

Supplementary Material

Table S1. WEDISTRICCT scenario: detailed life cycle inventory of material inputs

SOFC module – Stack components			
Lifetime = 4.57 years			
Component	Material input	Amount (g/SOFC)	
Anode chemical	Ni based Y ₂ O ₃ (ceramic powder)	520	
	30% Aluminium oxide (GLO) market for		156
	70% Nickel, 99.5% (GLO)		364
	Methyl methacrylate (binder)	630	
	Water (solvent)	250	
Electrolyte chemical	Y ₂ O ₃ stabilized with ZrO ₂ (ceramic powder)	8.4	
	Methyl methacrylate (binder)	6.3	
	Water (solvent)	3	
Cathode chemical	LSCF (La,Sr) (Co,Fe)O ₃ ceramic powder	39	
	Ethylcellulose (cathode binder)	0.42	
	Terpineol (cathode solvent)	14	
Other stack elements	Interconnect (steel, chromium steel 18/8)	30,000	
	Casing (steel, chromium steel 18/8)	1323	
	Glass ceramic (insulation) (Glass wool mat)	304.5	
SOFC module – Other SOFC parts			
Lifetime = 10 years			
Processes inside SOFC	Element	Amount (g/SOFC)	
	Pre-reformer	1,700	
	Heat exchanger	7,300	
	Burner/oxidizer	2,310	
	Catalyst		210
	Box		2,099
	Desulphurizer	10,810	
	Catalyst		1,838
	Box		8,972
	Waste heat recovery (steel, chromium steel 18/8)	1,900	
	Condensate storage (HDPE)	2,400	
	Demin storage (HDPE)	900	
	Power system	120	
	Case (cold rolled steel)	72,000	
	Air and fuel supply system (steel, chromium steel)	30,000	
Immersion Cooling System (ICS) – SUBMER Technologies ©			
Lifetime = 15 years			
Component	Total weight (kg/component)	Details (main materials)	
Smart coolant	1,080		
Tank	844	Recycled stainless steel, plastic PET, synthetic rubber, wool and mineral fibres	
Submersible electric pump	80	Virgin stainless steel, wiring system, synthetic rubber, copper	
Piping breakdown	70	Stainless steel	
Chassis	55.6	Recycled stainless steel, synthetic rubber	

Heat exchanger	13.1	Recycled stainless steel, cooper recycled
Electrical cabinet (control box)	9	Virgin stainless steel, cooper recycled, electrical components
Control cabinet chassis (control box)	6.2	Recycled stainless steel
Bracket	7	Recycled stainless steel
Micro PC	0.7	Aluminium/zinc
CE plate	0.02	Aluminium
Level sensor	0.12	Virgin stainless steel
Circlips	0.2	Virgin stainless steel
Micro PC cable	0.1	
Sensor evaluation unit	0.123	Plastics
Temperature sensor	0.381	Stainless steel
Wires ethernet	0.035	Electronics 1 meter
Flow + temperature sensor	0.562	Stainless steel
Sliding nut with flange	0.03	Brass
Led profile	0.4	Aluminium
Led difuser	0.16	PVC
Led clamp	0.03	Stainless steel
Led cover	0.01	PVC

Table S2. WEDISTRICK scenario: energy generation and consumption

SOFC module	kWh/6 months
Biogas consumed	72,163.97
Immersion Cooling System (ICS) – SUBMER Technologies ©	kWh/6 months
Immersion system (consumption)	41,856.39
Smartpod system (consumption)	4,8650
Other data centre systems (consumption)	843.35
Grid energy consumed	4,150.35
Total electrical energy consumed	43,543.10
Thermal energy to fuel cells (production)	1,411.68
Thermal energy to cooler (production)	14,773.73
Total thermal energy used (production)	16,185.41
Total thermal energy produced by DC	41,856.39
Heat lost from data centre to ambient	25,670.98