Turin, December the 4th, 2019

biogas
biometano
eolico
fotovoltaico
micro cogenerazione

Asja Group

A success story for a renewable future

A SUSTAINABLE TRAINING INSTITUTION

ITC International Training Centre
Centre international de formation
Centro Internacional de Formación

Emanuele Torre
Business Developer
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INTEGRATED RENEWABLE PLAYER

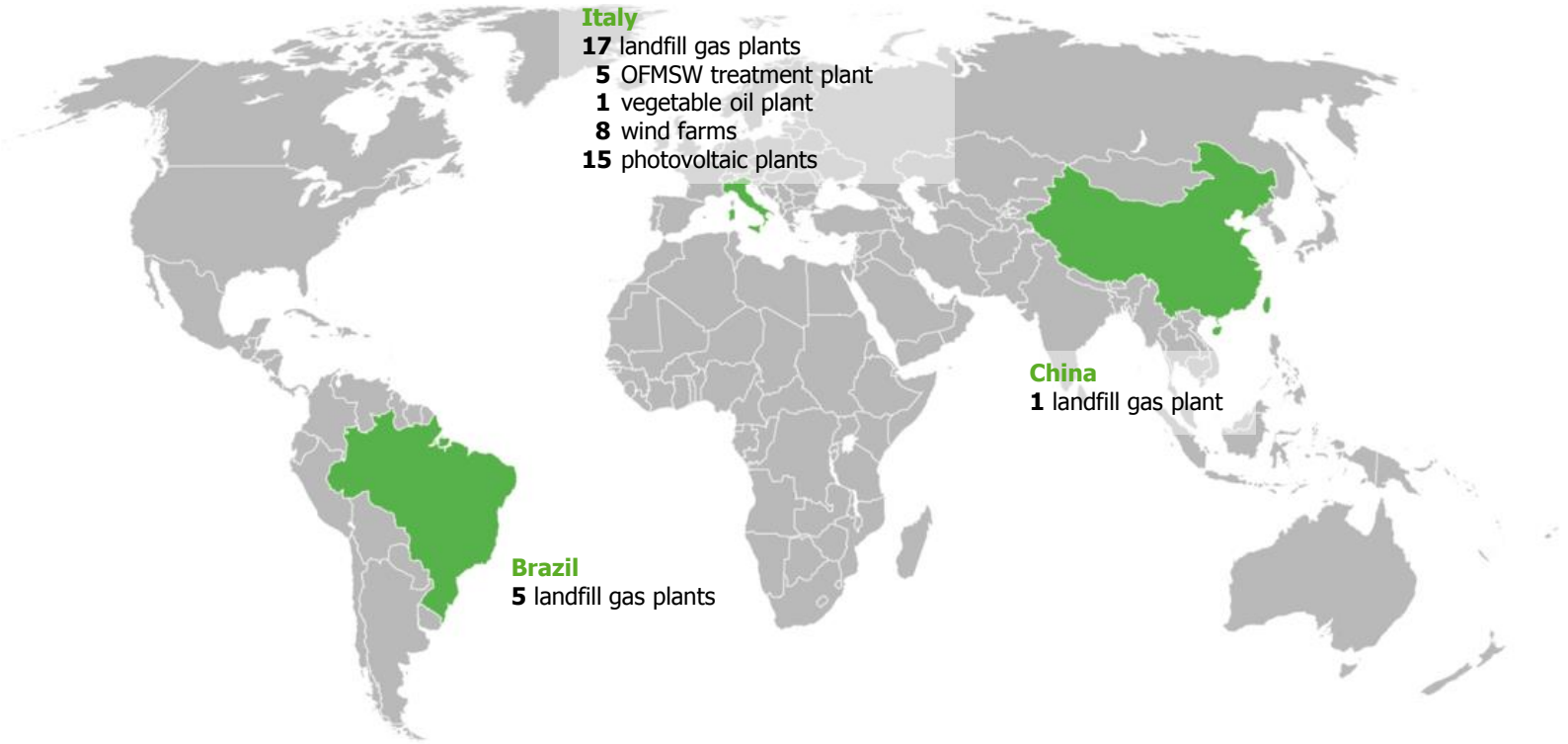
Since 1995 Asja has been a leader in power generation from renewable sources and in the reduction of greenhouse gas emissions that cause climate change.

Asja operates in the energy efficiency sector developing and marketing the TOTEM, a high-efficiency micro-cogeneration unit.

Where we are

- Italy: Turin headquarters, Palermo
- Brazil: Belo Horizonte
- China: Shenyang

THE ASJA'S 52 OPERATION PLANTS
177.4 MW INSTALLED POWER



605,000 MWh p. a.
green energy produced

1,500,000 tons p. a.
CO_2 avoided

1,000,000
oil barrels saved in 1 year

900,000
people enjoying clean lighting
from our green energy

ASJA RENEWABLE ENERGY PLANTS

Italy

8 wind farms

84.1 MW installed power

Italy

14 photovoltaic plants

11.6 MW installed power

WIND FARMS

We generate energy from wind

Thanks to its long-standing experience in the sector of renewable sources, Asja designs, builds and operates wind farms of any size, extremely efficient and reliable.

WIND FARMS

Asja in-house staff has all the skills that are needed to develop a windfarm project through its various stages:

- Site-scouting
- Feasibility studies
- Wind measure management
- Wind assessment
- Layout optimisation
- Project design
- Environmental impact analysis
- Handling of the permit issuance
- Management of the relations with institutions
- Wind Farm construction
- Wind Farm management
- Due Diligence to evaluate wind farm acquisitions
- Energy sale
- Green Certificates trading

WIND FARMS

84.1 MW installed power

Wind farm | Matera (Italy)

Wind farm | Fumosa (Tp, Italy)

PHOTOVOLTAIC SYSTEMS

We develop excellency

Asja designs, builds and manages performing, reliable photovoltaic installations.

Its many years' experience in the field of renewables makes it the partner of choice for all businesses and organizations intending to set up a PV plant in Italy.

PHOTOVOLTAIC SYSTEMS

PV plant | Rabbici Sferro Trapani | SICILY - ITALY | December 2010

With its team of engineers Asja directly handles all stages that eventually lead to plant commissioning:

site scouting, design, permit issuance procedures, relations with stakeholders and negotiation of agreements, plant construction, granting of feed-in tariffs, selling of energy, plant maintenance.

PHOTOVOLTAIC PLANTS

11.6 MW installed power

PV plant | San Giorgio (To - Italy)

Roof mounted PV system | Rivoli (To – Italy)

PV plant | Fiera Levante (Ba - Italy)

LANDFILL GAS PLANTS

Italy

17 landfill gas plants

51.1 MW installed power

China (CDM projects)

1 landfill gas plant

3.9 MW installed power

Brazil (CDM projects)

5 landfill gas plants

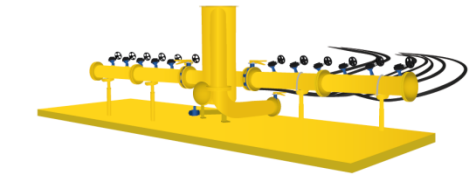
26.7 MW installed power

LANDFILL GAS PLANTS

We generate energy from waste

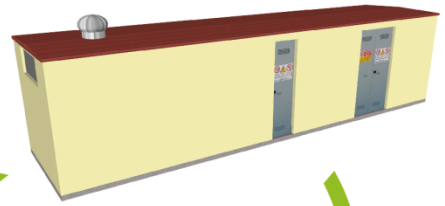
Asja develops, builds and manages waste-to-energy plants that recover biogas produced by the anaerobic digestion of the organic fraction of municipal solid waste (OFMSW) stored at the landfill.

LANDFILL GAS PLANTS

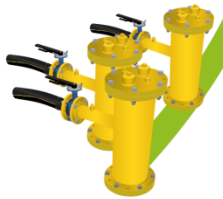


GENERAL
MANIFOLD

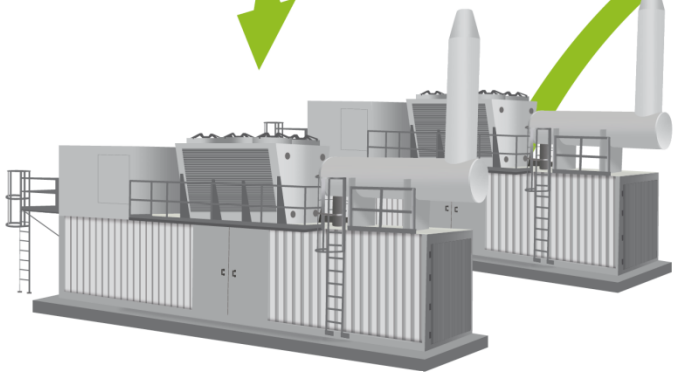
SUCTION AND
TREATMENT SECTION



GRID CONNECTION



WELL-HEAD



ENERGY GENERATING
SECTION

GREEN ENERGY

LANDFILL GAS PLANTS

The capture of biogas generated from landfills avoids the release into the air of its most harmful component: methane (CH_4). This gas poisons the atmosphere 21 times as much as carbon dioxide (CO_2).

To produce energy from biogas instead of fossil fuels - the quantity being the same - makes it possible to achieve an appreciable reduction in the quantity of CO_2 produced.

LANDFILL GAS PLANTS

81.7 MW installed power

Landfill gas plant | Monte Scarpino (Ge - Italy)

Landfill gas plant | Shenyang (China)

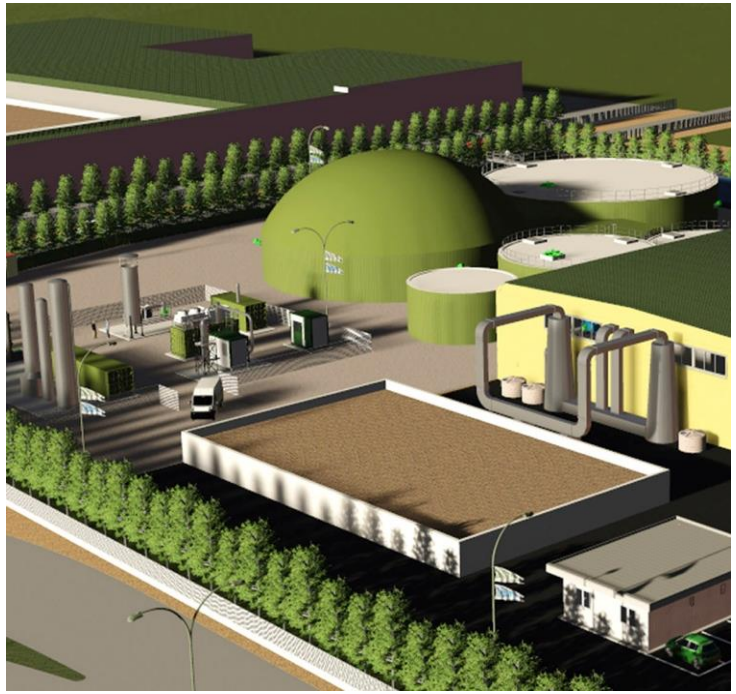
Landfill gas plant | João Pessoa (Paraíba - Brazil)

OFMSW ANAEROBIC DIGESTION PLANTS
BIOMETHANE AND ELECTRICAL ENERGY

A new frontier in biogas-to-energy systems

Asja designs, builds and operates plants to produce **biomethane** and **electrical energy** from the organic fraction of municipal solid waste and waste and by-products from the agroindustrial sector.

