



TOTEM mCHP with Fiat Engine: Save Money and the Environment

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Gianluca Ragonesi, Head of business development and sales, Totem Energy



Renewable energy since 1995

200 MW

installed power



TOTEM ENERGY

A SUBSIDIARY OF ASJA GROUP

With a strong expertise in the centralized energy generation the Italian Group Asja Ambiente decided years ago to move into the business of the **decentralized energy generation** with the strong awareness it will play an essential role in the years ahead.

Through the daughter company **TOTEM ENERGY**, Asja Group has become a specialist in onsite Energy Generation products and particularly in microcogeneration.

Its flagship product is the **TOTEM micro CHP**.





FIAT Fire 1.4 CNG E6

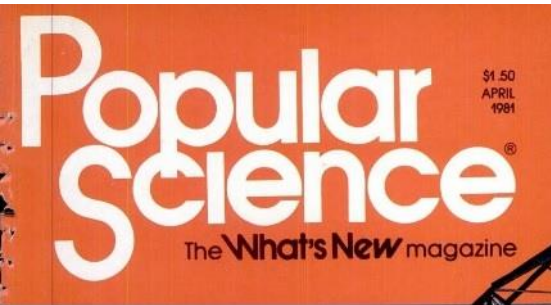


**MAGNETI
MARELLI**

CONTROL UNIT



TOTEM THE BEGINNING (1981)



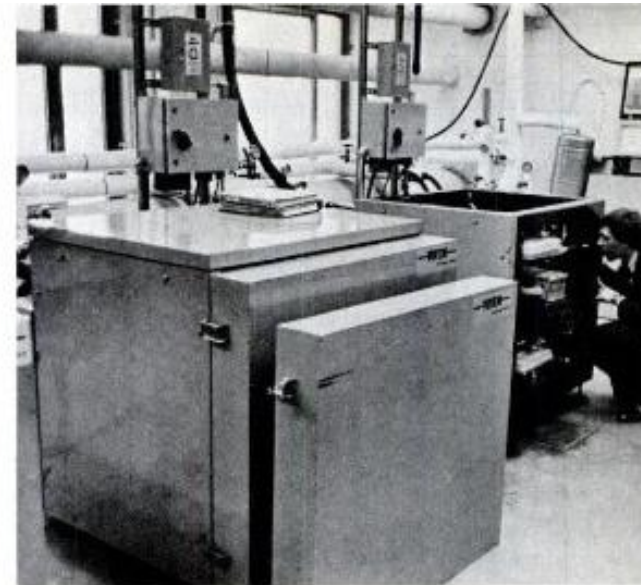
«...Now a small co-generation unit, developed and marketed by Fiat in Europe and called TOTAL Energy Module, or TOTEM, is available in the U.S. Through Brooklyn Union Gas Co. In New York City...»

Co-generator produces heat and electricity

Co-generation—burning fuel to produce both heat and electricity—is an old conservation idea that has recently been revived and hailed as an energy-saving alternative. Now a small co-generation unit, developed and marketed by Fiat in Europe and called the Total Energy Module, or Totem [PS, Aug. '77], is available in the U.S. through Brooklyn Union Gas Co. in New York City.

The heart of Totem is a 903-cc, four-cylinder internal-combustion engine—the standard engine in the Fiat 127 automobile. But Totem's engine has been modified to burn a variety of fuels, including natural gas, biogas, and propane, as well as methanol and other alcohols. The engine drives a 15-kW induction generator, producing electricity that can be fed into a utility grid or can supply power directly to a user's own circuits. Heat is extracted from the combustion process by circulating water through four primary and secondary heat exchangers, drawing heat from the generator, engine coolant, crankcase oil, and exhaust. The recaptured heat is used for domestic hot water, space heating, or, with the help of absorption water chillers, for air conditioning.

Totem has a fixed output ratio: Two-thirds is heat, one-third is electricity. Besides a 15-kW electrical output,



Compact Totem co-generators are 42" high, 41" wide, 46" long. Size will differ on U.S. version to fit through average door.

Totem generates 131,000 Btu/hr. That's enough heat to supply hot water for 16 apartments or heat four medium-size apartments.

With a price tag of about \$10,000, Totem is well suited to apartment buildings, restaurants, hotels, hospitals, and a variety of industrial applications. Fiat hopes to introduce the Totem concept to the U.S. by selling 100–200 units.

