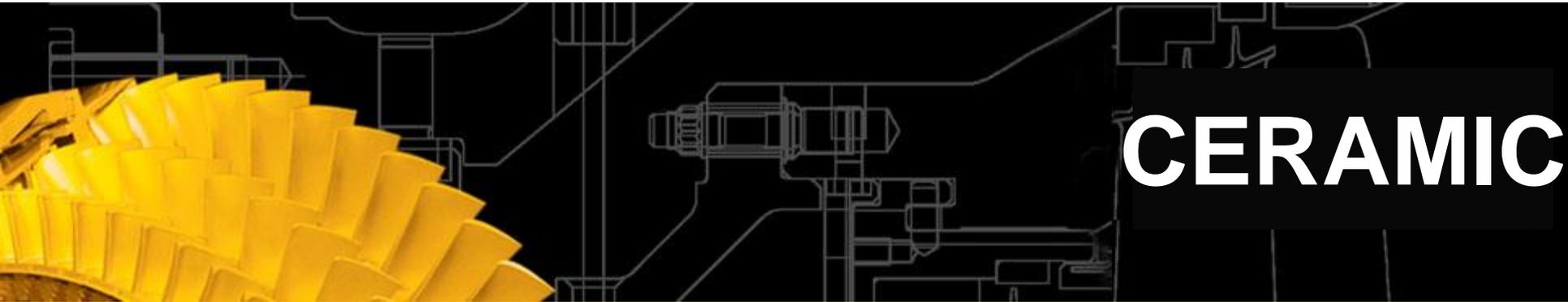


# Essiccazione diretta con Turbine a Gas



**CERAMIC**

**Convegno Tecnico Acimac**

**"Efficienza energetica in ceramica"**

E.Rigamonti

Baggiovara, Martedì 23 Febbraio 2016

**Solar Turbines** **Turbomach**  
*A Caterpillar Company* *A Caterpillar Company*

# Ceramic tiles production is constantly increasing worldwide

**>10 billion**

\$ sales worldwide in 2014

**+ 30%**

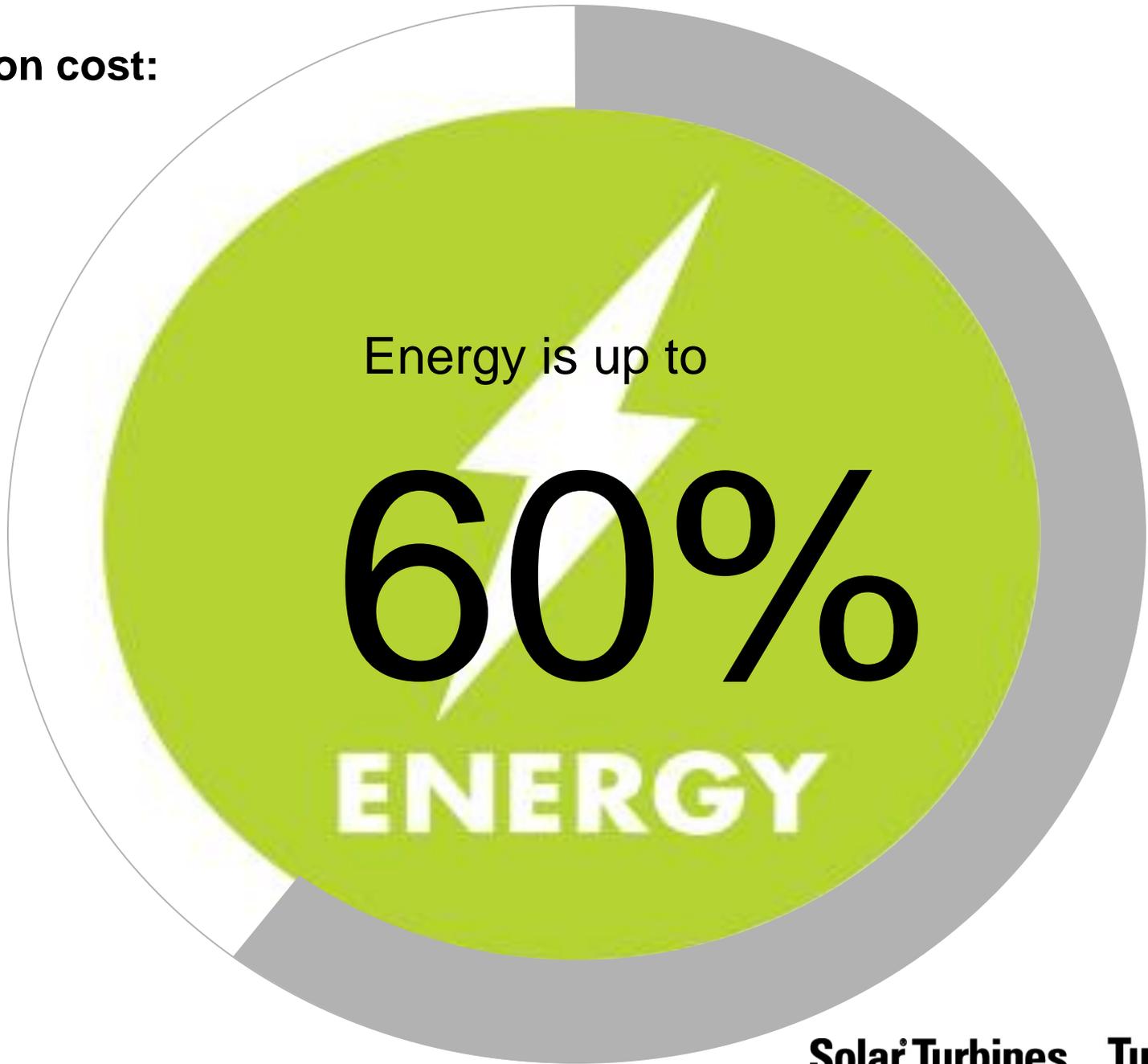
Production increase 2010-2014

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2014 Sq.m tiles Production worldwide