OFMSW ANAEROBIC DIGESTION PLANTS

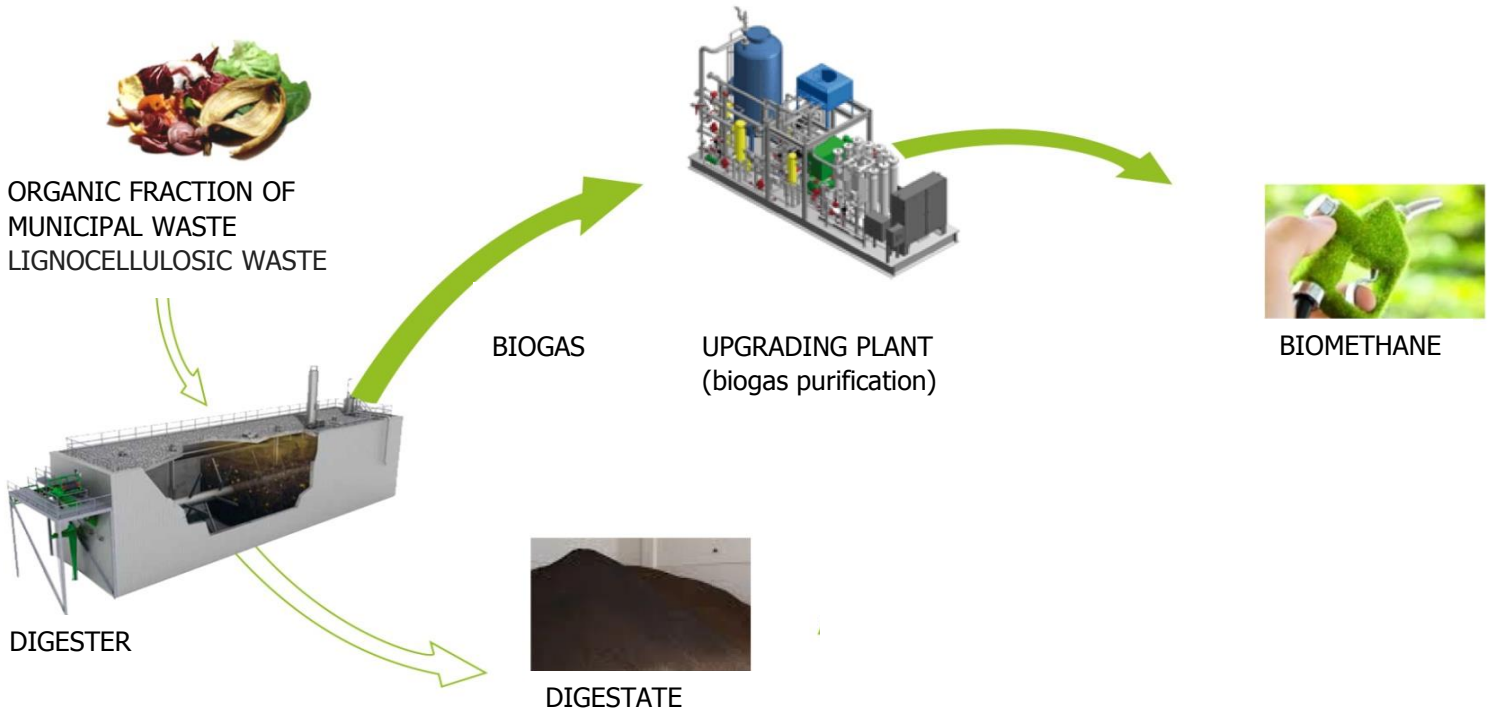


* Plant for the production of biomethane (Piedmont) detail of the render of the project

A new frontier for Asja

With its expertise gained in more than 20 years of activity and with more than 60 biogas plants designed, built and operated, Asja **is diversifying its development** by focusing on organic waste recovery plants through the anaerobic digestion and composting process. These plants utilize organic waste such as OFMSW (Organic Fraction of Municipal Solid Waste), scrap and pruning of public greenery and waste/by-products derived from agricultural and agro-industrial chains to produce **biomethane** and **compost**.

OFMSW ANAEROBIC DIGESTION PLANTS
PROCESS FLOW DIAGRAM



OFMSW ANAEROBIC DIGESTION PLANTS

KNOW HOW

Business development process follows tree different pipelines

GREENFIELD

Industrial or agricultural areas (even disused to be redeveloped / reconverted) on which to design, authorize, build and operate a new plant

BROWNFIELD

Acquisition of plants:

- under authorization process or authorized ready to built
- operating composting plants with the anaerobic section yet to be authorized
- integrated (AD + C) in operation

PUBLIC TENDER

- Public tender participation
- Project Financing proposal

OFMSW ANAEROBIC DIGESTION PLANTS
OUR PLANTS IN NUMBERS
SLIDE 1/3

FOLIGNO (PG) - UMBRIA

Authorized waste treatment capacity

OFMSW: 40.000 ton/y

Green wastes: 13.500 ton/y

Hourly production of biomethane

457 Sm^3/h

Annual production of compost

15.353 ton/y

Processes

Anaerobic digestion | composting | biogas upgrading

ANZIO (RM) - LAZIO

Authorized waste treatment capacity

OFMSW: 36.000 ton/y

Green wastes: 14.000 ton/y

Hourly production of biomethane

399 Sm^3/h

Annual production of compost

6.000 ton/y

Processes

Anaerobic digestion | composting | biogas upgrading

OFMSW ANAEROBIC DIGESTION PLANTS
OUR PLANTS IN NUMBERS
SLIDE 2/3

LEGNANO (MI) - LOMBARDY

Authorized waste treatment capacity

OFMSW: 40.000 ton/y

Green wastes: 12.400 ton/y

Hourly production of biomethane

457 Sm^3/h

Annual production of compost

15.600 ton/y

Processes

Anaerobic digestion | composting | biogas upgrading

PIANEZZA (TO) - PIEDMONT

Authorized waste treatment capacity

OFMSW and agro-industrial by-products:

40.000 ton/y (expansion in progress)

Hourly production of biomethane

465 Sm^3/h

Annual production of compost

6.400 ton/y

Processes

Anaerobic digestion | biogas upgrading

OFMSW ANAEROBIC DIGESTION PLANTS
OUR PLANTS IN NUMBERS
SLIDE 3/3

TUSCANIA (VT) - LAZIO

Authorized waste treatment capacity

OFMSW: 40.000 ton/y

Green wastes: 10.000 ton/y

Gross annual electricity production

6.500 MWh/y

Annual production of compost

15.600 ton/y

Processes

Anaerobic digestion | composting |

electrical energy production

OFMSW ANAEROBIC DIGESTION PLANTS

10.531 families

that we can satisfy with our biomethane

2.221 cars

that we can refuel every day with our biomethane

12.710

tones of oil saved

OFMSW ANAEROBIC DIGESTION PLANTS ENVIRONMENTAL AIMS

Long-range vehicular traffic

The installation of the plant within the area of competence:

- supplies locally the means of transports through a biomethane refuelling station
- decreases pollution with local and global benefit

CO_2 reduction

- Direct emissions: 20% less than gasoline and 5% less than diesel

NOx reduction

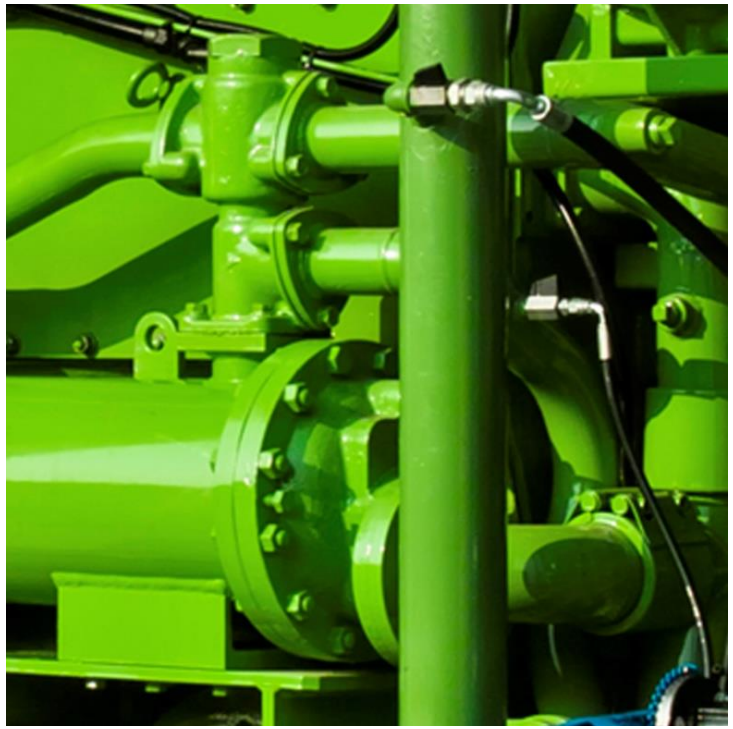
- Lower particulate emissions and NOx emission levels

BIOMETHANE PRODUCTION PLANTS FROM OFMSW

Biomethane production plant from OFMSW (Foligno, Pg - Italy)

OFMSW power plant | Tuscania (Vt - Italia)

ASJA ASSET MANAGEMENT



O&M + biogas and PV plants management

Asja offers a full service for biogas and PV plants management, assisting customers with its long experience and competence.

CERTIFICATIONS

ISO 9001 / Quality: company process optimization to ensure an ever-increasing fulfilment of client requirements.

BS OHSAS 18001 / Health and Safety: ongoing improvement in the protection of workers health and safety in the performance of their job activities.

