

Table 1: Specific energy demand and CO₂ emissions for different lime production routes

Case	Natural gas use (kWh/t)	Hydrogen use (kWh/t)	Biogas use (kWh/t)	Biomass use (kWh/t)	Electricity use (kWh/t)	Net scope 1 CO ₂ emissions* (kg/t)
NG	970.5	0	0	0	30.0	958.1
NG-CC	1970.6	0	0	0	107.0	293.8
NGOxy	870.1	0	0	0	81.2	940.3
NGOxy-CC	870.1	0	0	0	373.2	94.0
H2	0	1074.0	0	0	30.0	786.0
H2-CC	822.0	1074.0	0	0	93.4	241.6
Plasma	0	0	0	0	1026.8	786.0
Plasma-CC	0	0	0	0	1270.8	78.6
Biogas	0	0	1012.2	0	30.0	786.0
Biogas-CC	1230.4	0	1012.2	0	124.7	-32.7
Biomass	0	0	0	1122.3	30.0	786.0
Biomass-CC	1226.6	0	0	1122.3	124.3	-30.5

*CO₂ emissions include CO₂ generated by the calcination reaction ($\text{CaCO}_3 + \text{heat} \rightarrow \text{CaO} + \text{CO}_2$) and fuel combustion for heat supply (lime kiln + boiler for CC)

Table 2: Prices for electricity, hydrogen, natural gas, biogas, biomass, and CO₂ emission, transport and storage for different years and scenarios (E = electrification; C = central; M = clean molecules)

Scenario	2030			2040			2050			Units	Source
	E	C	M	E	C	M	E	C	M		
Electricity	106.95	121.26	121.09	87.36	101.73	98.30	65.67	105.29	95.31	€/MWh	[1]
Hydrogen	94.53	101.72	78.00	70.21	81.20	65.77	47.31	67.22	58.50	€/MWh	[1]
Natural gas	38.52			35			35			€/MWh	[2]
Biogas	39.61			28.56			28.56			€/MWh	[3]
Biomass	16.92			18			18			€/MWh	[2]
CO ₂ tax	150			250			350			€/t	[2]
CO ₂ transport	38			38			38			€/t	[4]
CO ₂ storage	6			6			6			€/t	[4]

References:

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