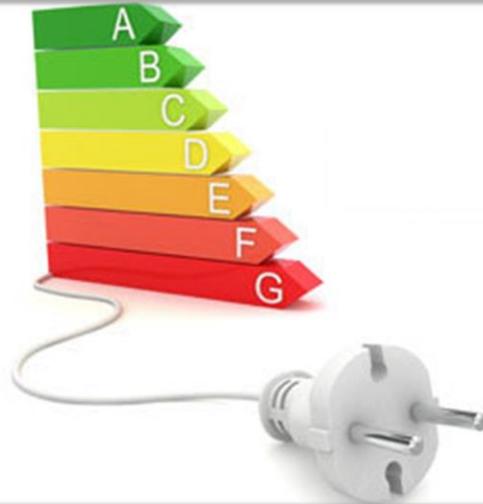
**12,409,000,000**

**Production cost:**



# Co-generation

Save energy while producing  
heat and electricity  
simultaneously



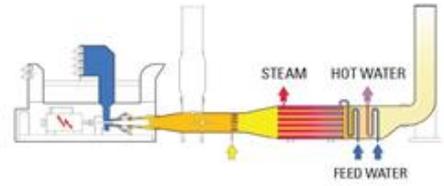
# COGENERATION SOLUTIONS WITH GAS TURBINES

## SOLUTIONS

**DIAGRAM 1 – STEAM AND HOT WATER GENERATION**

- Pulp and Paper
- Food & Beverage
- Chemical & Fertilizer
- Pharmaceutical Industry
- Textile Industry
- District Heating

**1 POWER, STEAM AND HOT WATER GENERATION**



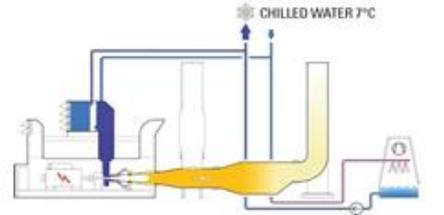
**4 POWER GENERATION AND TISSUE DRYING**



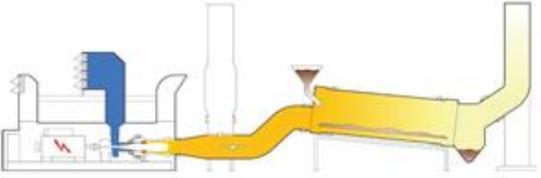
**DIAGRAM 2 – DISTRICT COOLING**

- Air conditioning for Service Centers and Residential & Commercial Complexes
- Turbine air inlet chilling, to improve performance at high ambient temperatures

**2 POWER GENERATION AND DISTRICT COOLING**



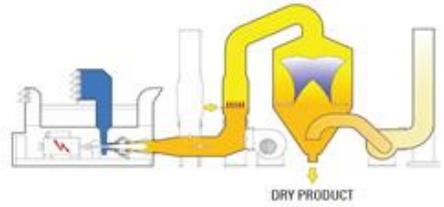
**5 POWER GENERATION AND DRYING OF BIO-MASS**



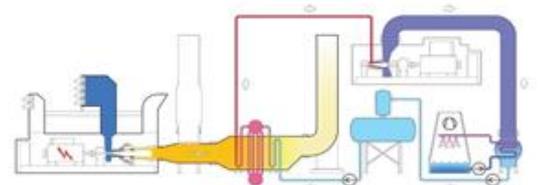
**DIAGRAM 3, 4 AND 5 – DRYING APPLICATIONS**

