

Energy from waste



Commercially proven energy recovery



Energy from waste - a proven solution

High energy costs and the security of energy supply are issues of growing concern. Governments are seeking to reduce the environmental impact of energy consumption. At the same time communities are required to comply with legislation designed to divert waste from landfill and are seeking to manage waste in more sustainable ways.

The small-scale, commercially proven, ENERGOS energy from waste technology provides an environmentally beneficial solution to these problems. We provide a local solution to produce low-cost heat and electricity, while outperforming the EU Emissions Standard (2000/76/EC).

Our community sized facilities convert non-recyclable, residual waste into renewable energy displacing fossil fuels.

ENERGOS, part of the ENER-G group, specialises in gasification technology. As a leading supplier of energy from waste plants, our solution offers:

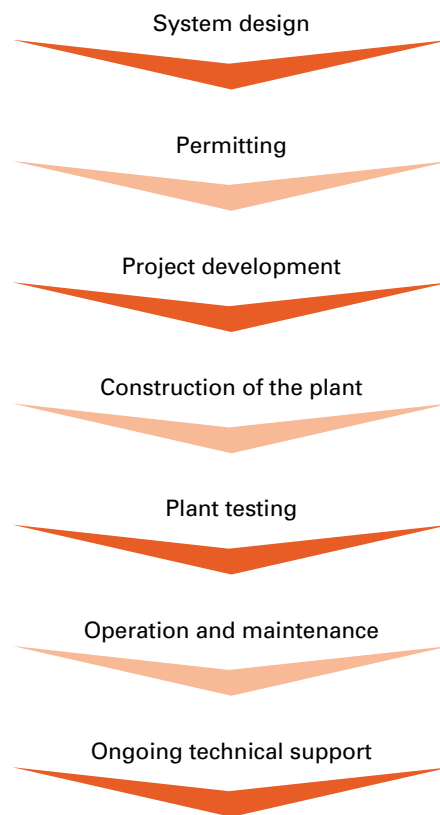
- Diversion of residual waste from landfill
- Energy recovery as heat or electricity
- Ultra-low emissions
- A local solution to a local waste problem

The ENERGOS technology is proven beyond doubt: in 2010 the 8 operating plants built since 1997 have accumulated a combined total of 400,000 hours.

The existing plants achieve outstanding environmental results, with minimal impact on the local community.

The solution facilitates flexible, expandable local waste recycling strategies helping local authorities to meet the EU landfill obligation. Local industry also benefits from a reliable, secure, and low-cost source of heat and power.

ENERGOS plant delivery includes:



State-of-the-art technology

ENERGOS technology provides a robust solution for the treatment of residual waste and its conversion to energy.

The ENERGOS thermal conversion process consists of two stages:

- Primary chamber – for gasification of the waste
- Secondary chamber – for high temperature oxidation of the syngas produced in the primary chamber

The patented gasification process and proprietary control system ensure that emissions are consistently low. Average NO_x emissions are typically 25-30% of the EU limit and no de-NO_x system is needed. In many cases total emissions from sites using the energy may decrease, improving local air quality.

A local solution minimises transport issues, thereby reducing emissions from refuse vehicles.

The modular design creates an unrivalled flexibility in the range 40,000 tpa to 200,000 tpa. Additional capacity can be added as and when it is needed so there is no costly redundant capacity.

Due to the flexible process, various waste streams can be processed, including Municipal Solid Waste (MSW), residual MSW, SRF/RDF and commercial waste. This flexibility is important as the composition of waste streams will change due to ever-improving recycling rates.

The energy recovered from the biodegradable fraction of waste allows limited exemption from CO₂ emissions under the EU Emissions Trading Scheme (EU ETS).