For more information, write to Totem Project, Bob Ritacco, Brooklyn Union Gas, 195 Montague St., Brooklyn, N.Y. 11201.—*Jeanne McDermott*



TOTEM

BRIEF HISTORY

The first micro-cogenerator in the world: the TOTEM (15 kW)



Research and Development Center of Fiat developed the TOTEM: first micro-cogenerator powered by natural gas

Growing demand for energy efficiency solutions

Asja Group acquired TOTEM brand and started the new TOTEM micro CHP development headed by Stefano Re Fiorentin, former Head of FIAT R&D

Launch of: New TOTEM (10- 20 - 25 kW)



1977

1987

2013

2016

TOTEM SPECIAL FEATURES

Model		TOTEM 25
Rated Electrical Power	kW	25
Rated Thermal Power	BTU kW	170,600 (195,200*) 50 (57.2*)
Net electrical efficiency (LHV)	%	31.2%
Total efficiency (LHV)	%	94.2 % (103.3%*)
Inlet water temperature	°F / °C	158 / 70
Engine		FCA Fire 1400 cc
Engine Control Unit		Magneti Marelli
Fuel		Natural Gas
Black-out start capability		Yes
Input power rate (LHV)	BTU (kW) Th/hr	270,760 (79.3) 2.71
Input power rate (HHV)	BTU (kW) Th/hr	300,214 (87.9) 3.00
Gas pressure requirement	W.C.	8
Emission settings (NOx)@ 5% O ₂	lb/MWhr	< 0.10
Emission settings (CO)@ 5% O ₂	lb/MWhr	< 0.10

* Referred to the input water temperature 95 F (35 °C)

Modulation. From 7.5 - 25 kW of electricity and 15 - 57 kW of heat. Electricity generated matches customer's demand without exceeding the required need.

Black-out start. Working while grid failure or power outage. In black-out start mode TOTEM can be fueled either with natural gas or propane.

Single phase ready. Through the 3+1 wires inverter it can supply three single phase sub grid at once

Emissions. TOTEM emissions are up to 20 times less than a condensing boiler.



TOTEM MORE FEATURES

Short payback time. 2 - 4 years on average due to bills cost savings (heat and power).

Indoor / outdoor. Suitable to indoor and outdoor installation.

Flexible operation. Designed to single and cascade operation.

Robust and reliable. The real time and precise control of the FIAT Engine through the Magneti Marelli Engine allows a predictive maintenance: components are replaced only when TOTEM efficiency start decreasing, therefore TOTEM efficiency is ensured all over time.

TOTEM

INSIDE (1/2)



TOTEM INSIDE (2/2)





TOTEM PRODUCTION

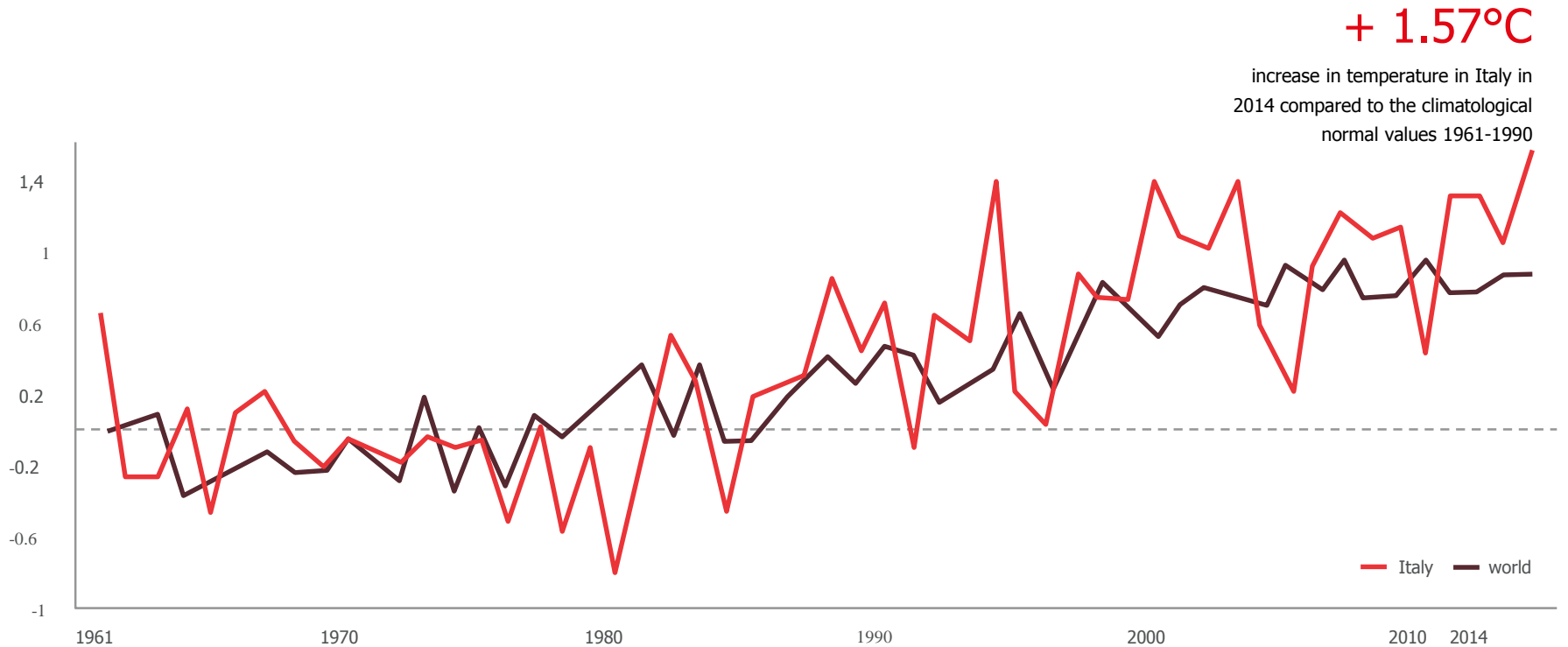
Production plant is located in Turin (Italy).