ISO 14001 / Environment: commitment based on awareness and respect for the environment, with a view to prevent and reduce pollution and to constantly improve.

Reconta Ernst & Young: financial statements audit.

MICROCOGENERATION

We invest in energy efficiency

Asja manufactures and markets high-efficient heating, cooling and distributed power generation systems:

- TOTEM microcogenerators* that produce heat and power while respecting the environment;

*22 to 50 kW heat / 10 to 25 kW power - 128x79.5x192 cm

ASJA -CO_2

We curb CO_2 emissions

Asja avoids the emission of about 1,500,000 tons of CO_2 every year.

Carbon credits generated by Asja plants are RINA* and Gold Standard** certificated.

* for renewable energy plants built and operated in Italy

** for renewable energy plants build and operated in Brazil and China

Investing in the future

Asja believes that research is fundamental to its work, hence its main activities in the field:

- CO_2: investigation, development and application of new technologies for CO_2 sequestration, immobilization and reuse;
- microcogeneration: energy efficiency solutions;
- plastics: investigation of new technologies for microplastics biodegradation.

MEMBERSHIP

Elettricità Futura

the main employer's association representing and protecting large and small companies operating in the Italian electricity generation sector and producing both renewable and conventional power. Its members supply more than 70% of the electricity consumed in Italy.

Asja is also member of **Confindustria, The European House Ambrosetti, Aspen Institute Italia, Kyoto club, Key Energy**.

In 2018 Asja entered the London Stock Exchange Group's international ELITE project.

CORPORATE SOCIAL RESPONSIBILITY

MAcA - A come Ambiente Museum of Turin

We are active partners in **Museo A Come Ambiente**, an interactive museum aiming at environmental awareness education and dissemination.

We support modern art through **Sandretto Re Rebaudengo Foundation**.

Every year we award the best documentary among the ones competing in the **Cinemambiente Film Festival in Turin (Italy)**.

We take part to the **World Environment Day** with initiatives aiming to improve environmental awareness.

We support the **Poligrow Foundation** in the implementation of social and environmental projects in disadvantaged areas of Colombia.

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micro cogenerazione

Micro-Combined Heat & Power Generation

Part 1 | Micro-cogeneration Technology

TOTEM by asja

A SUSTAINABLE TRAINING INSTITUTION

ITC International Training Centre
Centre international de formation
Centro Internacional de Formación

Gian Maria Rossi Sebastiano
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ASJA AMBIENTE ITALIA
MICRO-COGENERATION

Asja Ambiente Italia operates in the energy efficiency and energy saving sectors by developing and marketing TOTEM micro-cogenerators. Since 1995 Asja has been a leader in power generation from renewable sources and in the reduction of greenhouse gas emissions that cause climate change.

“Our energy environment is changing rapidly as Governments globally strive to make cost-efficient use of resources while enabling the emergence of a low carbon economy.

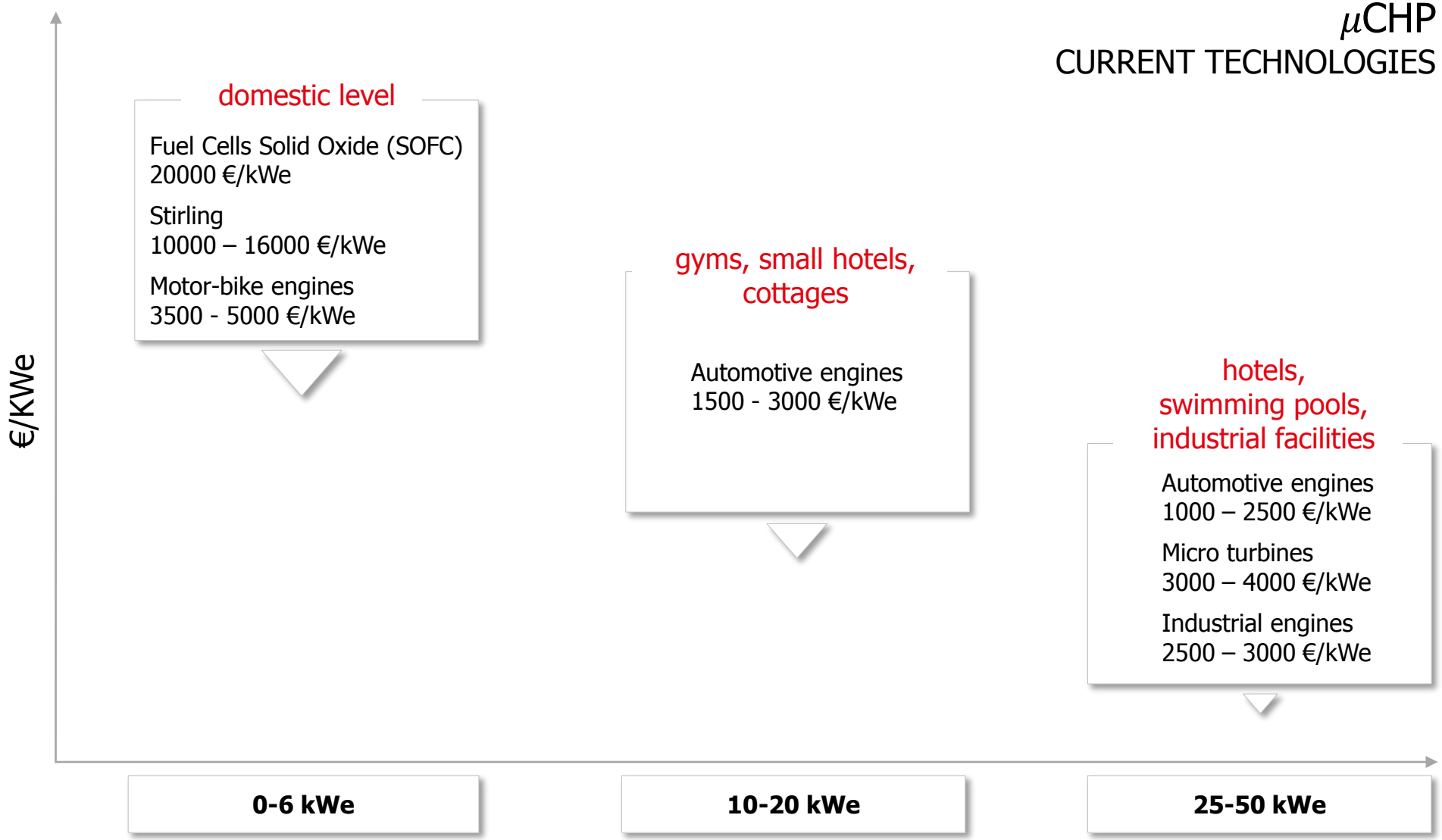
Innovative policy is crucial to enabling the emergence of those technologies that will deliver this outcome.

Micro Combined Heat and Power (μCHP), a cost-effective and flexible low carbon solution that generates heat and electricity on-site, can support the transformation of the energy system and the achievement of relevant policy objectives, including environmental ones.

Widespread μCHP deployment can transfer a significant part of electricity generation at local level, creating significant benefits for the energy system and for consumers.”

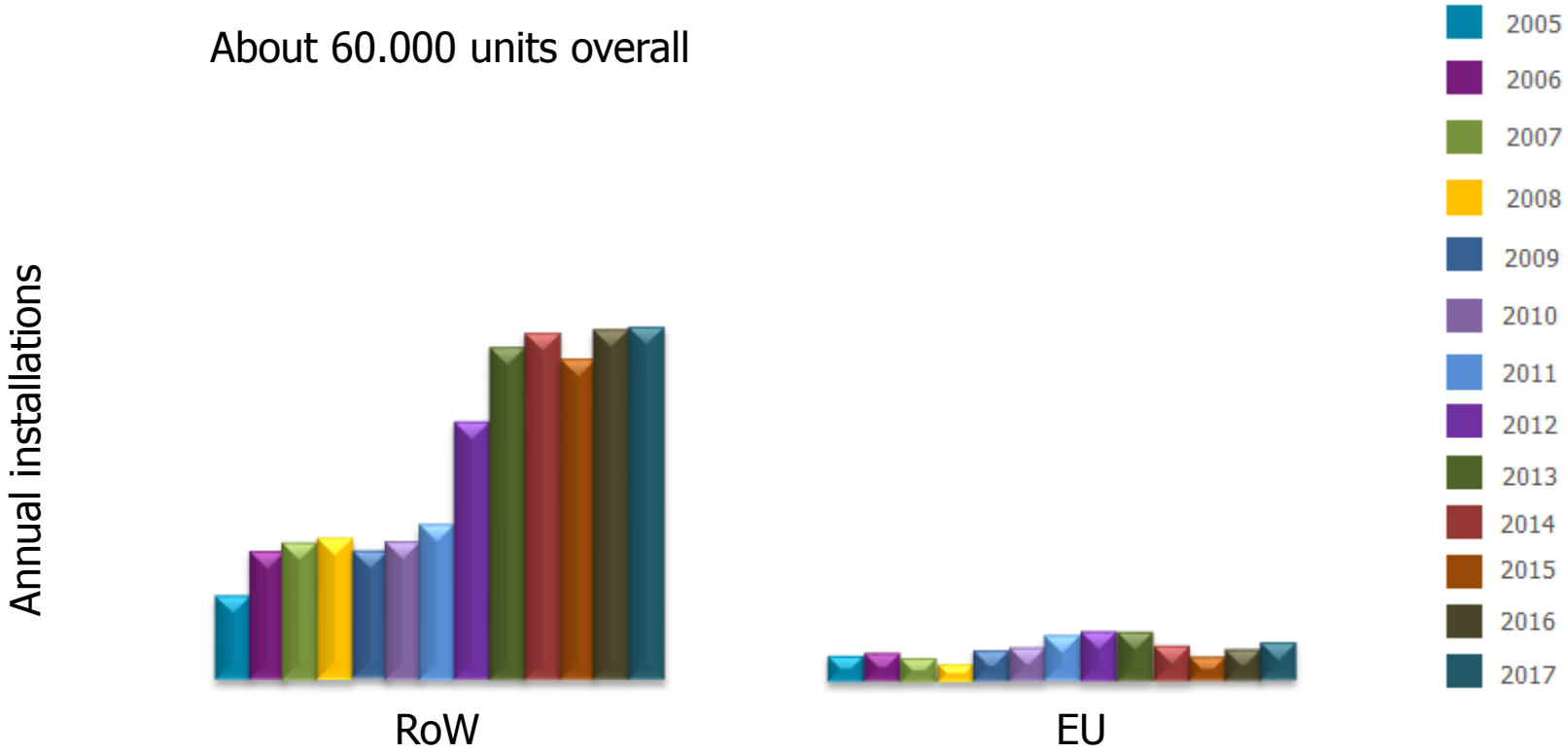
Supporting widespread uptake to achieve energy policy objectives
Ecuity Consulting LLP – March 2013

