	-85%	3.8	2.7	-28%
Underground storage injection	0.2	0.2	29%	0.6	0.7	28%

	PORTUGAL			SPAIN		
Bcm/year	2016	2017	Δ	2016	2017	Δ
Capacity	19.7	19.7	0%	126.2	126.2	0%
NG	5.3	5.3	0%	26.8	26.8	0%
LNG	11.8	11.8	0%	91.3	91.3	0%
Underground Storage Withdrawal	2.6	2.6	0%	8.1	8.1	0%
Bcm						
Storage Capacity	0.6	0.6	0%	5.7	5.7	0%
Underground Storage	0.3	0.3	0%	3.1	3.1	0%
Aboveground Storage	0.2	0.2	0%	2.6	2.6	0%

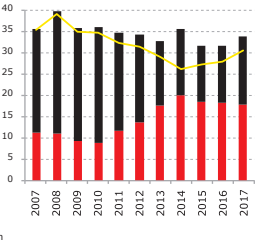
⁽¹⁾ Bcm = billion cubic meters (equivalent to 11 667 GWh)

NATURAL GAS BALANCE EVOLUTION

PORTUGAL
Bcm



SPAIN
Bcm



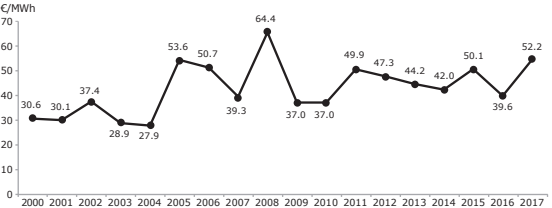
PRICES AND SPREADS

FUEL, CO ₂ AND EXCHANGE RATES		2013	2014	2015	2016	2017	Δ '17-'16
Brent	\$/bbl	108.7	99.0	52.5	43.7	54.3	24%
Coal API#2	\$/ton	81.7	75.3	56.8	59.8	84.5	41%
Gas (NBP)	\$/MBtu	10.7	8.2	6.5	4.6	5.8	25%
Gas (WACOG) ⁽¹⁾	\$/MBtu	10.3	10.3	7.2	5.4	6.0	10%
Gas (Mibgas)	€/MWh	-	-	-	17.0	20.9	23%
CO ₂ (USA)	€/ton	4.5	6.0	7.7	5.3	5.8	9%
EUR/USD		1.33	1.33	1.11	1.11	1.13	2%
EUR/GBP		0.85	0.81	0.73	0.82	0.88	7%

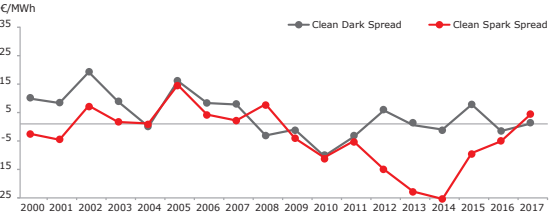
	PORTUGAL			SPAIN		
€/MWh	2016	2017	Δ	2016	2017	Δ
Pool Baseload	39.4	52.5	33%	39.6	52.2	32%
- Pool Peak	44.8	57.0	27%	44.9	57.1	27%
- Pool Offpeak	36.6	50.0	36%	36.8	49.5	35%
Clean Spark Spread	2.3	12.3	444%	-5.0	4.4	-187%
Clean Dark Spread	7.7	11.6	51%	-1.6	1.2	-178%

⁽¹⁾ Weighted Average Cost of Gas (Iberian Peninsula)

POOL BASELOAD PRICES IN SPAIN



COAL AND GAS CLEAN SPREADS IN SPAIN



Assuming average efficiency of 48% for CCGT and 34% for Coal plants in the Iberian Peninsula

