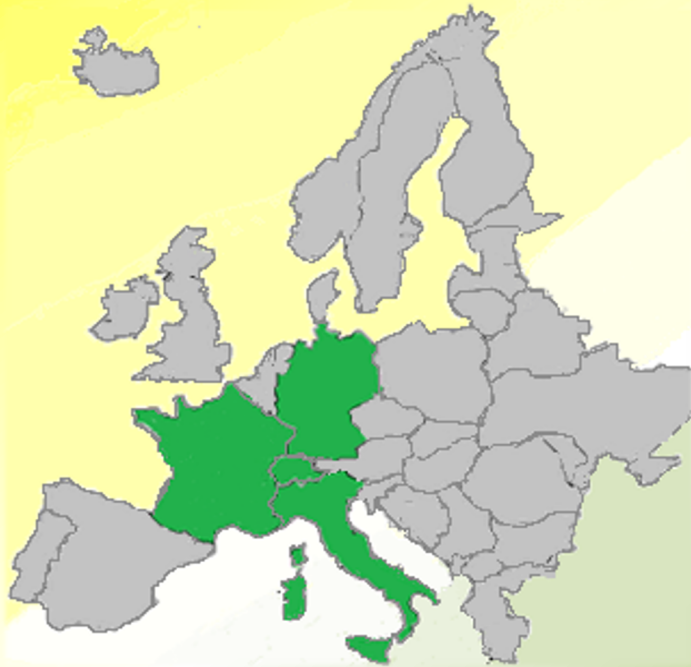


The **EU-project “Waste2Watts”** aims to develop a one-stop solution for the conversion of biogas from a large variety of waste feedstock to clean, efficient and silent electricity and heat, directly exploitable by the site where the biogas is produced.

CONSORTIUM

The W2W network is composed of eleven partners from 4 leading biogas countries joining the efforts to this objective:

- two biogas cleaning SMEs,
- two SOFC manufacturing SMEs,
- one biogas expert SME,
- five leading research and education centers in SOFC characterization and modelling, and in biogas use as a fuel.



Project Team

Industrial Advisory Group

www.waste2watts.eu

Bringing clean electricity and heat to small-scale farms in Europe



“Unlocking unused bio-WASTE resources with loW cost cleAning and Thermal inTegration with Solid oxide fuel cells”

An FCH JU project



Jan. 2019 – Dec. 2021

Huge unutilised biogas potential is spread over Europe: millions of farms, municipalities and food processing centers produce biowaste at relatively small-scale, where a 100 kWth digester is sufficient to convert the waste to biogas. Waste2Watts provides a turn-key solution based on solid oxide fuel cells (SOFCs) for CHP exploitation of small scale digester gas-producing sites, providing farmers and municipalities with a competitive edge in efficiency at low impact.



The project will demonstrate intrinsic advantages of the SOFC, compared to alternatives (engines):

- by achieving twice as high biogas-to-electrical efficiency, especially for small scale;
- by an intrinsically very low level of polluting emissions (NOx, CO, HC, SOx);
- by exploiting dilute LFG and bio-waste streams (farms, OFMSW) avoiding GHG emissions
- by complementing bio-methane upgrading, which currently needs very large flows of biogas >100 m³/h

www.waste2watts.eu

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Unused Biogas Market Potential:

SOFC units	Agricultural waste				OFMSW				Total per region
	XS (5 kWe)	S (50 kWe)	M & L (200 kWe)	Installations agro	XS & S (50 kWe)	M (200 kWe)	L (500 kWe)	Installations OFMSW	
EU-27	1718037	327979	111594	2157610	ND	ND	ND	-	2157610
France	91050	77902	27693	196645	15	156	244	414	197059
Germany	91495	48421	8372	148289	215	88	142	445	148733
Italy	253208	34131	3555	290894	25	103	145	273	291168
Switzerland	10685	5917	74	16676	128	38	7	173	16848
F+D+IT+CH	446438	166371	39694	652503	383	385	537	1305	653908

in addition:
10 XS = 1 S

*ND: not determined

SOFC application range

ICE application range

avg size of ICE CHP plant

Bio-methane injection

avg size of injection plant

99% of farms

average size of a EU farm (50 LSU – biogas from manure)

average size of a EU farm (16 ha – biogas from agrosidues)

typical size of a municipality (biogas from solid wastes)

	1.7	5	17	50	170	500	1'700	
→ m ³ /h biogas (60% CH ₄)								
→ m ³ /h CH ₄	1	3	10	30	100	300	1'000	
→ kW _{CH₄}	10	30	100	300	1'000	3'000	10'000	
→ kW _e (SOFC – 50% eff.)	5	15	50	150	500	1'500	5'000	
→ LSU (cow-equivalent)	50	150	500	1'500	5'000	15'000	50'000	
→ ha (agrosidues) 1 km ² = 100 ha	20	60	200	600	2'000	6'000	20'000	
→ OFMSW ton/day	0.5	1.5	5	15	50	150	500	
→ OFMSW ton/yr	180	500	1'800	5'000	18'000	50'000	180'000	
→ people-equivalent	1500	5000	15'000	50'000	150'000	0.5 M	1.5 M	

Crop residues: 50 kW_{CH₄} / km²
 Manure: 40 kW_{CH₄} / km²
 Cities (OFMSW): 30 kW_{CH₄} / km²
 (e.g. Amsterdam = 5'000 people / km²)
 1 km² = 100 ha

EPFL



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