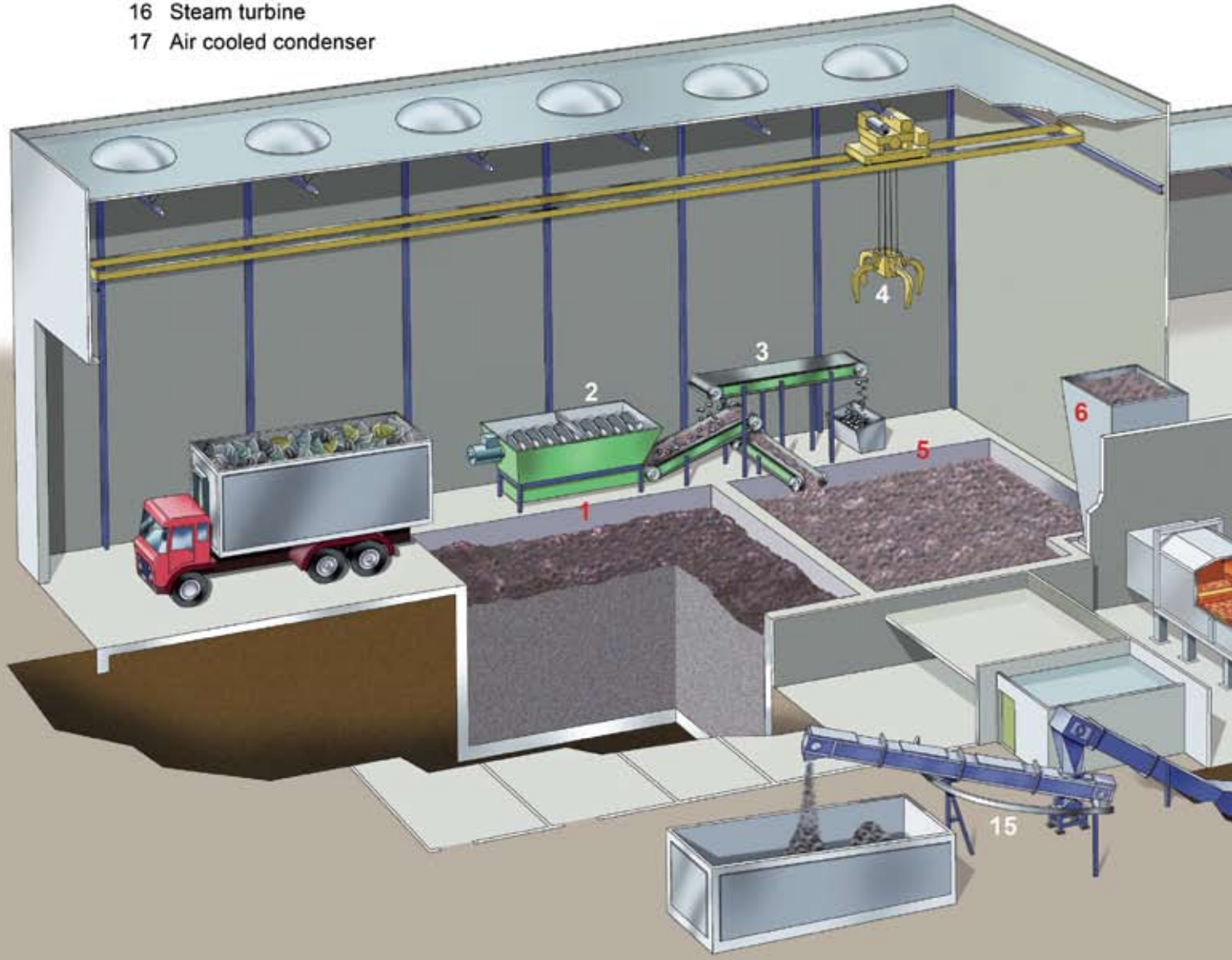
The building footprint is small and its overall height low, reducing the visual impact of the plant.