It is over 2,100 m² area designed according to the maximum efficiency standards: all taking place within that area, from research and development of new models to the production, assembly and testing, is characterized by a rational use of energy produced and consumed.

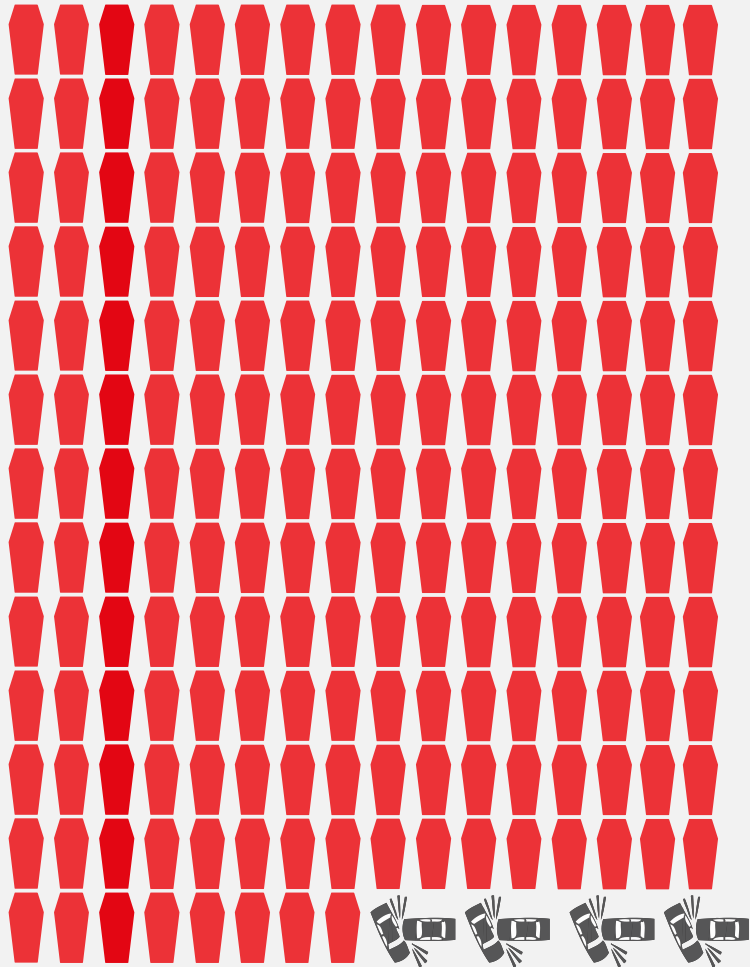
Production capacity is currently set up to 600 units per year.

TOTEM

HOW CAN WE PRESERVE THE ENVIRONMENT?



...nearly doubled than worldwide!



TOTEM HOW CAN WE SAVE LIVES?

