

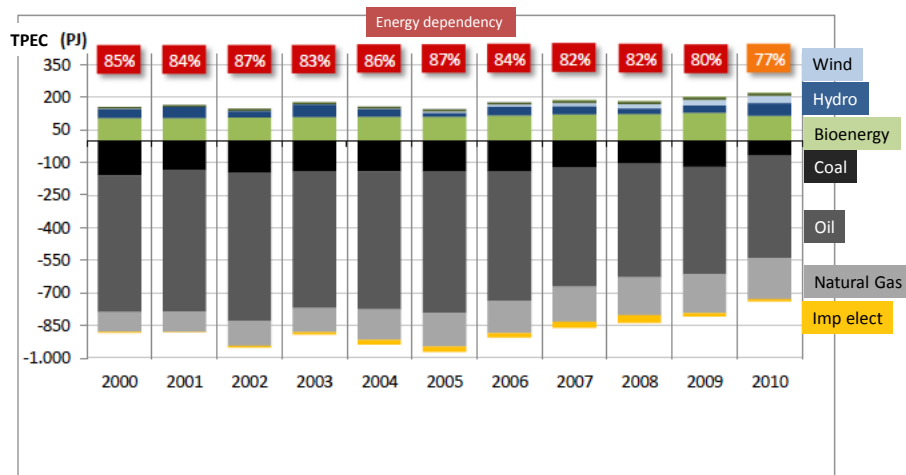


## RENEWABLE POWER COST SUPPLY CURVES (AIC) TIMES\_PT: PORTUGAL

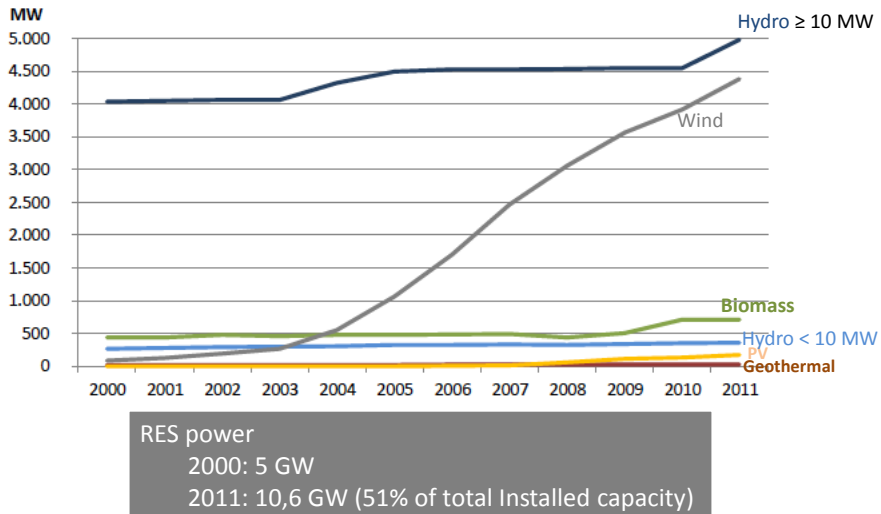
Júlia Seixas, Patrícia Fortes, Luís Dias  
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Portugal: Total Primary Energy Consumption

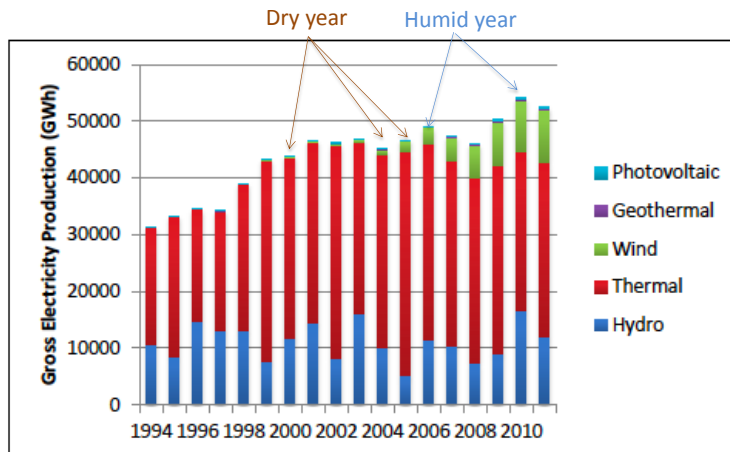


Portugal: Installed Capacity of Renewable Power



Source: DGEG, 2012

Portugal: Gross Electricity Production



Renewable power  
 2000: 27%  
 2005: 15% (dry year)  
 2010: 48% (humid year)  
 2011: 41% (average year)

Portugal: SCENARIOS FOR IRENA COMPARISON

**REFERENCE SCENARIO: PT\_REF**

Energy prices: ETP2012, 2D scenario (IEA, 2012)  
 Non-ETS sectors: CO<sub>2</sub> cap +1% /2005  
 ETS sectors: CO<sub>2</sub> price= 25€/2020; 52€/2030 (EC, 2011)  
 No feed-in or any subsidies  
 No electricity trade with Spain after 2015

PT policy: Renewable Energy Action Plan (2013)  
 Targets for 2020 (and 2030)  
 Hydro: 0.9 GW, Wind onshore: 5 GW  
 Solar PV: 0.6 GW, Solar CSP: 50 MW,  
 Wind offshore: 27 MW  
 Biomass: 0.7 GW, Biomass CHP: 0.4 GW  
 Biogas: 59 MW; Biogas CHP: 7 MW