μCHP
CURRENT TECHNOLOGIES

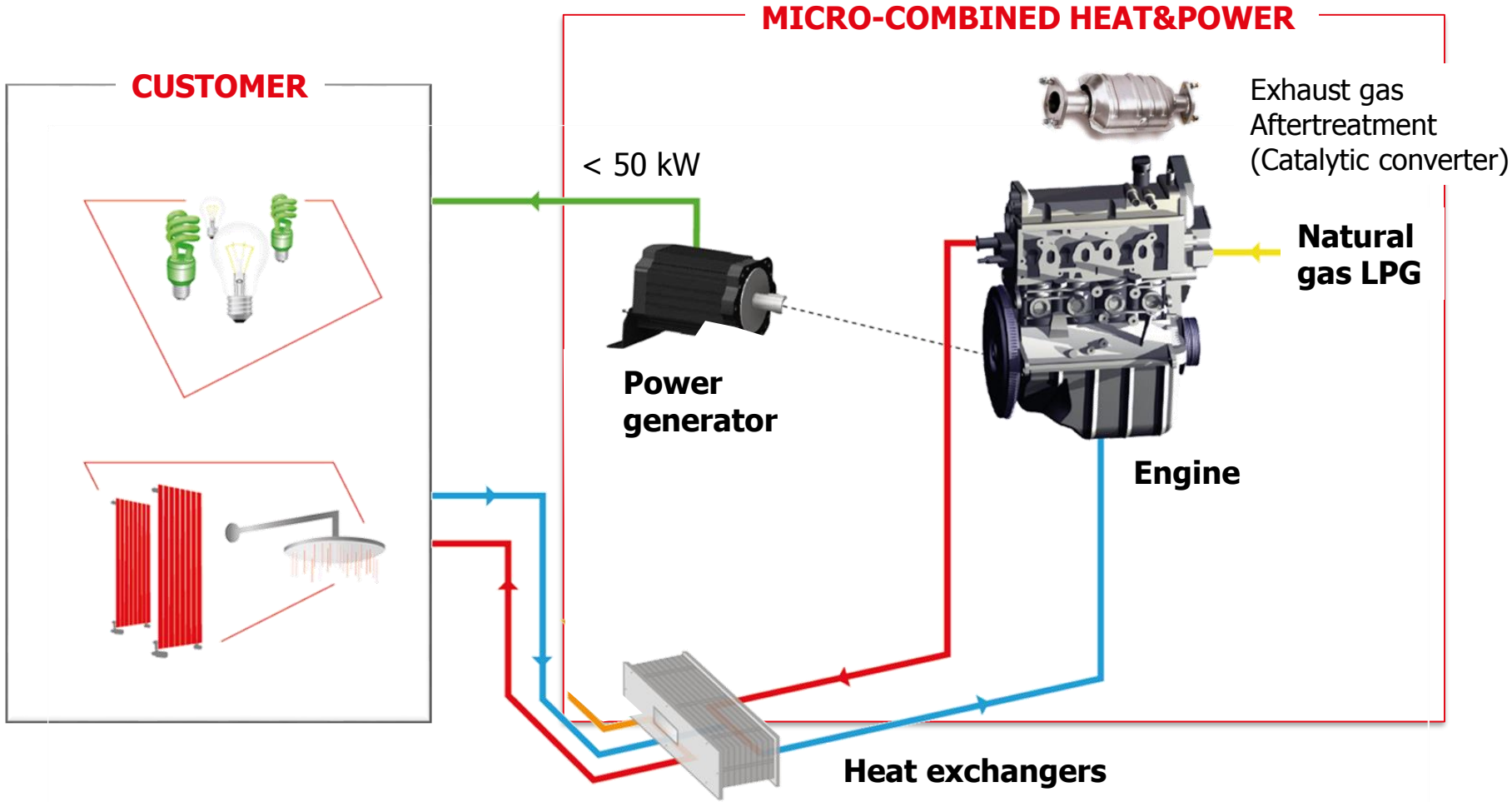


μCHP
IN THE WORLD

About 60.000 units overall



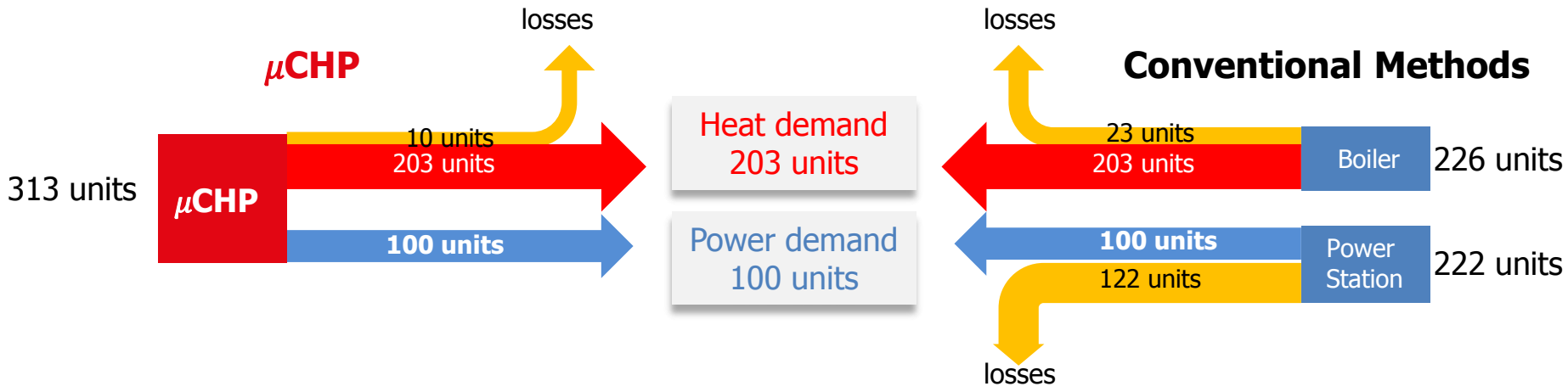
μCHP BASED ON INTERNAL COMBUSTION ENGINES



μCHP
ENERGY SAVINGS

μCHP brings savings as the primary energy used is less than that required for the separate production of heat and power

Energy to produce 100 units electrical power demand



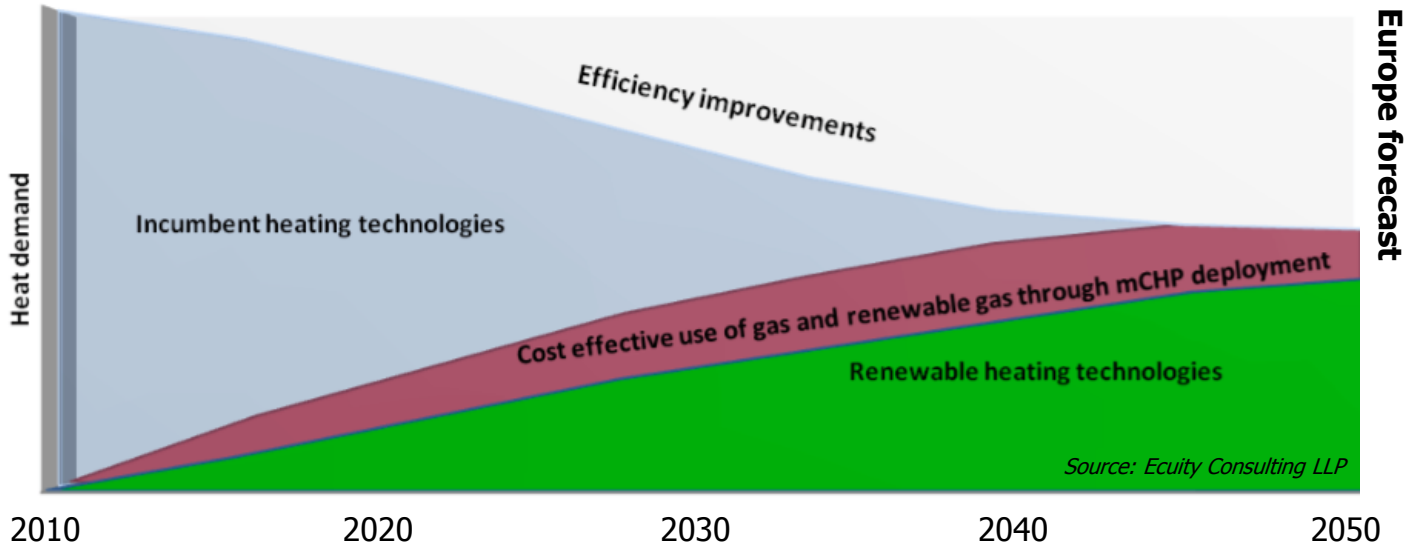
313 units of fuel input
303 units of delivered energy

30% saving

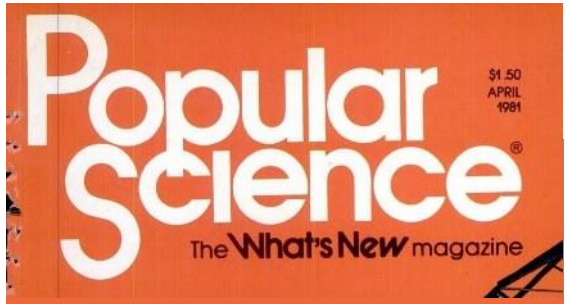
448 units of fuel input
303 units of delivered energy

μCHP AND BIOMETHANE

- Engine-based μCHP are flexible in terms of fuel type utilisation.
- Therefore, renewable gases like biomethane should be considered as the eventual fuel of preference for μCHP.
- Renewable gas fuelled μCHP would allow the technology to become part of the portfolio of renewable solutions to attain full decarbonisation of power and heating.



