



ENERGY COSTS

ELECTRICITY COSTS

The electricity price is changing dynamically in function of the hour and seasonality of the year, being influenced by the percentage of the renewables in the energy mix, for example. In order to take this phenomenon into account, the electricity price used in the tool it is not constant along the year but it is using a normalized European price profile. This profile is calculated using different real hourly profiles from Spain, UK, Germany and Sweden. Figure 1 shows the normalized European electrical price profile used in the calculations.

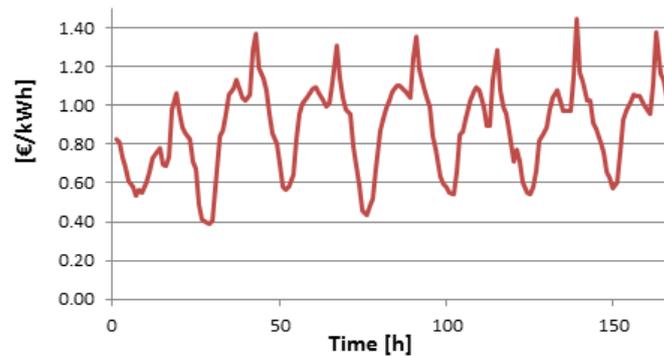


Figure 1 Normalized European electrical price profile.

This profile is then used to calculate the electricity cost for each of the country multiplying it for the yearly average value from EUROSTAT¹ data bases. A part of the energy cost, the charged fees are also an important part of the electrical bill, therefore an average value calculated from different countries is used. Table 1 shows the default average price of the electricity cost for each of the countries available in the RenewIT tool.

¹ Eurostat, "Eurostat Statistics Explained," [Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_price_statistics. [Accessed 2015]



Hypothesis for modelling: Energy costs

Table 1. EUROSTAT values for electricity cost in the selected countries

Country	Electricity cost [€/kWh]	Country	Electricity cost [€/kWh]
Austria	0.070	Latvia	0.080
Albania	0.074	Lithuania	0.096
Belarus	0.019	Norway	0.050
Belgium	0.079	Macedonia	0.074
Bosnia and Herzegovina	0.066	Poland	0.067
Bulgaria	0.073	Portugal	0.089
Czech Republic	0.076	Romania	0.063
Croatia	0.074	Scotland	0.114
Denmark	0.057	Serbia	0.060
Finland	0.063	Spain	0.099
France	0.060	Slovakia	0.101
Germany	0.072	Sweden	0.063
Greece	0.086	Switzerland	0.150
Hungary	0.080	The Netherlands	0.072
Iceland	0.044	Ukraine	0.019
Ireland	0.105	UK	0.114
Italy	0.095		

Since the normalized average value is calculated using different electricity profiles from different countries, it is necessary to take into account the differences between peak and off-peak periods. For that reason, the tool is also asking for peak and off-peak hours of the electricity prices. They are then used to adjust the electricity cost profile for each location. Notice that by default, the peak hours are +15% of the average price while off-peak hours are -15% of the average value.



OTHER ENERGY COSTS

Table 2 shows the cost of all the energy sources (water, gas, biogas, biomass, and district cooling supply) used in order to calculate the OPEX in the different concepts. For district cooling, the connection cost is considerable and therefore it has also accounted for the economic analysis. For these energy sources, constant price over all the locations has been considered.

Table 2. Yearly average energy costs

Energy source	Cost	Reference
Water	2.25 €/m ³	European Environment Agency [1]
Gas	0.041 €/kWh	Eurostat ¹
Biogas ²	0.086-0.065 €/kWh	Oxford Institute for Energy Studies [2]
Biomass	Local residues 55-68 €/t	IRENA [3]
	Local production 60-94 €/t	
	Non-local production 98-115 €/t	
DC supply ³	To connect: 147.24 €/kW	District cooling supply at Parc de l'Alba [4]
	Annual fix cost: 22.24 €/kW·yr	
	Energy cost: 35.12 €/MWh	

CO₂ EMISSIONS COST

Moreover, it is assumed the same cost of the CO₂ emissions for all the locations, 8.99 €/tCO₂. This price is calculated using the cost of CO₂ emissions and inflation rate reported by the IEA⁴ in 2012, 7.78 €/tCO₂ and 5% respectively.

² Compared to the natural gas-based methanol production, bio-methanol production costs are estimated to be 1.5-4 times higher in the scientific literature. Current bio-methanol projects focus mainly on using waste streams from other industrial processes, suggesting that those can offer the best economics. Wood-based bio-methanol costs are estimated from 160 to 940 €/t. When using waste streams, the production costs are estimated to be slightly lower between 200 and 500 €/t [5].

³ These values are for a real district cooling connexion in Spain, in particular in Parc de l'Alba [4].

⁴ IEA, 2013, "Scope and Methodology World Energy Outlook"



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