- Ceramic Industry
- Tissue Mill
- Bio-Mass

**3 POWER GENERATION AND CERAMIC POWDER DRYING**



**6 POWER GENERATION**

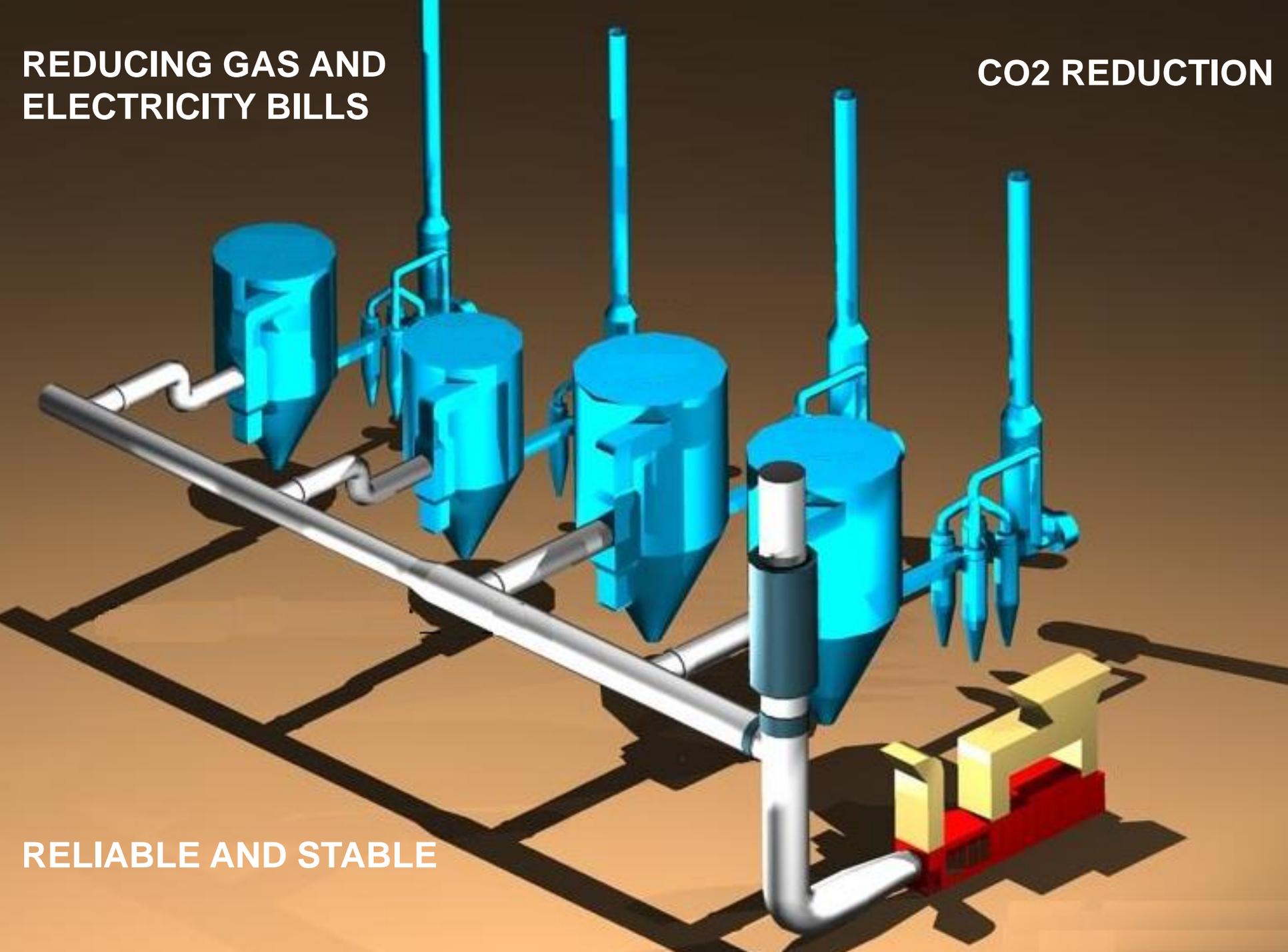


**DIAGRAM 6 – POWER GENERATION**

- Utilities
- Municipality
- IPP & MPP

**REDUCING GAS AND  
ELECTRICITY BILLS**

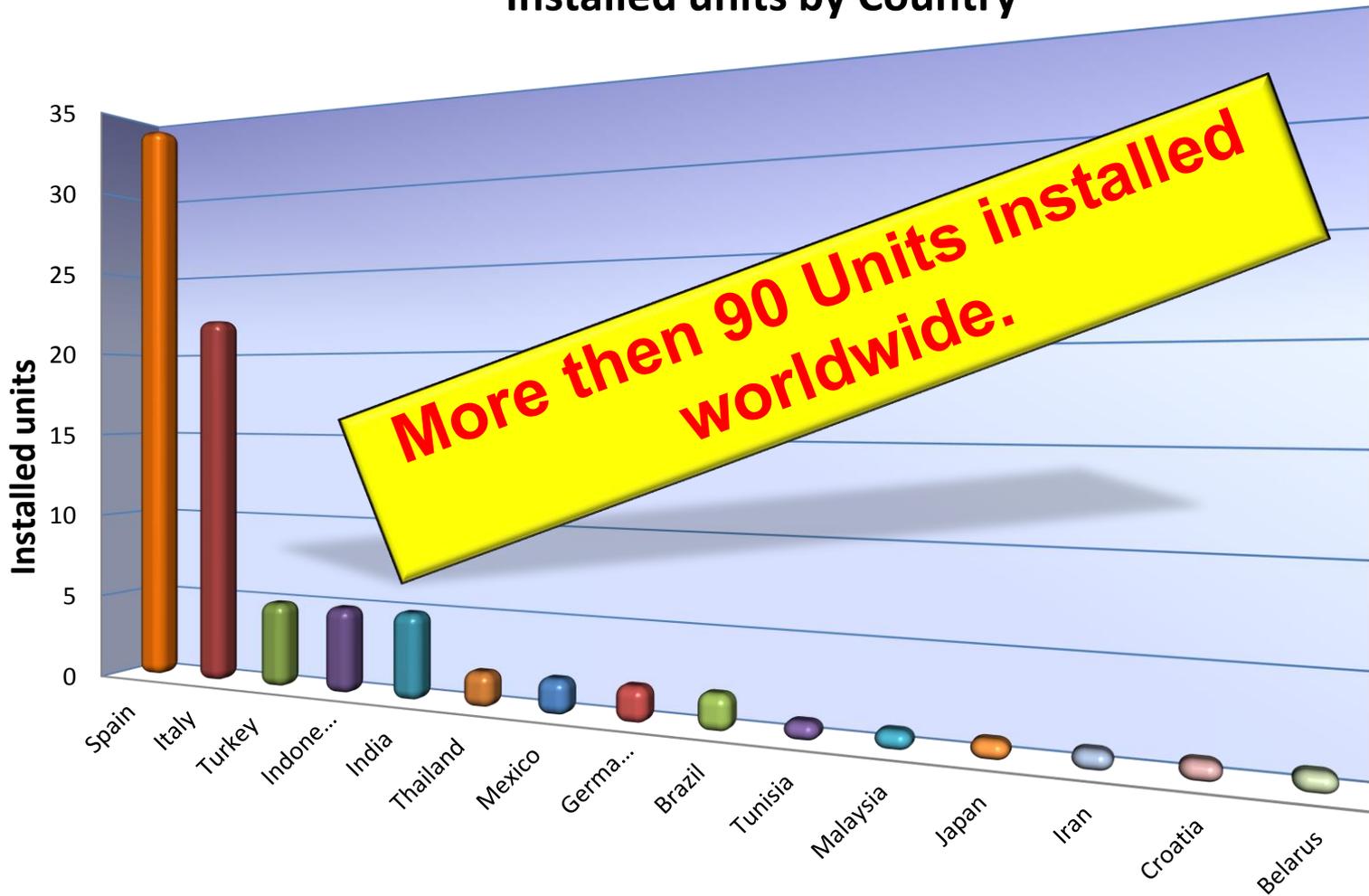
**CO2 REDUCTION**



**RELIABLE AND STABLE**

# EXPERIENCE IN CERAMICS MARKET

## Installed units by Country





**Solar Turbines**  
A Caterpillar Company

**Turbomach**  
A Caterpillar Company

**WIDE RANGE OF GASEOUS AND LIQUID FUELS  
FOR POWER GENERATION AND OIL AND GAS APPLICATIONS  
WITH RELIABLE AND QUALITY 24/7 OEM LIFE-CYCLE SUPPORT**



**WIDE RANGE OF GASEOUS AND LIQUID FUELS  
FOR POWER GENERATION AND OIL AND GAS APPLICATIONS  
WITH RELIABLE AND QUALITY 24/7 OEM LIFE-CYCLE SUPPORT**