Air pollution

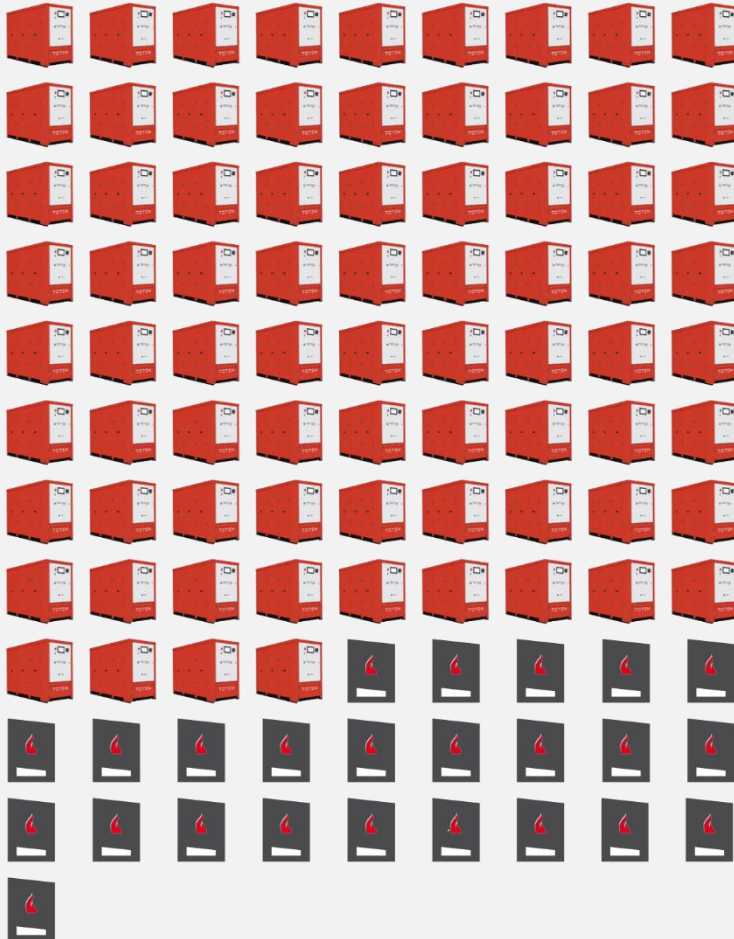
Italy, one of the worst records in Europe.

84,400

Deaths per year caused by air pollution.

25 times +

Compared with the victims of car accidents
(3,380 deaths).



TOTEM OUR VISION

If all the residential boilers in Italy (with exception of single houses) were replaced by TOTEM microcogenerators that would lead to:

-30,000 deaths

per year caused by air pollution (thanks to the yearly reduction of about 1500 Tons of Nox and 7500 Tons of Particular Matters).



TOTEM APPLICATIONS

- Wellness centers
- Accommodations
- Restaurants
- Healthcare
- Residential
- Public
- Agricultural sector
- Distribution
- Small / medium industry



TOTEM OPPORTUNITIES IN USA

State	Hotels and motels	Grocery stores	Apartments complexes	Public Schools	Private Schools	Hospitals	Nursing homes	Retirement community	Total
California	6,287	9,018	5,454	10,110	3,544	499	1,231	2,602	38,745
Colorado	2,098	1,859	2,282	1,809	379	104	213	714	9,458
Connecticut	867	1,679	1,332	1,150	367	51	236	569	6,251
Florida	4,233	6,397	3,858	4,134	1,662	287	681	1,701	22,953
Georgia	2,186	3,876	2,969	2,519	601	220	360	1,035	13,766
Illinois	2,349	4,943	3,255	4,403	1,510	251	783	1,460	18,954
Massachusetts	1,936	2,632	1,958	1,856	803	131	427	825	10,568
Michigan	2,358	3,627	3,171	4,083	835	180	427	1,281	15,962
Minnesota	1,991	2,006	2,309	2,273	534	176	384	1,025	10,698
North Caroline	2,339	4,085	2,910	2,568	552	172	421	1,183	14,230
New Jersey	2,593	3,918	2,227	2,603	1,234	111	359	812	13,857
New York	3,739	6,321	2,652	4,694	1,827	299	623	1,253	21,408
Ohio	2,344	4,309	3,152	3,875	929	229	961	1,605	17,404
Oklahoma	1,206	1,680	2,243	1,796	161	176	313	652	8,227
Pennsylvania	3,047	5,611	2,656	3,249	2,150	296	706	1,221	18,936
Wisconsin	2,150	2,141	2,501	2,275	879	172	388	1,131	11,637

More than 100,000 opportunities.....