TOTEM
THE BEGINNING (1981)



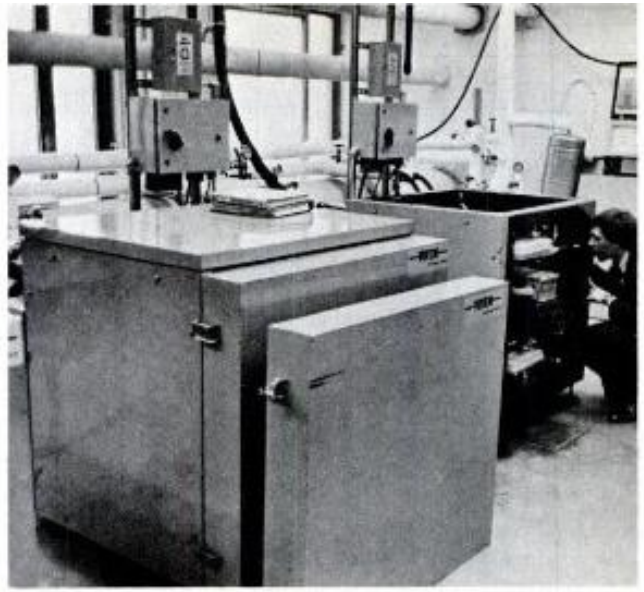
«...Now a small co-generation unit, developed and marketed by Fiat in Europe and called TOTAL Energy Module, or TOTEM, is available in the U.S. Through Brooklyn Union Gas Co. In New York City...»

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.

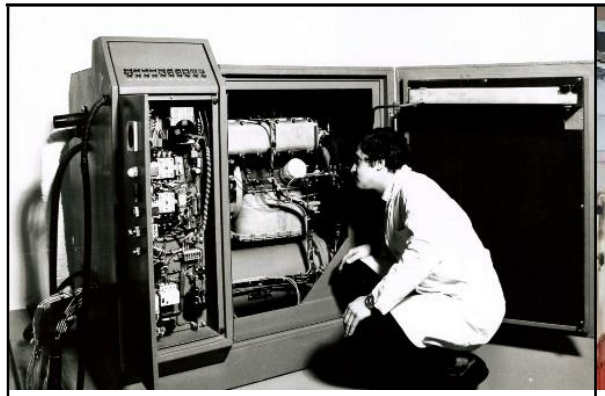
Totem generates 131,000 Btu/hr. That's enough heat to supply hot water for 16 apartments or heat four medium-size apartments.

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*

40+ YEARS OF HISTORY

1977



Research and Development Center of Fiat designs the TOTEM, first microcogenerator in the world.

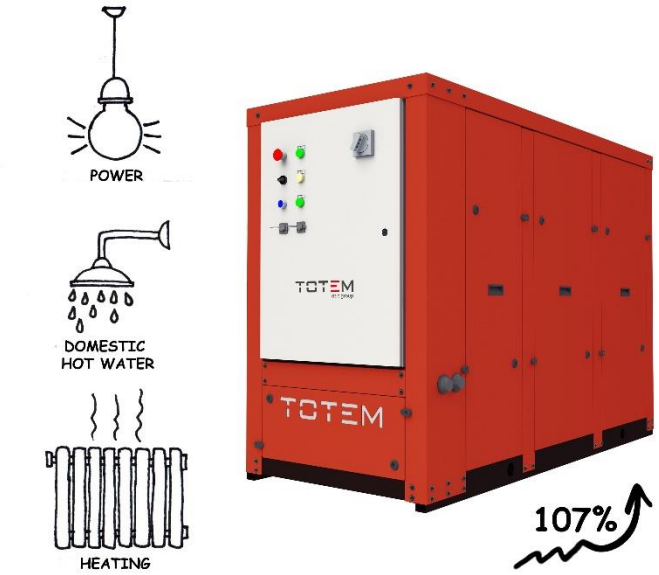
2015

Asja Group has developed TOTEM 2.0.

2019

TOTEM 2.0 is currently on the Market in Europe and North America

TOTEM MICROCOGENERATOR
HEAT, POWER, EFFICIENCY



TOTEM microcogenerator

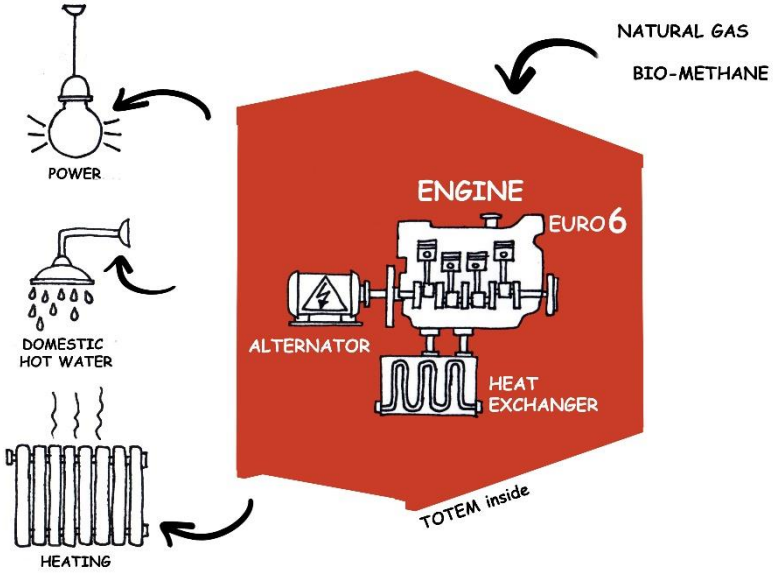
Innovative, 100% Italian, the evolution of the first microcogenerator in the world designed by Fiat Research and Development Center in 1977. TOTEM can be considered as a «boiler» that produces power in addition to the heat without harming the environment.

Efficiency 107%

TOTEM has an efficiency of 97% that increases up to 107% when it operates in condensing mode[1].

[1] heat recovery due to the condensation of water vapor in the exhaust gases

ADVANCED TECHNOLOGY



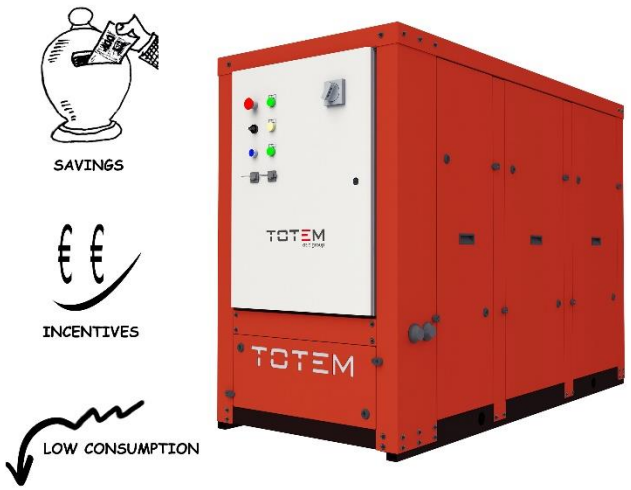
How it works

The TOTEM brain is its Operating System that, thanks to the application of IoT technology, allows to manage every single unit remotely and also to enable cluster operation.

The TOTEM heart is a natural gas engine of FIAT 500 coupled with the alternator for power production.

Thanks to an efficient system utilizing a heat exchanger, the engine exhaust heat is totally recovered and provided to the customer.

TOTEM, WHY IT IS CONVENIENT



Savings

Allows savings up to 20% on the primary energy use[1] and financial savings up to 40% on the previous energy bills.

Incentives

Entitled to 65% of Ecobonus and White Certificates[2].

Low consumption

Extremely low consumption allows the client to repay it in 2 years or even less.

[1] compared to the equivalent weighted average consumption in Italy for the production of power and heat
[2] applies to an Italian market

TOTEM
FEATURES

MODEL		TOTEM 10	TOTEM 20	TOTEM 25
Rated electric power	kW	10	20	25
Rated thermal power	kW	21,6 (25,2*)	41,9 (48,5*)	50,2 (57,6*)
Electrical efficiency	%	29,6	31,2	32,5
Total efficiency	%	93,6 (104,3*)	96,5 (106,8*)	97,8 (107,4*)
Engine		Fiat Fire 1400 cc		
Engine Control Unit		Magneti Marelli		
Fuel		methane, biomethane		
Fuel consumption (CH_4)	Nm^3/h	3,31	6,28	7,54
Emissions (NOx)@ 5%O_2	mg/Nm^3	≤ 10		
Emissions (CO) @ 5% O_2	mg/Nm^3	≤ 10		

Fiat Chrysler Automobiles engines and Magneti Marelli technologies

Multi fuel

Methane, biomethane

Reliable

with high level of efficiency over time

Short payback

2 - 4 years due to savings on energy bills (heat and power)

Indoor / outdoor

installation inside and outside

Operation

single and cascade operation

THE BEST RELATIONSHIP BETWEEN ENERGY PRODUCED AND EMISSIONS

NOx Emissions

Average of the boilers installed nationwide[1]

230 mg/Nm³

Limits for boilers in the Region of Lombardia[2]

178 mg/Nm³

Boilers Class 5 (lowest emissions)

≤ 61 mg/Nm³

TOTEM[3]

≤ 7 mg/Nm³

The TOTEM is the most efficient microcogenerator with the lowest emissions into the atmosphere thanks to the stoichiometric control of the carburation and to an efficient catalyst.

NOx emissions (nitrogen oxides) of TOTEM are:

- 25 times lower than the set limits established for boilers in the region of Lombardia, that are the stringent at national level
- 9 times lower than the boilers with the lowest emissions (class 5)

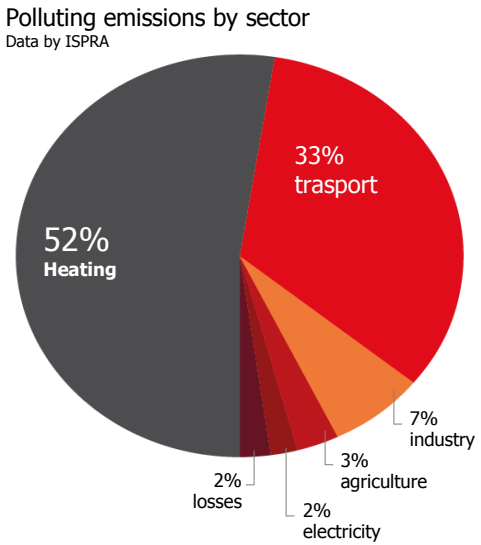
NOx is one of the most dangerous atmospheric pollutants for human health because they are the precursors to form other harmful substances (mainly PM).