**NORTH AMERICA**  
3.5 GW

**EUROPE**  
3.8 GW

**ASIA**  
5.1 GW

**SOLAR GAS TURBINES  
UNMATCHED EXPERIENCE**

**15.500 Gas Turbines**

**6.200 Generator Set**

**+26 GW Generated Worldwide**

**800 MW Renewable Fuel Installation**

**1,5 Billion Hours**

**Operating in over 95 countries worldwide**

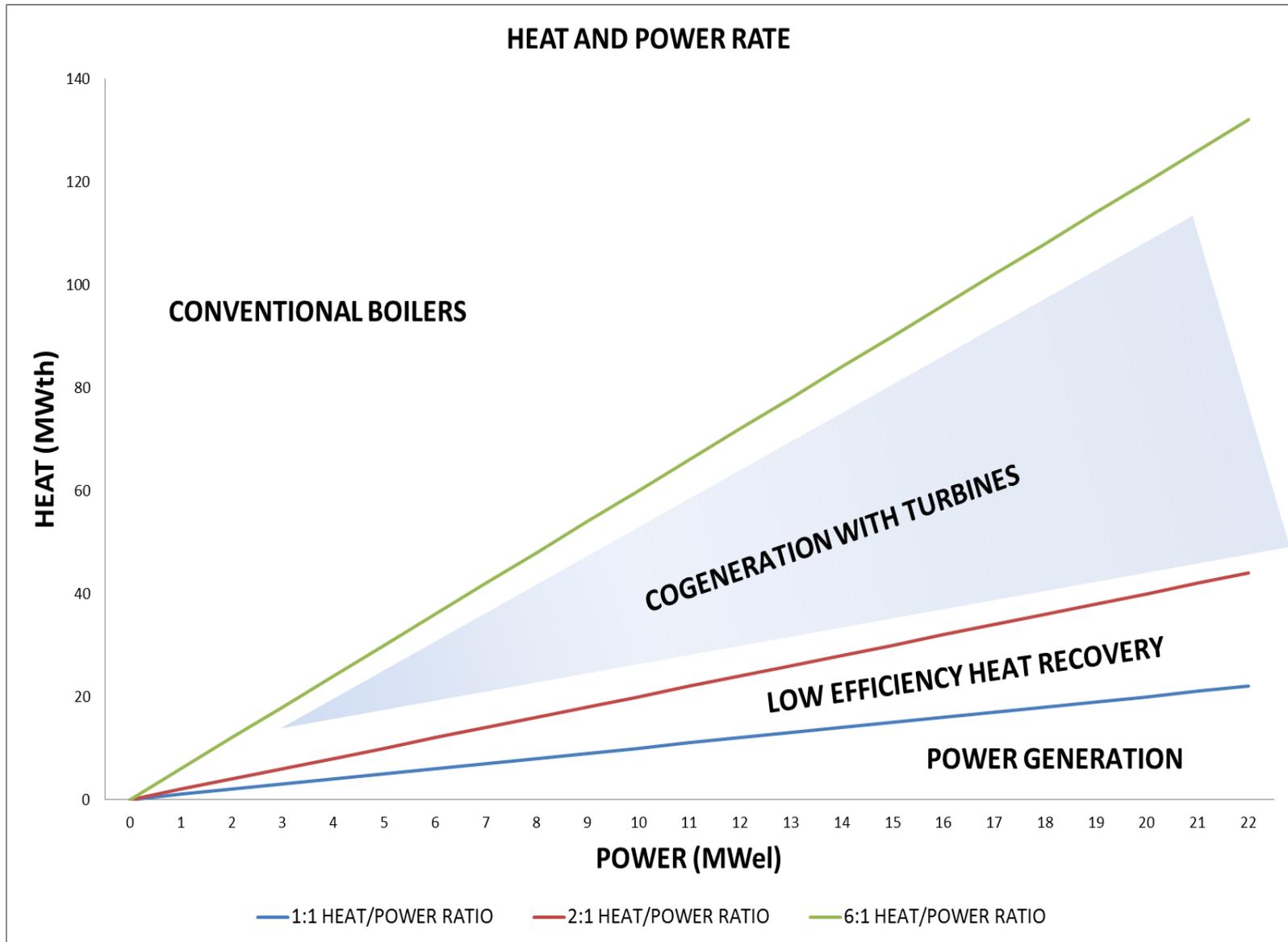
**LATIN AMERICA**  
2.8 GW

**AUSTRALIA**  
1.4 GW