* Source: US database Data-list.com



HEAT



POWER



BUSINESS CASE

SWIMMING POOL | PAYBACK CALCULATION
LOCATION | PIEMONTE, ITALY

Annual energy cost without TOTEM

Heat (39,247 therm/year)	78,621 €
Power (267,045 kWh/year)	49,817 €

Solution

TOTEM 20	x 1
Working hours	8,600

Annual energy and operation cost with TOTEM

Heat	54,937 €
Power + TOTEM Operations cost	53,465 €

Cumulative net savings for 10 years 144,870 €

Payback Time* 2.7 years

* With reference to energy prices applicable to Italy. TOTEM units w/o black start feature.



HEAT



POWER



BUSINESS CASE

CONDOMINIUM | PAYBACK CALCULATION

LOCATION | EMILIA ROMAGNA, ITALY

Annual energy cost without TOTEM

Heat (38,383 therm/year)	137,015 €
Power (496,904 kWh/year)	112,052 €

Solution

TOTEM 20	× 2
Working hours	4,917

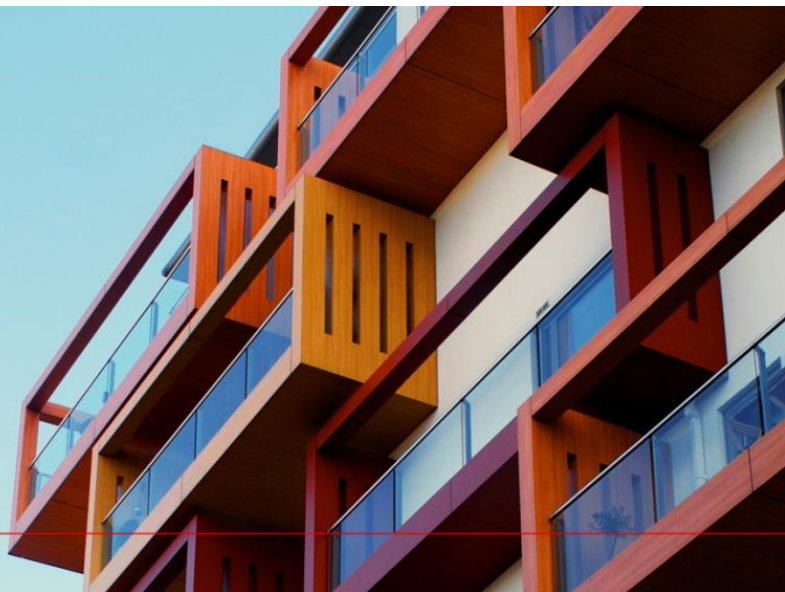
Annual energy and operation cost with TOTEM

Heat	86,086 €
Power + TOTEM Operations cost	131,166 €

Cumulative net savings for 10 years 209,250 €

Payback Time* 3.4 years

* With reference to energy prices applicable to Italy. TOTEM units w/o black start feature.





SWIMMING POOL REFERENCE CASE

Swimming Pool Adria Nuoto

Unit type

TOTEM 25

Number of units

2

Fuel type

Natural Gas

Application type

Wellness centers

Location

Northern East | Italy



HOTEL REFERENCE CASE

Hotel Du Cheval Blanc

Unit type

TOTEM 20

Number of units

2

Fuel type

Natural Gas

Application type

Tourist accommodation

Location

Northern West | Italy



HOTEL & TERME REFERENCE CASE

Hotel Weiss

Unit type

TOTEM 20

Number of units

1

Fuel type

Natural Gas

Application type

Tourist accommodation

Location

Angermünde | Germany



RETIREMENT HOUSE REFERENCE CASE

Retirement House Sant'Anna

Unit type

TOTEM 20

Number of units

1

Fuel type

Natural Gas

Application type

Healthcare

Location

Eisenach | Germany



STUDENT ACCOMMODATION REFERENCE CASE

Student accommodation

Unit type

TOTEM 10

Number of units

1

Fuel type

Natural Gas

Application type

Residential

Location

Luton, London | United Kingdom





PUBLIC REFERENCE CASE

Fire station

Unit type

TOTEM 20

Number of units

1

Fuel type

Natural Gas

Application type

Public

Location

London | United Kingdom



Still using the same old boiler?
It's time to change,
choose TOTEM

TOTEM
asja group

TOTEM BENEFITS TO GAS UTILITIES

More revenues. Due to electric market penetration (if any existing customer would buy a TOTEM unit this would bring up to 30% more natural gas consumption).