ELECTRICITY BALANCE

	PORTUGAL			SPAIN		
GWh	2016	2017	Δ	2016	2017	Δ
Ordinary Regime	34 484	32 623	-5%	150 688	149 799	-1%
Nuclear	0	0	0%	56 099	55 609	-1%
Hydro	15 413	5 536	-64%	33 715	17 743	-47%
Thermal	19 071	27 087	42%	60 874	76 447	26%
- CCGT	7 373	13 479	83%	25 686	33 855	32%
- Coal	11 698	13 608	16%	35 188	42 593	21%
Special Regime	21 510	20 733	-4%	97 848	98 644	1%
Hydro	1 332	614	-54%	5 450	2 867	-47%
Wind	12 188	11 974	-2%	47 298	47 498	0%
Solar	786	852	8%	12 650	13 336	5%
Thermal	7 204	7 293	1%	32 450	34 943	8%
- Cogeneration	5 763	5 805	1%	24 144	25 677	6%
- Biomass and Waste	1 441	1 488	3%	8 306	9 266	12%
Import Balance	-5 082	-2 684	-	7 667	9 171	-
Imports	1 973	3 072	-	21 845	23 759	-
Exports	-7 055	-5 756	-	-14 178	-14 588	-
Hydro Pumping	-1 519	-2 223	46%	-4 819	-3 675	-24%
Total Consumption	49 393	47 835	-3.2%	251 384	253 939	1.0%
Hydro Capability Factor	1.33	0.47	-65%	1.12	0.53	-53%
Gross Production + Net Imp.	54 007	54 916	2%	256 203	257 614	1%
Renewable Gen. (real)	33 348	24 108	-28%	105 860	90 710	-14%
- % Renewables (real)	61.7%	43.9%	-	41.3%	35.2%	-
Renewable Gen. (Directive) ⁽¹⁾	29 205	29 507	1%	93 786	-	-
- % Renewables (Directive)	54.1%	53.7%	-	36.6%	-	-

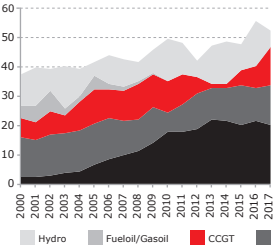
Electricity data includes T&D losses

Portugal: Gross Production and Renewable Generation include islands; Spain: values refer to mainland only

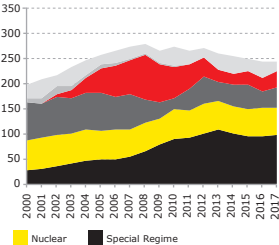
⁽¹⁾ Directive 2009/28/EC

ELECTRICITY GENERATION MIX

PORTUGAL
TWh



SPAIN
TWh



GHG EMISSIONS

PORTUGAL

SPAIN

kton CO ₂ eq.	2015	2016	2017	2015	2016	2017
Total Emissions	69 577	67 776	n.a.	335 809	324 707	n.a.
CO ₂ Emissions	52 370	50 440	n.a.	271 727	260 986	n.a.
Other Gas Emissions	17 207	17 336	n.a.	64 082	63 721	n.a.
CO ₂ ETS Emissions	27 947	25 745	30 116	137 270	123 556	136 319
ETS Free Allowances	11 479	11 217	10 958	60 373	60 019	58 571
ETS Auctions	12 634	14 116	17 281	62 066	69 346	84 876
ETS Balance	-3 835	-412	-1 877	-14 831	5 809	7 128
CO ₂ Emissions (Power Sec.)	14 248	13 226	13 226	59 018	44 173	54 884
CCGT	1 886	2 652	2 652	9 249	9 390	12 535
Coal	12 362	10 574	10 574	49 769	34 783	42 349
SEF Power Sector (g/kWh)	298	236	251	221	178	221

GHG - Greenhouse Gas

n.a. - Values not available at the date of publication

ETS - Emissions Trading System

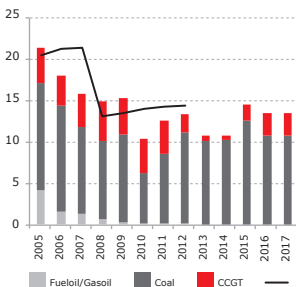
SEF - Specific Emission Factor

Estimated values according to the sector's average emission factors

CO₂ EMISSIONS AND FREE ALLOWANCES IN THE IBERIAN PENINSULA (POWER SECTOR)

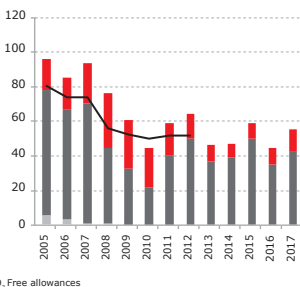
PORTUGAL

Mton CO₂



SPAIN

Mton CO₂



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