2.7 GW

1.8 GW

# Project Specifics – Heat and Power Ratio



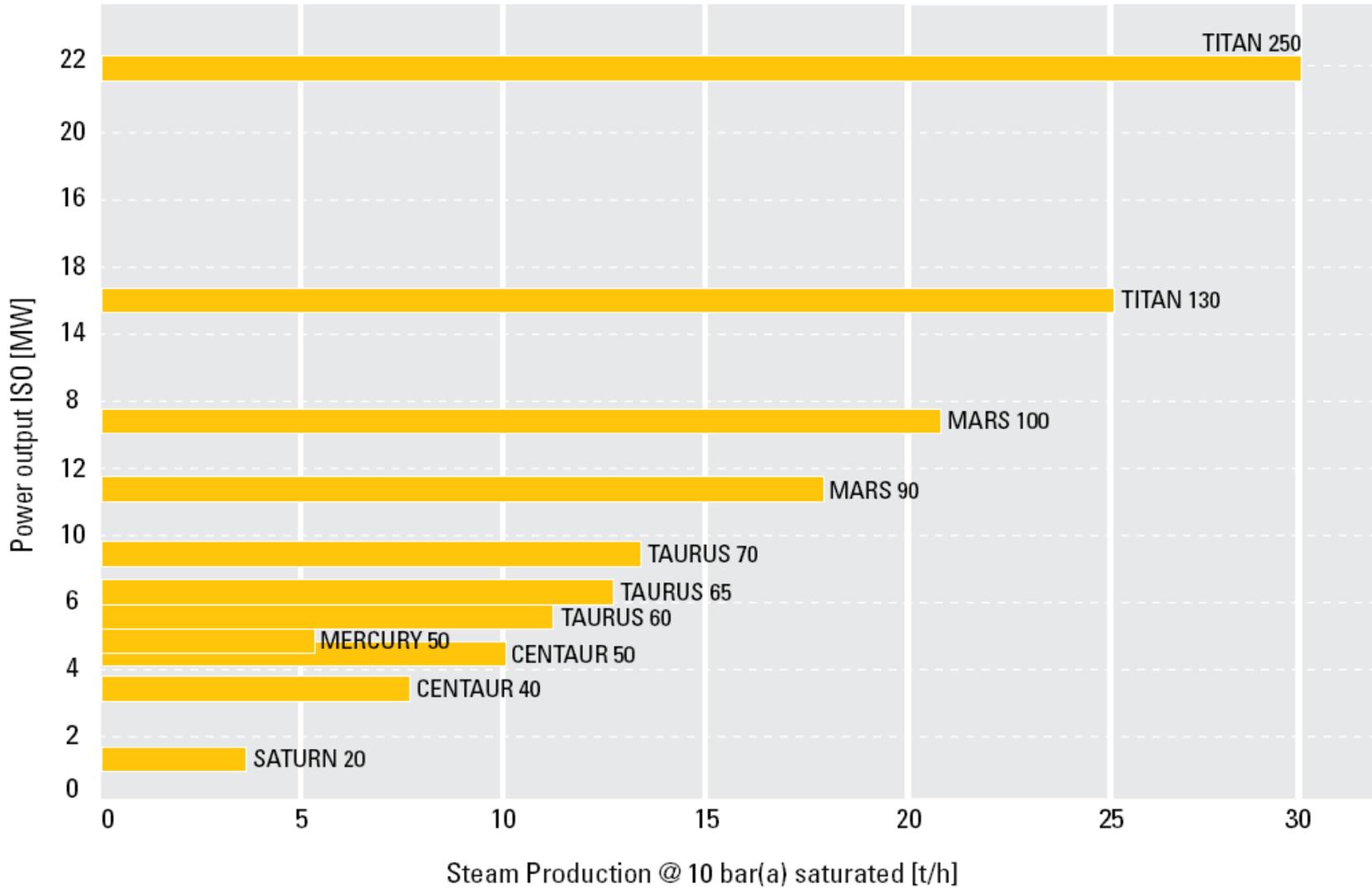
**Solar Turbines**

*A Caterpillar Company*

**Turbomach**

*A Caterpillar Company*

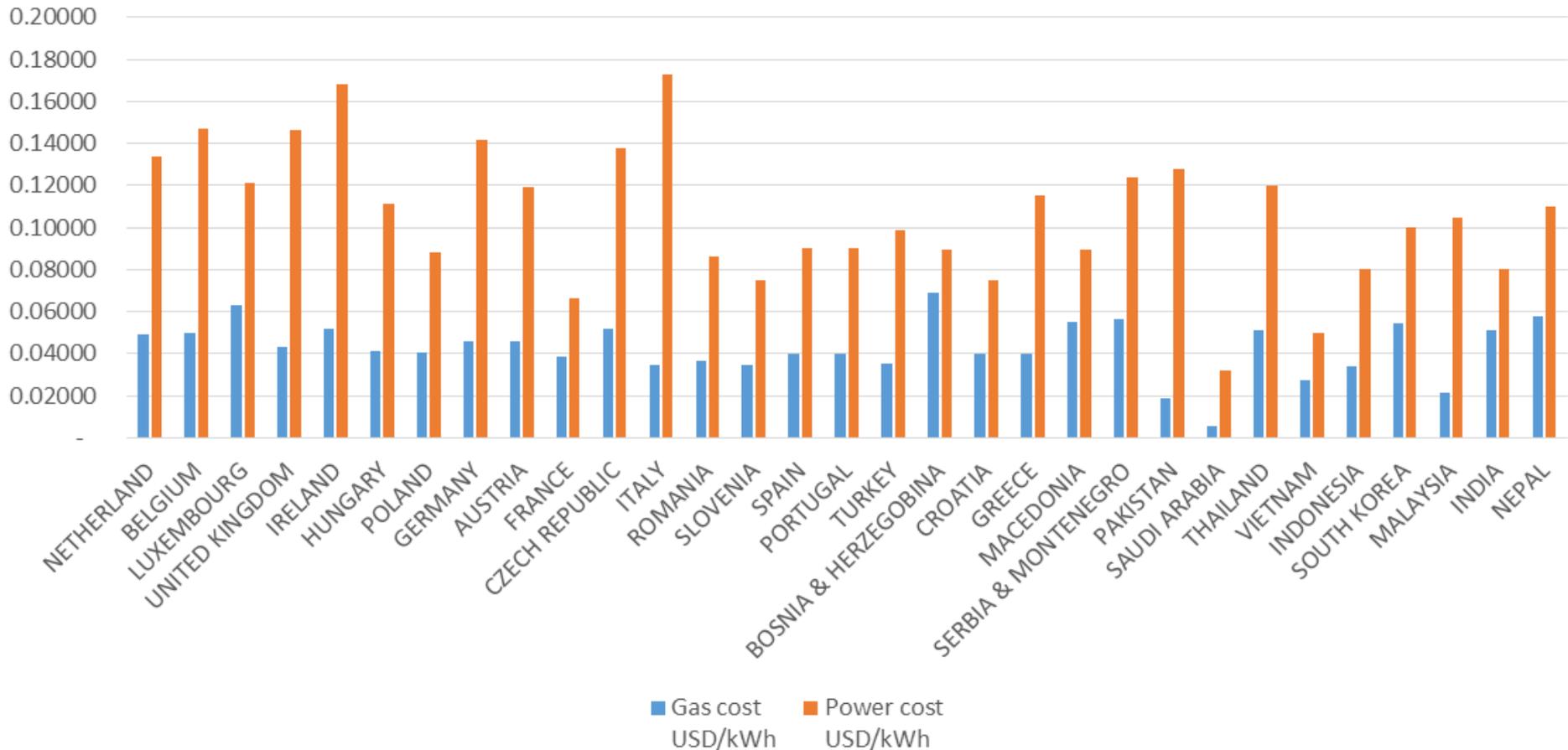
# INDUSTRIAL GAS TURBINES FROM 1 – 22 MW



# Local Specific Conditions – Spark Spread

→ When a CHP or an industrial CHP solution is convenient over conventional solution?