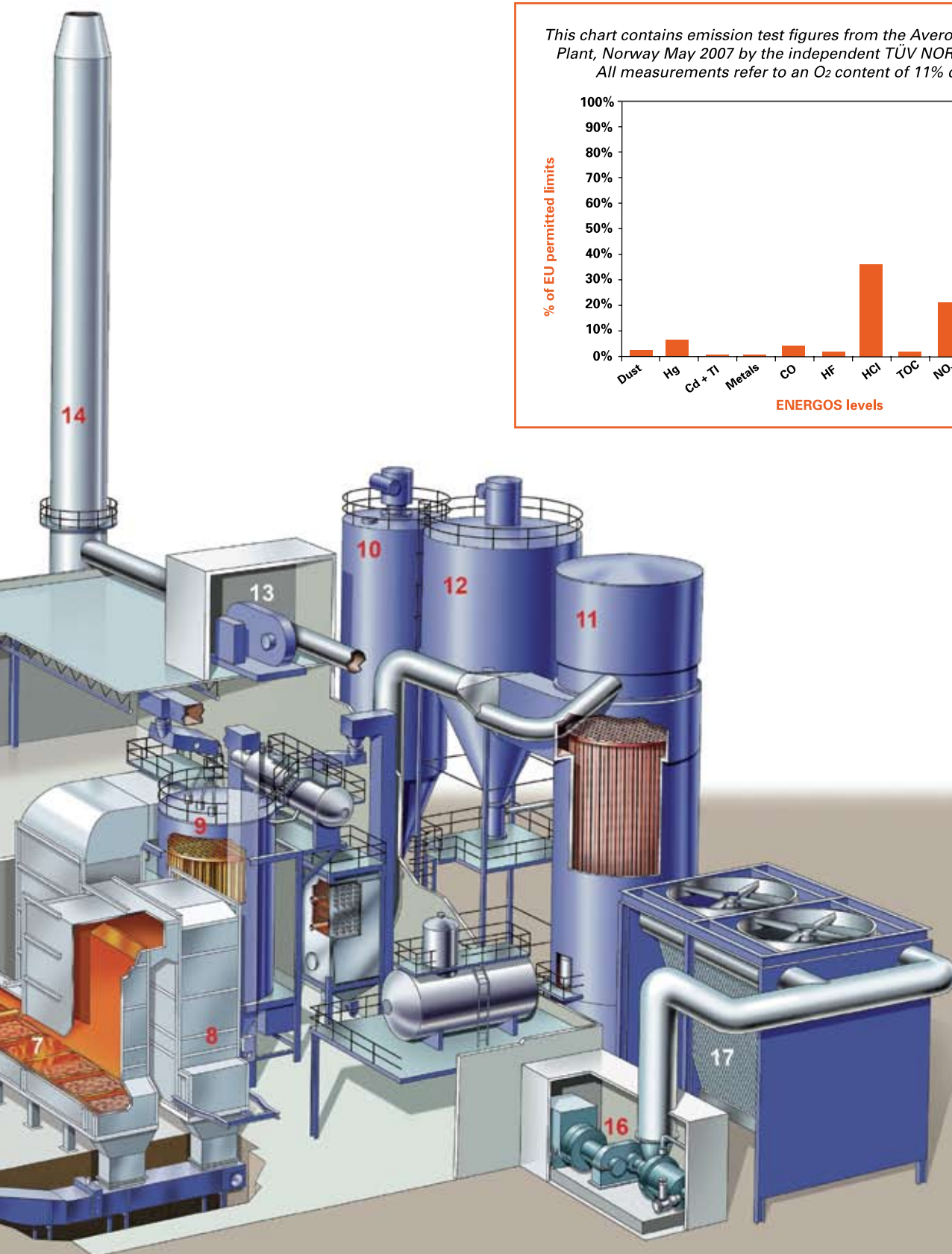
Benefits of the technology:

Environmental benefits	Operational benefits	Financial benefits
<ul style="list-style-type: none"> • Low and stable carbon monoxide (CO) and nitrogen oxide (NO_x) emissions • Average NO_x emissions are typically 25-30% of the EU limit • Very low dioxin emissions typically 1% of the EU safe limit • Low carbon content in the bottom ash. We guarantee less than 3% TOC • Independent leaching tests demonstrate that carbon leaching is only 10% of standard EFW processes • A local solution offers minimised transportation and therefore reduced emissions from refuse vehicles • In many cases total emissions from sites using the energy may decrease, improving local air quality 	<ul style="list-style-type: none"> • The ENERGOS technology is proven and by the end of 2010 the combined operating experience of the 8 plants built since 1997 will exceed 400,000 hours • The proprietary control system ensures that emissions are consistently low and stable • Low NO_x, CO and TOCs – world-leading combustion efficiency • No compromise on emissions performance in the event of plant turndown • No ammonia or urea storage or handling issues • No de-NO_x system is required 	<ul style="list-style-type: none"> • The existing plants operate successfully on a commercial basis and are helping local authorities to meet the obligation placed on them by the EU's Landfill Directive • Renewables Obligation Certificates (ROCs) are issued for the biomass fraction of the waste when the plant produces electricity, enhancing the normal income streams • Energy recovered from the biomass content is not subject to the Climate Change Levy (CCL) • The energy recovered from the biodegradable fraction of waste affords some exemption from CO₂ emissions under the EU Emissions Trading Scheme (ETS) • Low operating and maintenance costs