[1] data from the ISPRA report 262/2017
[2] limits in Lombardia region for "Rehabilitation zones"
[3] quota attributed to the thermal energy; total emissions: ≤ 10 mg/Nm³

AIR POLLUTION
THE MAJOR CONTRIBUTOR IS HEATING

Heating

is responsible for more than half of the primary harmful emissions into the atmosphere



Harmful emissions

cause almost 80,000 deaths per year in Italy.
(16,4% of the total)

13 times more
vs victims of asbestos disease

25 times more
vs road accidents victims

57 times more
vs work-related victims

Solution

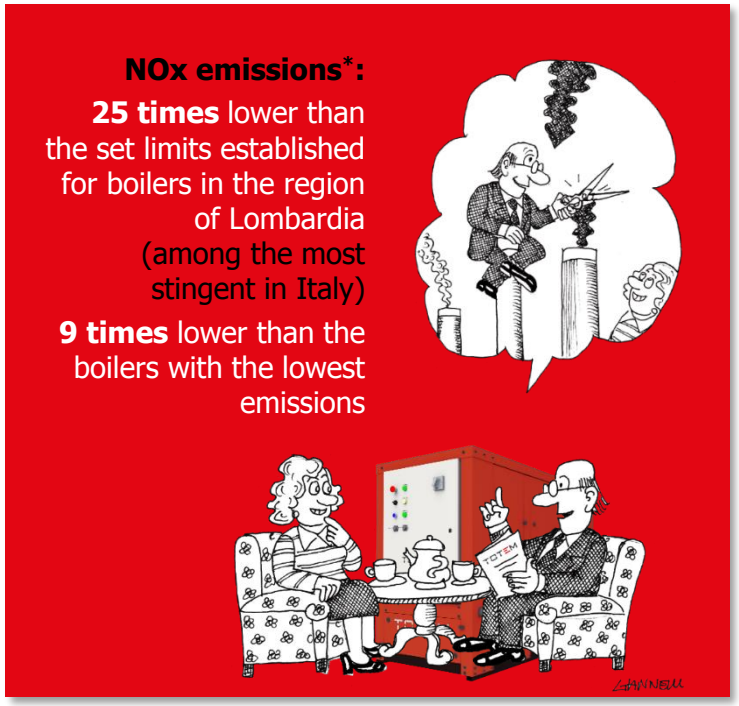
if the entire residential heat demand was produced by TOTEMs, every year it is expected…

30.000 less
deaths due to air pollution

7.500 ton less
of fine dust into the atmosphere

TOTEM is the most efficient and environmentally friendly solution to produce heat without harming the environment.

TOTEM MICROCOGENERATOR
AN ENVIRONMENTALLY FRIENDLY TECHNOLOGY



Microcogenerators can replace boilers in all cases where there is demand for electricity and heat (residential, tourist accommodations, wellness centers, healthcare, schools, public buildings, small/medium industry, Distribution,….).

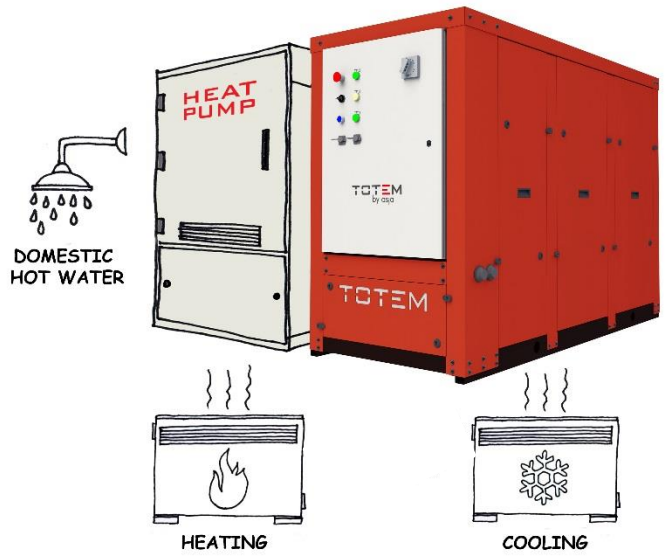
If you cover the residential heat requirement (with exception of the single-family building) with TOTEM microcogenerators**,** in Italy, according to the Althesys study, 30,000 premature deaths per year due to atmospheric pollution would be avoided.

* NOx is one of the most dangerous atmospheric pollutants for human health because they are the precursors to form other harmful substances (mainly PM).

INTEGRATION OF THE μCHP WITH THE HEAT PUMP

- The change in the Building Regulations by the end of the decade that will require any replacement of heating system to achieve a carbon reduction improvement vs. condensing boilers has the potential to establish a vibrant low carbon heating market.
- Such change would generate a level playing field for low carbon heating products, including μCHP.
- The power generated by the μCHP can be used by a Heat Pump to produce additional heat or to operate as a chiller.
- The combination of μCHP + Heat Pump can serve as a simple means of readily upgrading the existing stock of residential gas boilers and can integrate with legacy high-temperature heating systems (e.g. radiators, pumps).

TOTEM
INTEGRATION WITH HEAT PUMPS



Heat & cool at the best efficiency

TOTEM is also equipped with a control system that allows the integration with heat pumps.

The power generated by TOTEM can be used by a heat pump to produce additional heat or to operate as a chiller, taking benefit of the natural gas low cost as well as the heat pumps high efficiency.

As a result, this system is extremely advantageous from the economic point of view compared to the use of «stand alone» electric heat pump.

TOWARDS ENERGY 4D

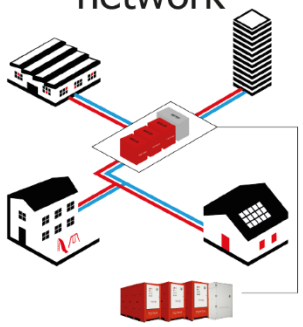
services for the
final clients

TOTEM
micro-cogenerator

FULL-THERMAL
TOTEM integrated with
Renewable Energy Sources
(heat pump or PV)

Distributed and
Decarbonized generation
power and/or heat at high
efficiency and with low emissions

services for the
network

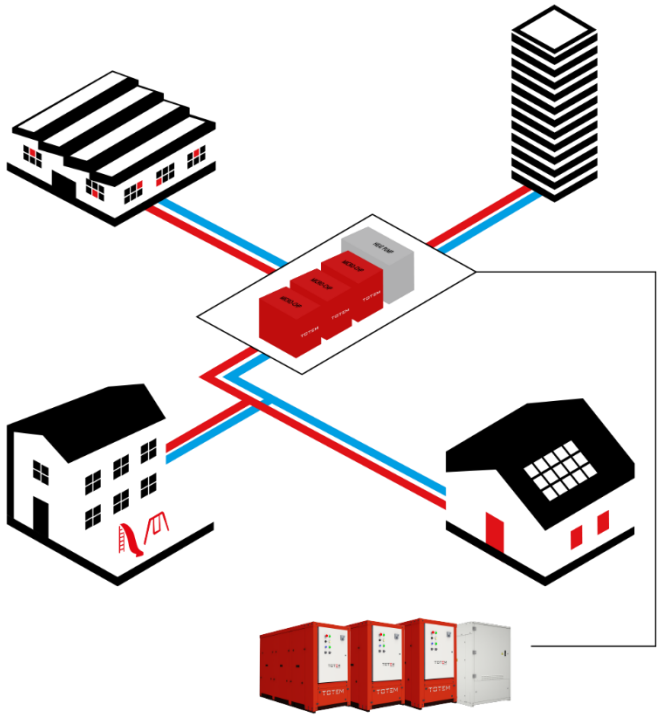


TOTEM DISTRICT
integrated management
of energy platforms
thanks to the Smart
Operating System

District heating & cooling

Digitized smart grid
to optimize and balance the power grid

TOTEM DISTRICT



TOTEM clusters distributed over the territory make energy platform efficient, flexible and with low emissions.

District heating & cooling

To meet local users' thermal needs (heating and cooling) by creating forms of «smart» district heating at the urban district level.

Digitized smart grid

To meet local power requirements by increasing the flexibility of renewable energy plants and optimizing the operation of the power grid through the access to the Dispatching Services Market (MSD).

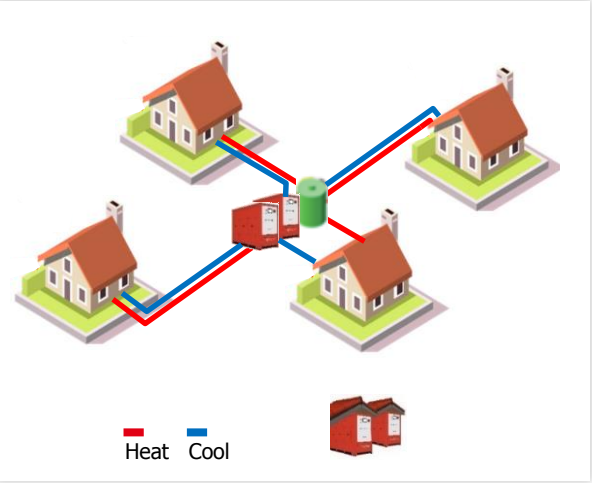
Thanks to the intelligent TOTEM Operation System that makes energy platforms flexible and helps to control it quickly.

TOTEM DISTRICT
HEATING AND COOLING

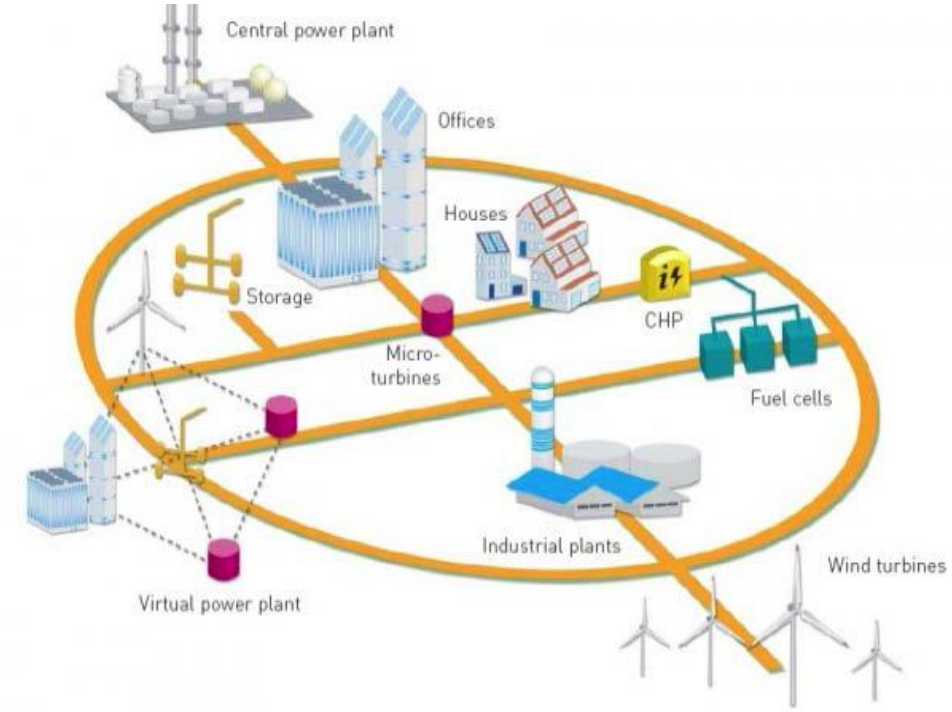
Distributed TOTEM, also in combination with heat pumps, can jointly make District Energy Generation for urban environments that would have advantages over the centralized electricity and heat generation.