11% RES in Transport Sector

**+31% RES in TOTAL Final Energy  
 2020 and 2030  
 (RES Directive for PT)**

**PT\_50**

Same as PT\_REF

+  
**2030: Min +50% OVER THE  
 SHARE OF RENEWABLE  
 ELECTRICITY PRODUCTION IN  
 REF**

**PT\_100**

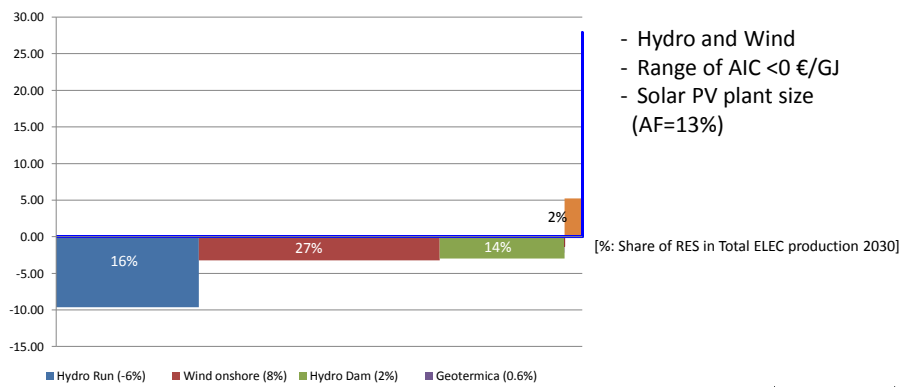
Same as PT\_REF

+  
**2030: Min +100% OVER THE  
 SHARE OF ELECTRICITY  
 PRODUCTION FROM RES IN  
 REF**

→ Conventional power technology to be substituted: NATURAL GAS COMBINE CYCLE POWER PLANT

Portugal: PT\_REF

AIC (AVERAGE INCREMENTAL COST)  
 M€/PJ

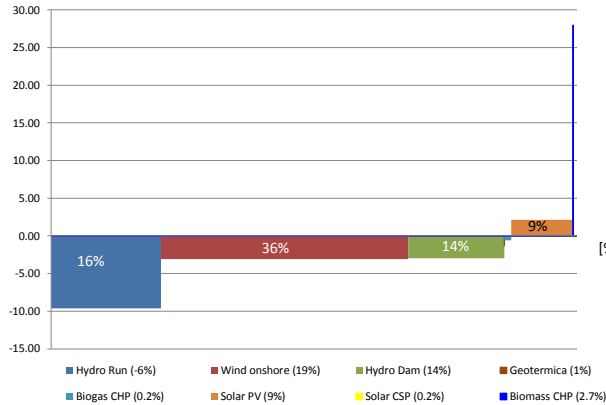


(% Additional share 2030/2010, according to IRENA paper)

Share RES (%)	PT_REF	
	2020	2030
RES Total Final Energy	31%	34%
RES Total Elec (incl CHP)	59%	59%
RES Elec (centralized)	68%	70%
RES Transports	11%	11%

Portugal: PT\_50

AIC (AVERAGE INCREMENTAL COST)  
M€/PJ



(% Additional share 2030/2010, according to IRENA paper)

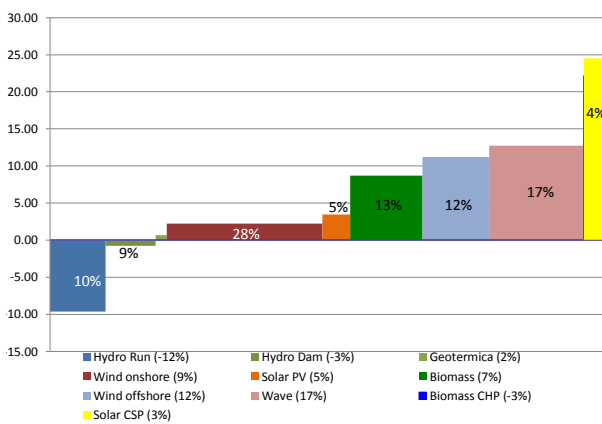
- Total ELEC similar to REF
- Wind onshore and PV increases
- Solar PV plant size (AF=18%)
- AIC of Solar PV decreases

[%: Share of RES in Total ELEC production 2030]

	PT_50	
	2020	2030
Share RES (%)	31%	35%
RES Final Energy	31%	35%
RES Total Elec (incl CHP)	59%	76%
RES Elec (centralized)	68%	90%
RES Transports	11%	11%

Portugal: PT\_100

AIC (AVERAGE INCREMENTAL COST)  
M€/PJ



(% Additional share 2030/2010, according to IRENA paper)

- Total ELEC increases 64%/ REF
- New Renewables portfolio
- Hydro and wind onshore up to maximum potential; include micro-turbines
- Range of AIC up to 25 €/GJ

[%: Share of RES in Total ELEC production 2030]

	PT_100	
	2020	2030
RES Energia Final	31%	45%
RES Elec (incl CHP)	59%	99%
RES Elec (centralized)	68%	100%
RES Transports	11%	11%

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THANK YOU

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