FACT SHEETS ABOUT PHOTOVOLTAICS

European Technology & Innovation Platform PV

PV is already a competitive electricity source

The cost of photovoltaic (PV) systems has decreased dramatically over the past years. Market prices of PV modules have decreased by 90% during the last eight years. PV has reached parity with retail electricity in most countries and market segments, and wholesale parity is approaching at many markets. The concept of Levelised Cost of Electricity (LCOE) is used for making fair comparisons with electricity prices and the cost of other power generation technologies. In this report, LCOE is defined to be the generation cost, i.e., including all the costs involved in supplying PV power at the point of connection to the grid. PV LCOE is based on PV system capital (CAPEX) and operational (OPEX) expenditure and includes the costs and profit margins of the whole value chain including financing, project development, manufacturing, installation, operation and maintenance.

PV system CAPEX can be divided into two parts: the modules and the Balance of System (BoS). For decades, module prices have very closely followed the so-called learning curve, which means that each time the global cumulative PV generation capacity doubles, the price of modules decreases by about 25%. This development is expected to continue during the next decades, mainly because of better manufacturing processes, less use of materials and continuously improving module efficiencies which will also drive down the BoS cost along with new innovations in e.g. installation processes.

According to the base scenario in the new ETIP PV report 'The True Competitiveness of Solar PV', the cumulative global PV capacity would increase from the end of year 2016 figure of 304 GW_p to about 2400 GW_p by 2030 and to 9000 GW_p by 2050. Applying this volume growth, the historic learning rate and an average 0.4%-point annual average efficiency improvement, PV LCOE would decrease from 2017 by at least 40% by 2030 and by 60% by 2050. Figures 1-4 show the PV LCOE at five European locations with four system sizes and different nominal Weighted Average Costs of Capital (WACC) rates. Annual inflation is set at 2% which means that e.g. 4% nominal WACC corresponds to 2% real WACC. PV system lifetime is 30 years and annual degradation 0.5% in all cases. OPEX decreases from 2017 to 2050 from 19 to 10 €/kW_p/a, except for the utility-scale, where it's 25% less. All prices are given in 2017 real euros. Other input parameters are given in Tables I and II.

	Rooftop		Ground	
Location	2017	2030	2017	2030
London	940	1010	1000	1070
Munich	1090	1180	1160	1250
Toulouse	1230	1330	1310	1410
Rome	1440	1560	1530	1650
Malaga	1630	1770	1740	1870

Table I. Yield parameters (in kWh/kW_p/a)

PV system type	2017	2020	2025	2030	2040	2050
Residential 1 kW_p	1.35	1.17	0.97	0.83	0.65	0.54
Commercial 50 kW_p	1.06	0.91	0.74	0.62	0.48	0.40
Industrial 1 MW_p	0.81	0.68	0.55	0.46	0.35	0.29
Utility-scale 50 MW_p	0.69	0.58	0.47	0.39	0.30	0.25

Table II. CAPEX parameters (without VAT, in 2017 €/W_p)

If compared with the average variable retail electricity prices, excluding the fixed fees which can't be saved by own PV consumption, PV electricity is already cheaper in all five locations with almost all realistic WACC rates and consumer segments. When comparing with the average wholesale (spot market) electricity prices in 2016 (e.g., 43 €/MWh in Italy and 40 €/MWh in Spain), utility-scale PV electricity is already competitive in Rome and Malaga if 7% nominal WACC is used.

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The utility-scale PV LCOE in Malaga in 2020 would be 25 €/MWh with 4% nominal WACC. We are already seeing several power purchase agreements (PPAs) signed for PV between 20 and 30 €/MWh around the world which proves that PV can be the cheapest electricity form when a moderate interest rate truly reflects its inherent low technology and environmental risk.

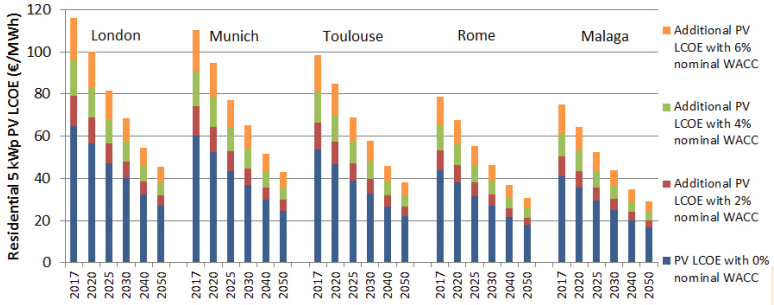

Figure 1. PV LCOE (in 2017 €) at five European locations with different nominal WACCs for 5 kW_p residential rooftop PV. VAT has been added to the residential PV CAPEX.

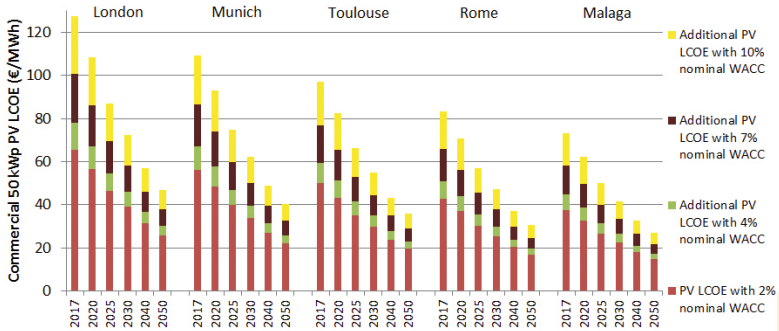

Figure 2. PV LCOE (in 2017 €) at five European locations with different nominal WACCs for 50 kW_p commercial rooftop PV.

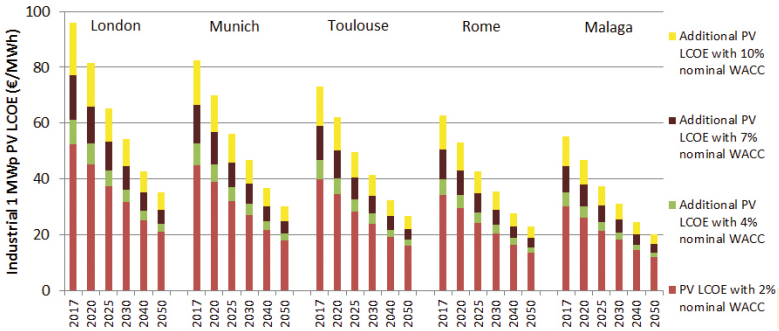

Figure 3. PV LCOE (in 2017 €) at five European locations with different nominal WACCs for 1 MW_p industrial PV.

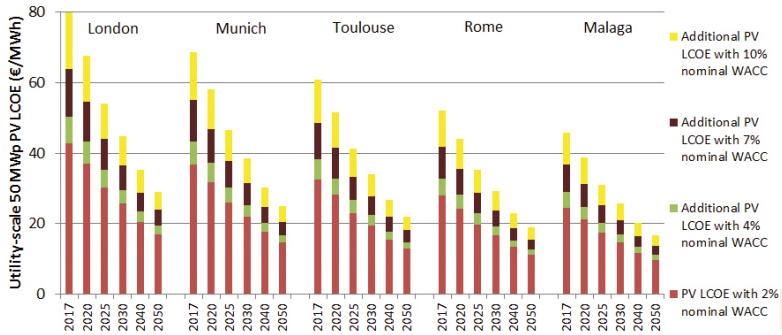

Figure 4. PV LCOE (in 2017 €) at five European locations with different nominal WACCs for 50 MW_p utility-scale PV.