Customer loyalty. CHP customers will remain long term natural gas users thanks to reduced energy costs and great savings.

System resilience. Offering the Black-out start feature to customers that need reliability in the face of outage.

Better image. "Greener" utility that promotes a "sustainable" product and therefore will have a better image in the marketplace.



TOTEM

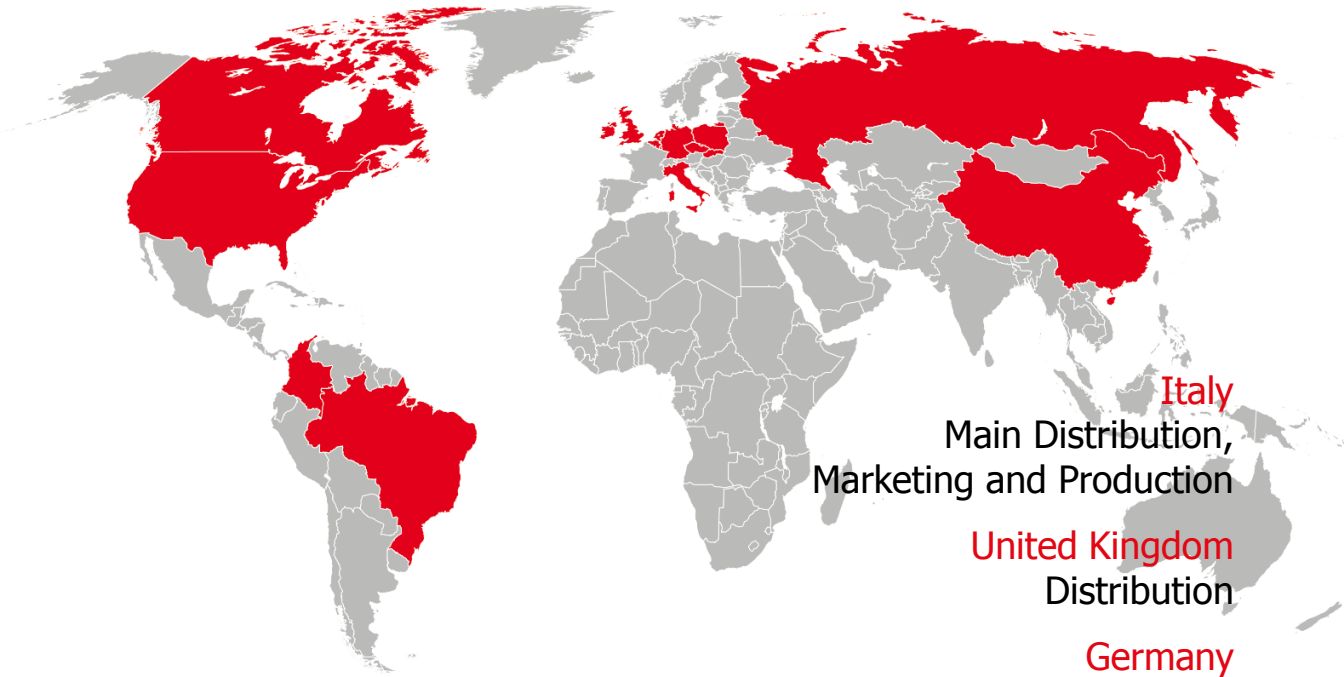
NEW PARTNERS FOR AN EXCITING MARKET

TOTEM Energy aims to make North American market one of its major markets within the next few years.

In addition to Natural Gas Utilities, we are looking for a strong engagement with:

- **Dealers and distributors**
(ex. HVAC companies, larger CHP distributors, companies that are familiar with mCHP technology).
- **Energy Service Companies ESCO's**

TOTEM ENERGY WORLDWIDE



Italy
Main Distribution,
Marketing and Production

United Kingdom
Distribution

Germany
Distribution

Czech Republic
Distribution

Slovakia
Distribution

Ireland
Distribution

Poland
Distribution

Belgium
Distribution

Netherlands
Distribution

Luxembourg
Distribution

Colombia
Distribution

USA & Canada
Coming soon

China
Market
Development

Brazil
Market
Development

Russia
Market
Development



**KEEP CALM
AND
Totemize
Every Building!**



TOTEM
asja group

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