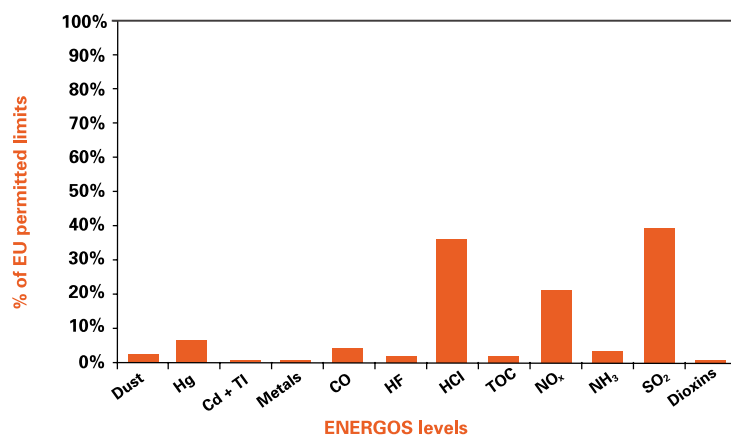
Energy from waste plant

- 1 Waste bunker
- 2 Shredder
- 3 Metal extraction conveyor
- 4 Fuel crane
- 5 Fuel bunker
- 6 Hopper
- 7 Primary chamber (Gasification)
- 8 Secondary chamber (High temperature oxidation)
- 9 Heat recovery steam generator (HRSG)
- 10 Lime and carbon silo
- 11 Bag house filter
- 12 Filter residue silo
- 13 Flue gas fan
- 14 Chimney
- 15 Bottom ash extraction
- 16 Steam turbine
- 17 Air cooled condenser





This chart contains emission test figures from the Averoy Energy Recovery Plant, Norway May 2007 by the independent TÜV NORD Umweltschutz. All measurements refer to an O₂ content of 11% dry flue gas.



Plant construction information

Environmental compliance

Consistently low emissions are achieved by the patented ENERGOS design. The thermal conversion process is strictly controlled and monitored by proprietary software. This unique system reduces the need to invest in high-cost, end of process flue gas cleaning systems making the ENERGOS technology cost-competitive, efficient and environmentally compliant.

In the UK, for example, the ENERGOS technology is classified as an Advanced Conversion Technology (ACT) and the electricity produced from the biomass fraction of the waste qualifies for Renewable Obligation Certificates (ROCs).

The proposed introduction of the Renewables Heat Incentive (RHI) will further incentivise the supply of steam and hot water to industrial processes and district heating networks.

Plant construction

“Communities will accept facilities that are sized appropriately to their requirements, and which do not import waste on a regional basis. The trend will be increasingly towards construction of units in the range of 30,000 to 80,000 tonnes per annum.”

Juniper Consultants,
Waste Management World,
January-February 2002.

The plants can be supplied on a build own operate (BOO) or Engineering, Procurement and Construction (EPC) basis.

The plant can be built to various configurations with options for high calorific value and mixed waste streams. The modularity of the design facilitates future expansion if and when it is needed without discouraging recycling.

ENERGOS delivers a complete turnkey solution with training of plant operators and support from our experienced team of engineers.

Equipment and performance guarantees are offered as standard. The construction of a standard ENERGOS plant takes approximately 21 months, depending on site condition and location.

Supporting the local economy while managing local waste

ENERGOS plants are built in modules with one or more parallel process lines meeting the requirements for energy production and waste treatment capacity. The energy value of the fuel is converted into electricity and/or heat. The heat is used locally in district heating or industrial applications. This low cost and secure source of energy directly replaces fossil fuels and can provide significant savings for local industry improving cost competitiveness.