Energy and gas costs play a primary role. **Economical Feasibility**



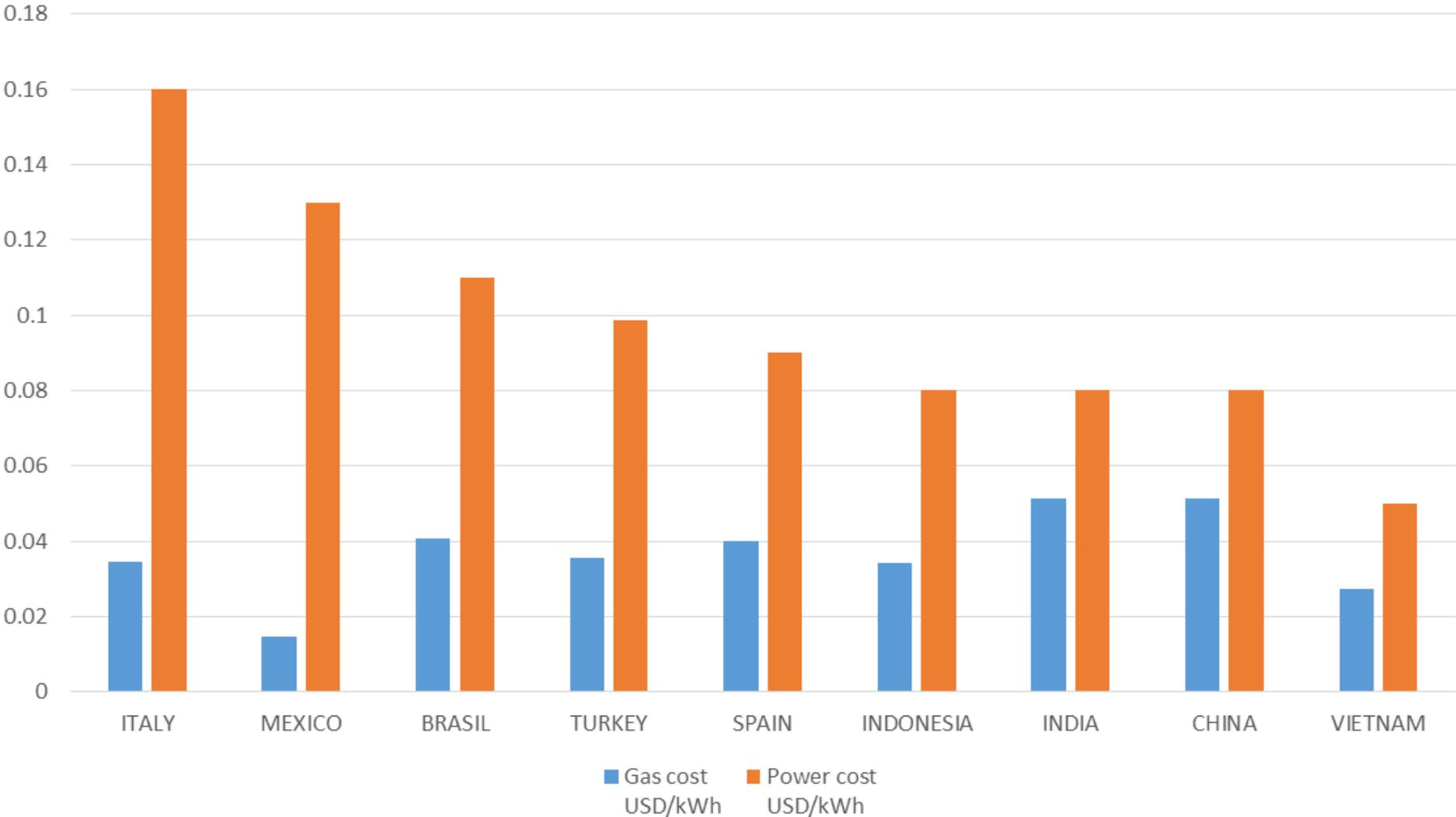
**Solar Turbines**

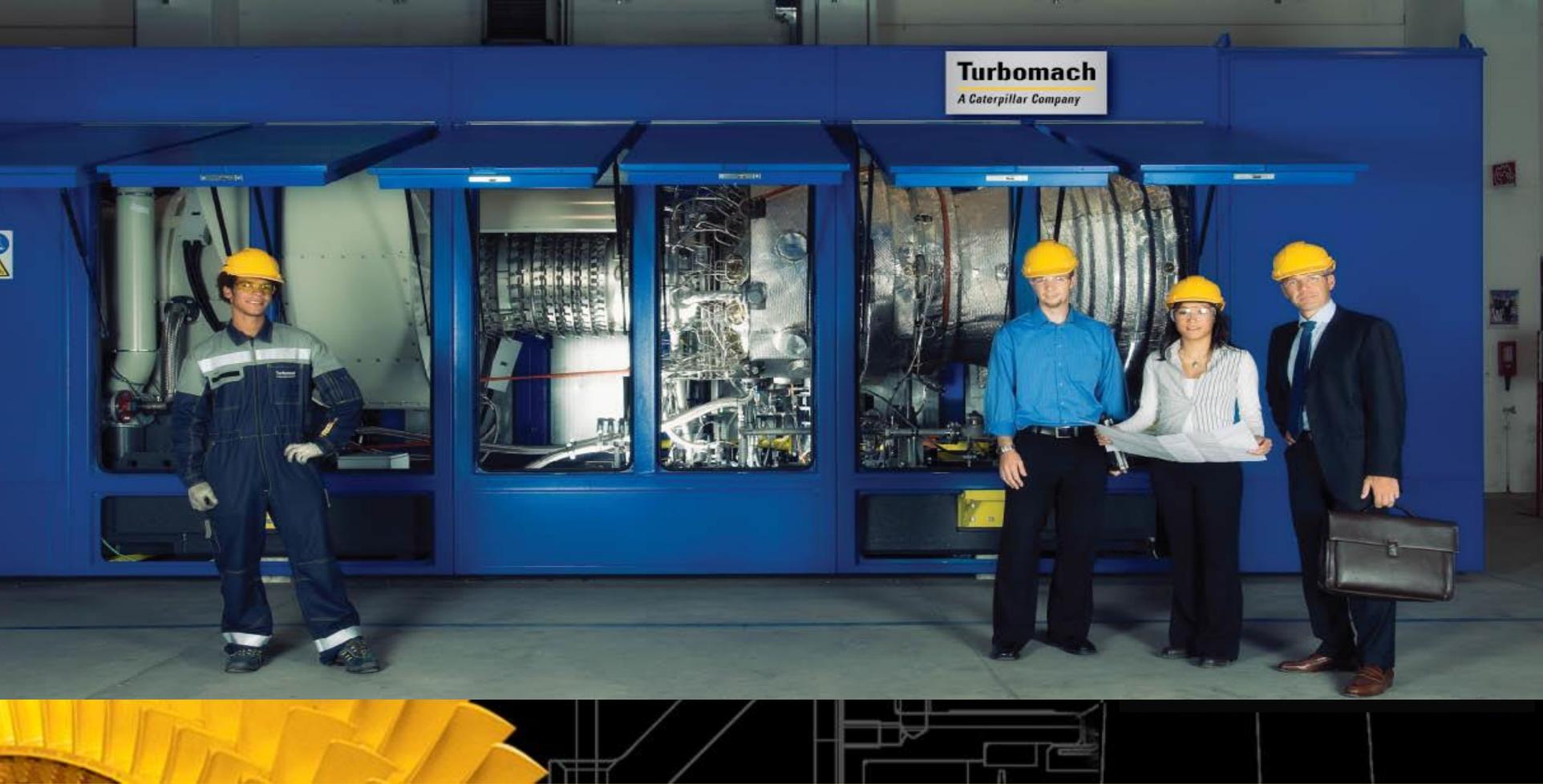
A Caterpillar Company

**Turbomach**

A Caterpillar Company

# TOP 10 CERAMIC PRODUCTION COUNTRIES





# CASE STUDY

**Solar Turbines** **Turbomach**  
*A Caterpillar Company* *A Caterpillar Company*

# Direct Drying with Gas Turbine Business case (Italy)

Electricity cost:

**140 Euro/MWh**

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Gas cost:

**0.30 Euro/Sm<sup>3</sup>**

Atomizer:

**ATM 110**

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Electric Power demand:

**4,300 kW**

**Solar Turbines**

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**Turbomach**

*A Caterpillar Company*

# CASE STUDY ITALY

€/y

COSTS		CHP NO €/y	CHP €/y
1	• Electricity from the grid	4,900,000	120,000
3	• Natural gas in Spray Dryer	2,100,000	130,000
4	• Natural gas in the GT	0	4,000,000
	• <b>TOTAL</b>	<b>7,000,000</b>	<b>4,250,000</b>

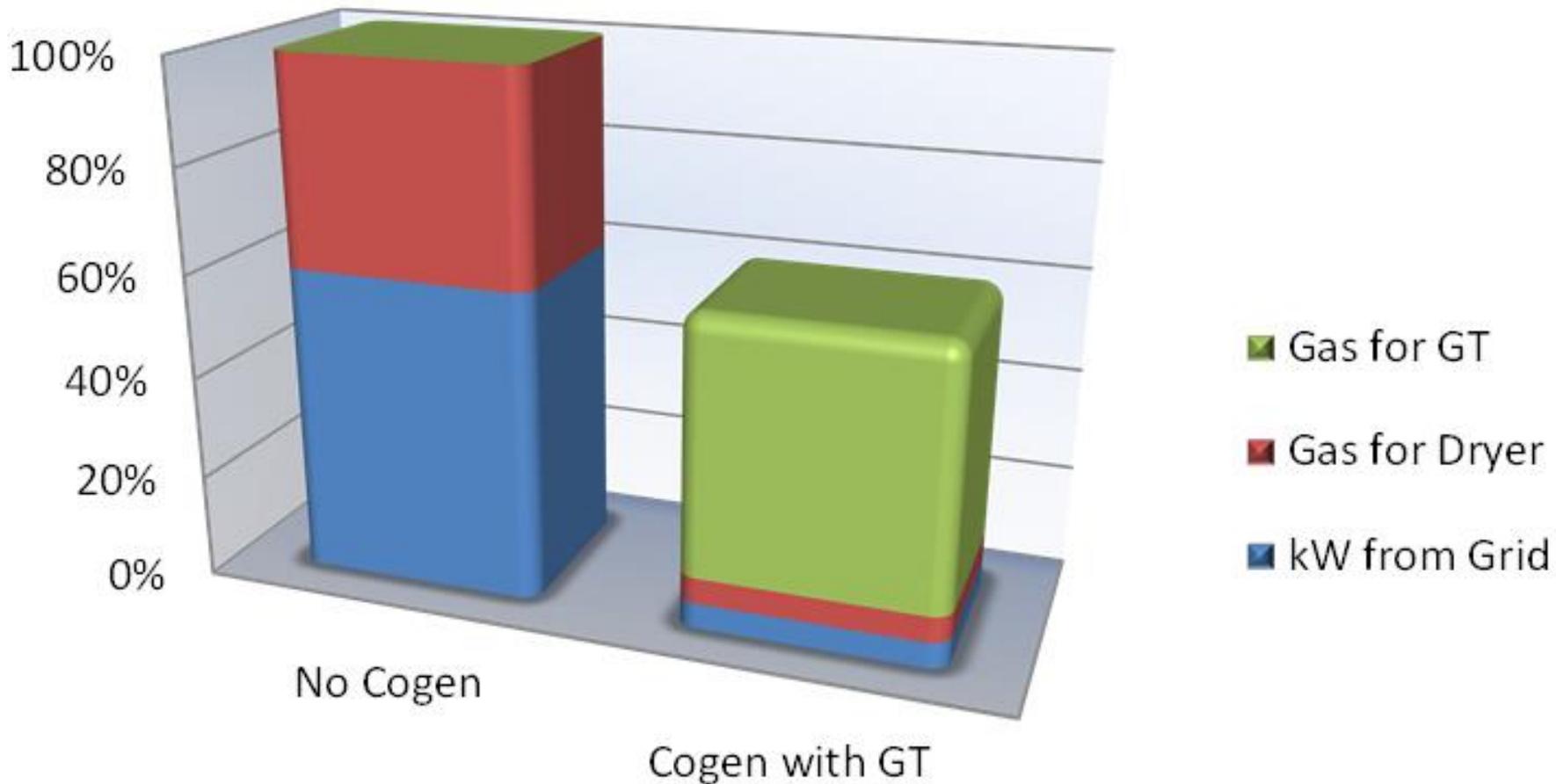
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**Turbomach**