TOTEM "clusters" can meet with flexibility the distributed customer demand of heat, cooling and power with the following advantages:

- reduced investments compared with centralized heating by having energy supply locally;
- cutting transmission cost for power as well as heat;
- applicability even for small residential buildings;
- production of cooling (and/or electrical) energy;
- harmful emissions lower than modern boilers and 20% less CO_2 over centralized electricity generation;
- maximum reliability and continuity in energy supply due to modularity.

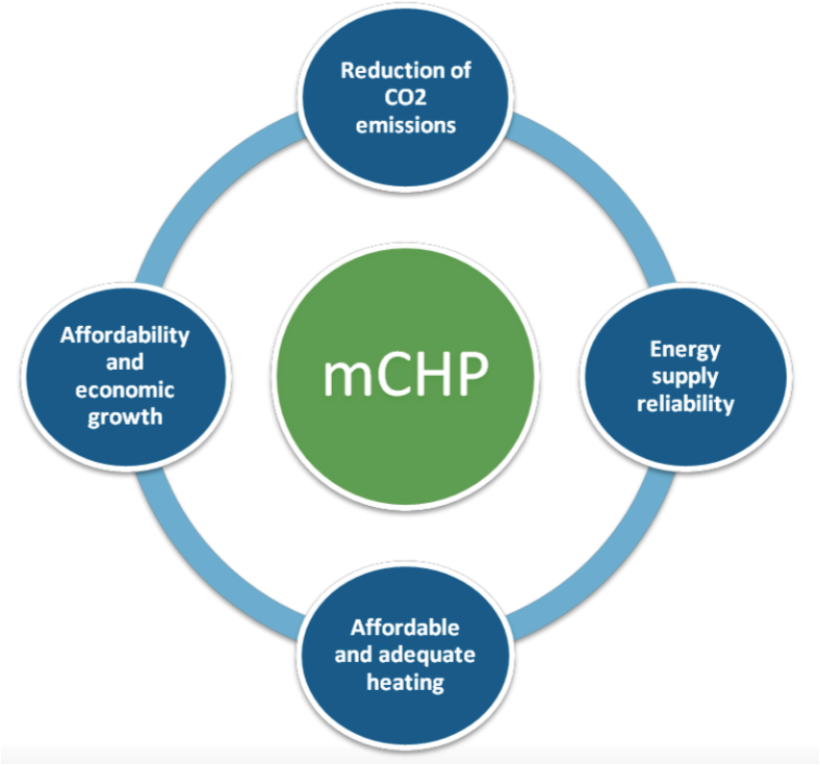


μCHP SMART GRID INTEGRATION



With the deployment of smart meters and the smart grid coupled with improvements in energy storage, μCHP flexibility would generate innovative possibilities to incorporate the demand side more actively in power system operation (prosumers) with considerable benefits.

μCHP
BENEFITS FOR THE ELECTRICAL SYSTEM AND FOR THE COUNTRY



- Benefits for the balance of payments and decreased dependence on import of fossil fuels
- Reduced CO_2 and NOx emissions (reduced dead and health costs)
- Decreased occurrence of overload conditions in the transmission lines, with increased resilience of the electric grid
- Reduced transmission and distribution losses
- Encouragement of new energy providers liberalization of the energy sector

μCHP
BENEFITS FOR THE USER

- Economic benefits

  savings on energy bills
- Enabler for District Power and Heating
- Increased security in electrical supply

  (μCHP can also work in "island" mode in the event of blackouts)
- Operation in "Peak-shaving"

  to cope with high power demand for limited time periods
- Increased "Power quality"

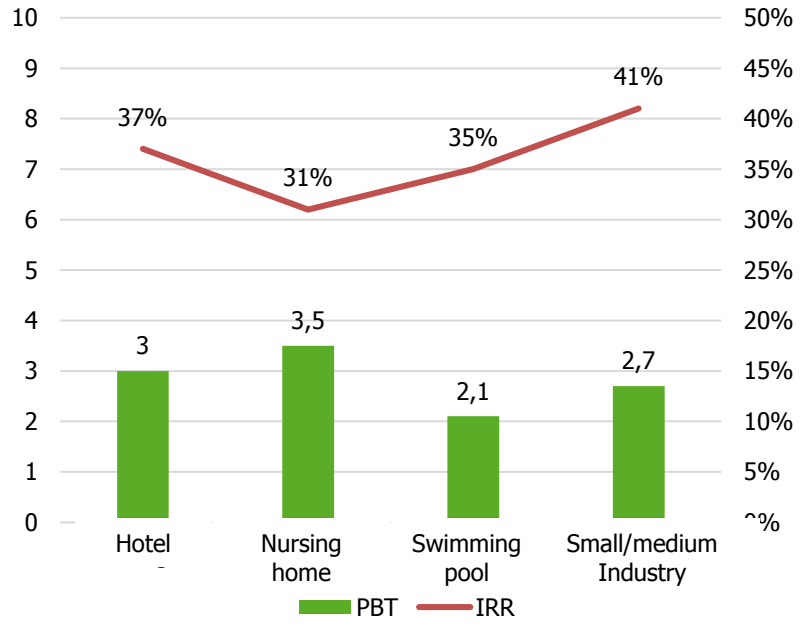
  to ensure constant voltage and frequency to safeguard production processes

μCHP
BENEFITS FOR THE ELECTRICAL SYSTEM AND FOR THE COUNTRY

- Widespread μCHP uptake could complement significant investment in centralised generation, or indeed transfer a considerable proportion of electricity generation from big centralised power stations to the local level
- About 7% of all generated electricity is lost when it is transported to consumers as a result of transmission and distribution losses. μCHP penetration would allow the efficient generation of electricity by alleviating losses of electricity
- In an environment that favours a more important role for local energy generation, μCHP is the most controllable distributed energy technology. The power output of μCHP can allow enhanced viability in local power generation as a result of its flexibility and natural fit with key renewable solutions and domestic electricity demand

MICROCOGENERATION
ECONOMIC BENEFITS

IRR e PBT resulting from installation of a microcogenerator in different structures



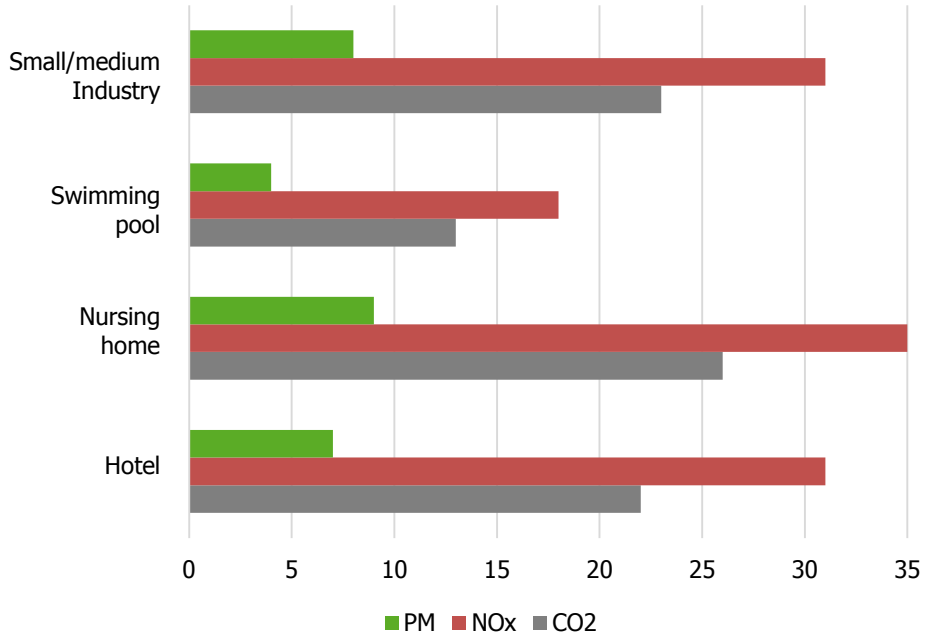
A study conducted by the *Energy & Strategy Group* of the Polytechnic University of Milan identified about 22,000 applications in Italy among hotels, nursing homes, swimming pools and Small/Medium industry that, for thermal and electrical consumption profiles, are among the optimal areas of application for the microcogeneration.

Economic analysis shows particularly interesting results in the *'energy service'* business model:

- Internal Rate of Return (IRR) higher than 30%;
- Average Pay Back Time (PBT) lower than 3 years.

MICROCOGENERATION
ENVIRONMENTAL BENEFITS

Equivalent savings in terms of annual car emissions from the operation of a microcogenerator in different structures



The Energy & Strategy Group study also calculated the environmental benefits of operating a microcogenerator in different application areas.