When combined with an efficient Materials Recycling Facility (MRF) ENERGOS plants can be used as part of an overall integrated waste management strategy.

The plant can be built to various configurations to meet energy demand and the requirements for managing local residual waste, with options for high calorific value and mixed waste streams. The modular nature of the design facilitates future expansion if and when it is needed, without discouraging recycling.

	Type 41	Type 51	Type 42	Type 52
Description	Single-line	Single-line	Double-line	Double-line
Typical net calorific value (MJ/kg)	8-14	12-18	8-14	12-18
Nominal fuel throughput per line (t/hr)	5 or 6	5 or 6	5 or 6	5 or 6
Nominal thermal output (MW)	13.5	16.4	27	32.8
Approximate electrical output (MW) ^{1,2}	3.1	3.8	6.5	8.1
Building area (sq metres) ¹	1,700	1,800	2,400	2,500
Site area (sq metres) ¹	6,000	6,200	9,000	9,200

¹ Project specific

Other size combinations are also available

² Based upon steam pressure of 23 bara, steam temperature of 380°C, condensing pressure of 0.1 bara

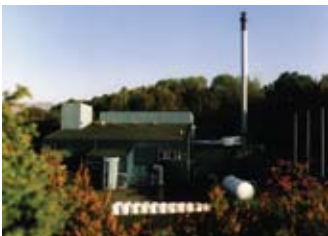
ENERGOS plants

Operational ENERGOS plants



Ranheim Plant

Location: Norway
 Commissioned: 1997
 Fuel capacity: 10,000 tonnes/year
 Energy production: 25 GWh (thermal)/year



Averøy Plant

Location: Norway
 Commissioned: 2000
 Fuel capacity: 30,000 tonnes/year
 Energy production: 69 GWh (thermal)/year



Hurum Plant

Location: Norway
 Commissioned: 2001
 Fuel capacity: 39,000 tonnes/year
 Energy production: 105 GWh (thermal)/year



Minden Plant

Location: Germany
 Commissioned: 2001
 Fuel capacity: 39,000 tonnes/year
 Energy production: 105 GWh (thermal)/year

Operational ENERGOS plants



Forus Plant

Location: Norway
 Commissioned: 2002
 Fuel capacity: 39,000 tonnes/year
 Energy production: 105 GWh (thermal)/year



Sarpsborg1 Plant

Location: Norway
 Commissioned: 2002
 Fuel capacity: 78,000 tonnes/year
 Energy production: 210 GWh (thermal)/year



Isle of Wight Plant

Location: United Kingdom
 Commissioned: January 2009
 Fuel capacity: 30,000 tonnes/year
 Energy production: (electrical) 1.8MW



Sarpsborg 2 Plant

Location: Norway
 Commissioned 2010
 Fuel capacity: 78,000 tonnes/year
 Energy production: 256 GWh (thermal)/year

ENERGOS plants under development



Irvine Plant

Fuel capacity: 78,000 tonnes/year



Knowsley Plant

Fuel capacity: 78,000 tonnes/year



Newport Plant

Fuel capacity: 120,000 tonnes/year



Doncaster Plant

Fuel capacity: 120,000 tonnes/year



Barry Plant

Fuel capacity: 80,000 tonnes/year



Bradford Plant

Fuel capacity: 160,000 tonnes/year

ABOUT ENER-G

ENER-G provides customers with a variety of technologies ranging from the generation of energy to the management of energy use, delivering sustainable energy solutions and technologies on a business-to-business basis worldwide.

Established in Salford, Greater Manchester in the 1980s, the company offers a 'one-stop-shop' for all commercial and industrial energy requirements, from the efficient generation of energy to the equally efficient control of consumption. The company has partners across the globe.

Our solutions include combined heat and power (CHP), biogas utilisation, heat pump technologies, efficient lighting, controls, metering and data solutions and energy from waste. This is accompanied by our wide range of energy and water consultancy and procurement services.

ENER-G is 100% dedicated to the development of its products and markets, and over the years has seen rapid growth, both organically and through acquisition to achieve a strong global presence within the energy industry. Currently ENER-G operates in the UK, the Netherlands, Norway, Poland, Hungary, Lithuania, Spain, Italy, Romania, Mexico and South Africa.



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