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# Production costs



# Direct Drying with Gas Turbine Business case (Italy)

98%

Plant Efficiency

- 40%

Utility costs

---

Annual savings per year (Euro)

2,750,000

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# iNSIGHT SYSTEM™

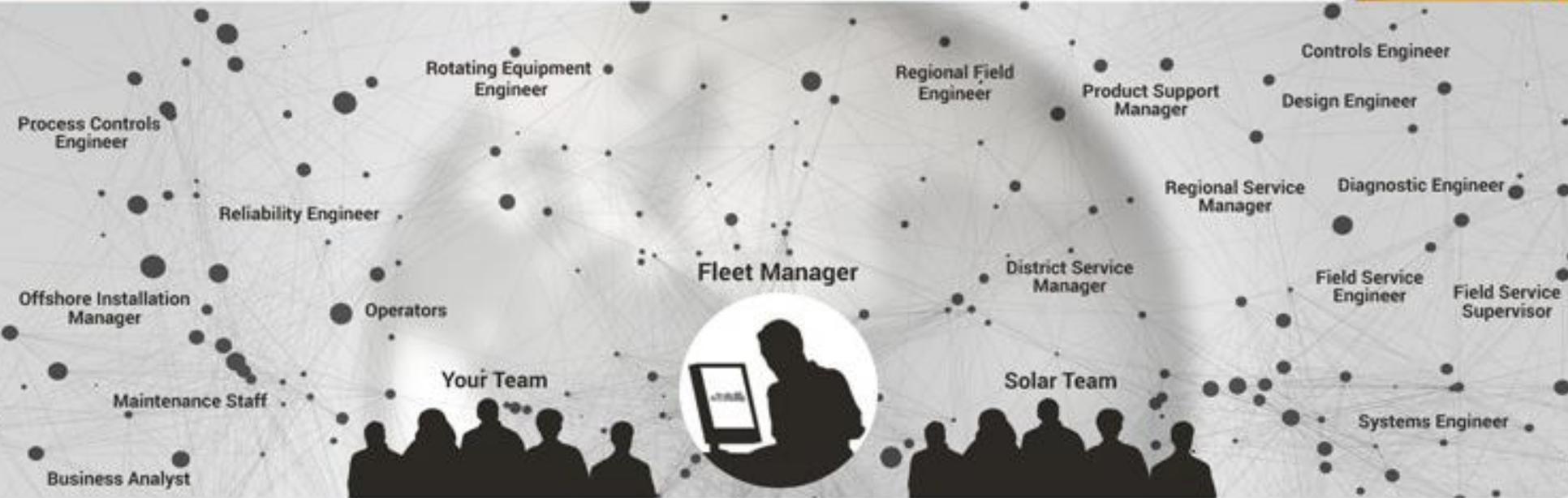
4.0  
is here!



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**Turbomach**  
A Caterpillar Company

# EQUIPMENT HEALTH MANAGEMENT



## iNSIGHT SYSTEM

- Dashboard
- Engine History
- Mobile
- Technical Support Network
- O&M Manuals
- Package Photos
- Condition Based Maintenance
- Fleet Statistics
- Service Bulletins
- Unplanned Downtime

INSIGHT **C**ONNECT





**Less Fuel**



**Less CO2**



**Less Maintenance**



**NO failures**



**Energy trading**



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**Turbomach**

*A Caterpillar Company*

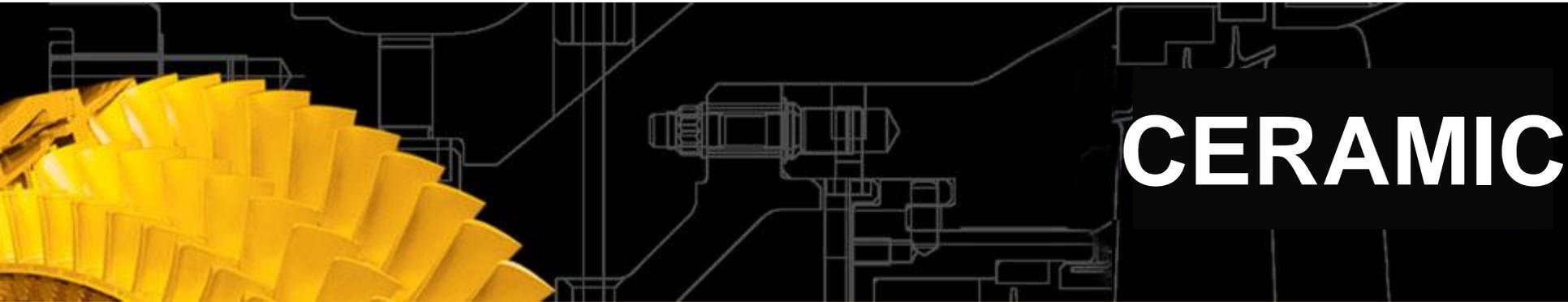


**Solar Turbines**  
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**Turbomach**  
*A Caterpillar Company*

For more information and support:

[www.turbomach.com](http://www.turbomach.com)



**THANK YOU FOR YOUR ATTENTION**

**Solar Turbines** **Turbomach**  
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