If microcogeneration were applied in all the structures identified by the study, it would be avoided every year:

- CO_2 emissions from 495.000 cars;
- NOx emissions from 675.000 cars;
- PM emissions from 170.000 cars.

biogas
biometano
eolico
fotovoltaico
micro cogenerazione

Micro-Combined Heat & Power Generation

Part 2 | Applications and Markets

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Managing Director
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APPLICATIONS

TOTEM users

Wellness centers
swimming pools, thermal baths, spa

Tourist accommodations
hotel, resort

Healthcare
hospitals, polyclinics, nursing homes

Residential
condominiums

Public
schools, public buildings

Agricultural sector
dairies, sausage factories

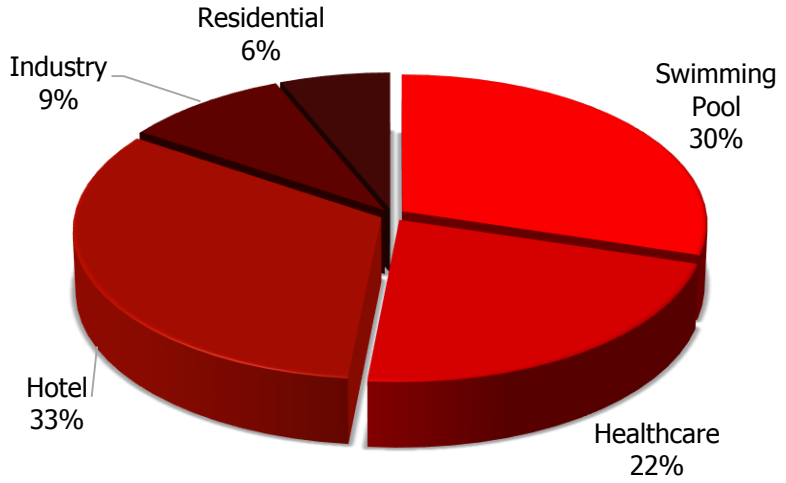
Distribution
supermarkets, outlet

Small/medium industry
production sites

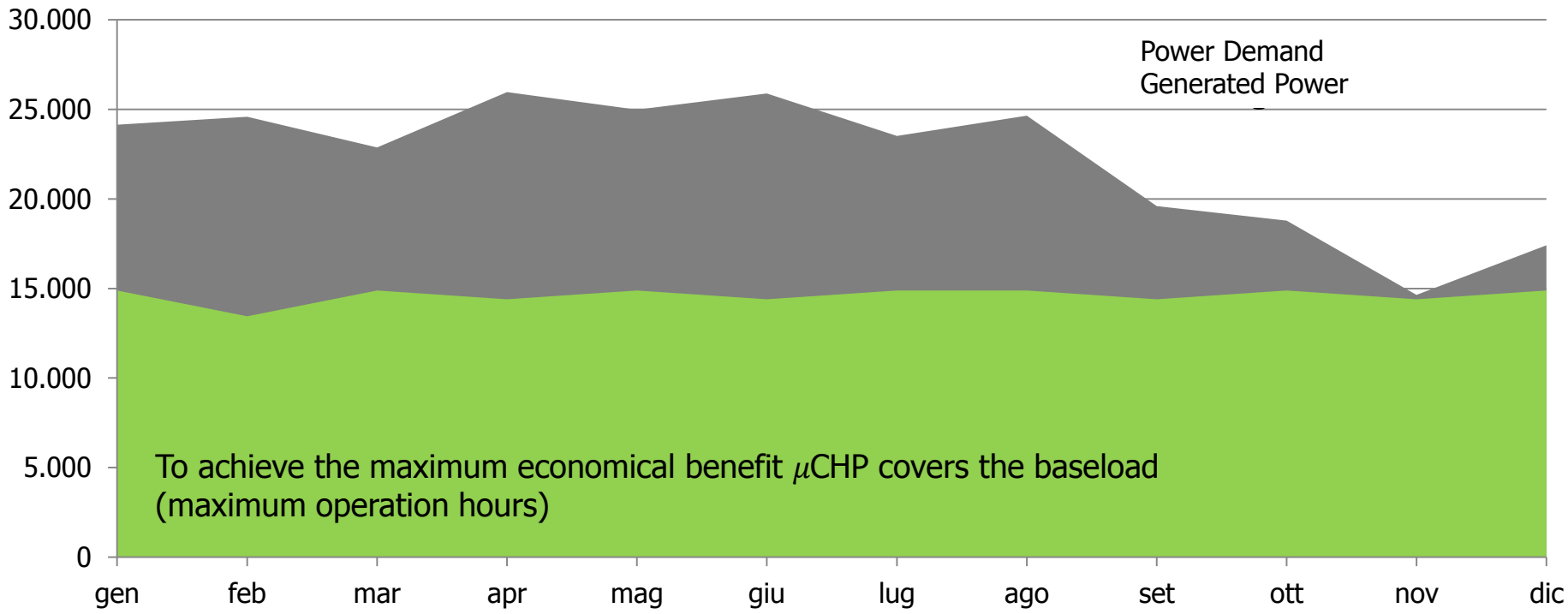
Energy districts
micro grids for district heating and power generation

Utilities

APPLICATIONS IN ITALY



μCHP POWER DEMAND COVERAGE
EXAMPLE: SWIMMING POOL



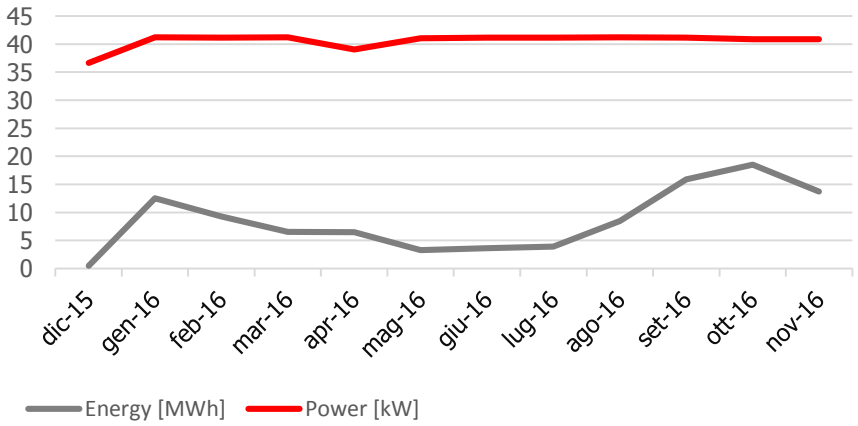
BUSINESS CASE
SWIMMING POOL | ECONOMIC BENEFITS

Cost without TOTEM	
Heat (methane)	15.684 €
Power	43.442 €
Total (A)	59.126 €
Cost with TOTEM (1 x 25 kW)	
Methane and TOTEM operation	27.253 €
Power	14.560 €
Total (B)	41.813 €
Incentives to use TOTEM	
Tax deduction (C)	4.290 €
Annual gross savings (A-B+C)	21.603 €
Cumulative gross savings in 15 years	324.045 €
Cost for TOTEM (with installation)	64.800 €
Cumulative net savings in 15 years	259.245 €
Payback (years)	3,0

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

BUSINESS CASE
HOTEL | ECONOMIC BENEFITS

Montlhly Performance

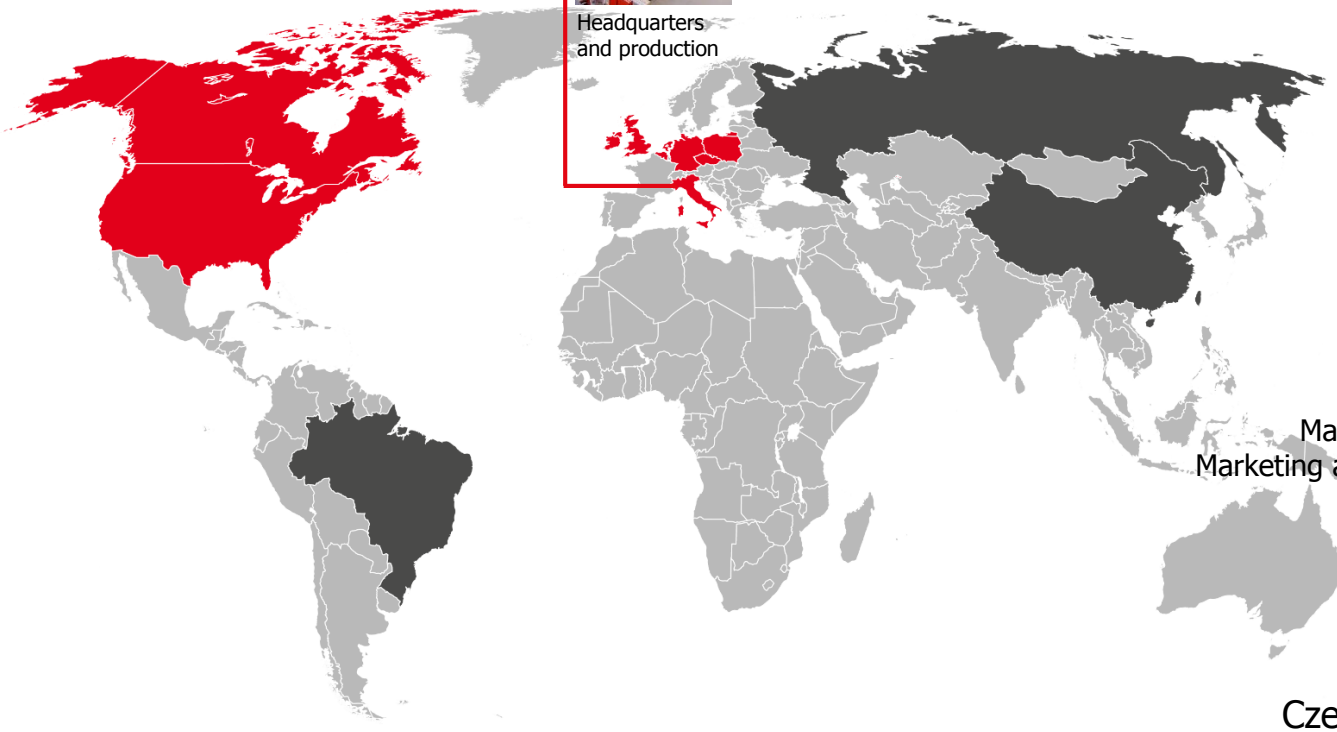


Cost without TOTEM	
Heat (methane)	66.524 €
Power	88.800 €
Total (A)	155.324 €
Cost with TOTEM (2 x 20 kW)	
Methane and TOTEM operation	87.251 €
Power	39.220 €
Total (B)	126.471 €
Incentives to use TOTEM	
Tax deduction (C)	5.963 €
Annual gross savings (A-B+C)	34.816 €
Cumulative gross savings in 15 years	522.240 €
Cost for TOTEM (with installation)	91.740 €
Cumulative net savings in 15 years	430.500 €
Payback (years)	2,6

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

TOTEM ENERGY WORLDWIDE

Headquarters
and production



Italy
Main Distribution,
Marketing and Production

UK
Distribution

Germany
Distribution

Czech Republic
Distribution

Slovenia
Distribution

Ireland
Distribution

Belgium
Distribution

Netherlands
Distribution

Luxembourg
Distribution

USA & Canada
Distribution

China
Business
Development

Brazil
Business
Development

Russia
Business
Development

biogas
biometano
eolico
fotovoltaico
micro cogenerazione

Thank you for your attention

TOTEM by asja

A SUSTAINABLE TRAINING INSTITUTION

ITC International Training Centre
Centre international de formation
Centro Internacional de Formación

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