



25th world gas conference
"Gas: Sustaining Future Global Growth"

Aeroderivative Combined Heat and Power

Fundamentals and Applications

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&

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5 June 2012

Kuala Lumpur Convention Center

Level 4 Room 403/4

Patron



Host



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Now is the time for CHP (3 Es)

■ Efficiency

- High Efficiency at mid-size plants
- Higher overall thermal efficiency
- Distributed Energy (low grid losses)



Two LM6000 aeroderivative gas turbines,
above, power Toronto International Airport

■ Environment

- Clean combustion
- High Efficiency / Lower CO₂ emissions

■ Economics

- Lower Fuel spend, Fuel Flexibility
- Strong demand, multiple sources
- Mid size plants, Lesser investment risk, Local investors

Aviation heritage ...

Aviation products

A300/A310/ A330



B747/B767/MD11

C-5



DC-10



CF6-80C2/E1



TF39/CF6-6



LMS100
100MW



LM6000
40-55MW



LM2500+/G4
28-34MW



LM2500
18-24MW

Aeroderivative Packaged Solutions



Power generation



Industrials



Off shore

Proven Technology ... dependable, durable, flexible power

Aeroderivatives ... where are they used?



**Independent
power producer**



**Mobile
power**
Ireland 3xTM2500



**Floating
production vessels**
LM6000



**Platform
538 Package**



District heating
Denmark



Utility



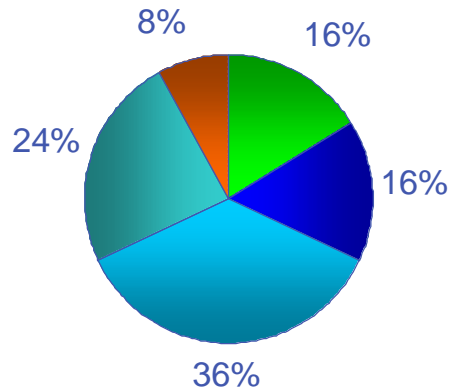
Pipeline
Alaska

Operational flexibility, high efficiency, superb reliability, fast installations

Aeroderivative GT not just for peaking power ...a wide range of applications

LM2500

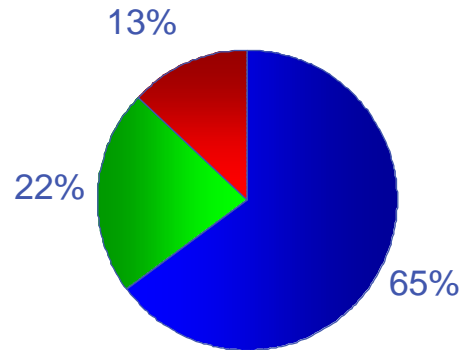
+1330 units in operation



- Cogeneration
- Land Base PG
- Land Base MD
- Platform MD + PG
- Lease / Other

LM6000

+770 units in operation



- Power Generation
- Cogeneration
- Combined Cycle

Proven experience
+150 units in Cogen
+98 units in CC

**This success stems from a variety of attributes that provide
an excellent fit in a multitude of applications**

Flexibility by design ... proven capabilities

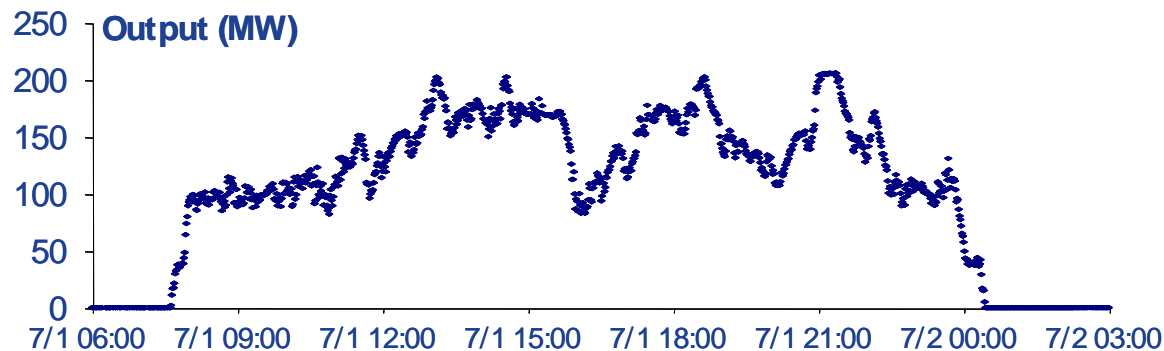
Attributes

- High efficiency in SC & CC
- Proven reliability & availability
- Multiple starts/day ... No maintenance penalty
- Fast-start ... 100% load in 10 min
- Fast load response
- Short installation time
- Small footprint

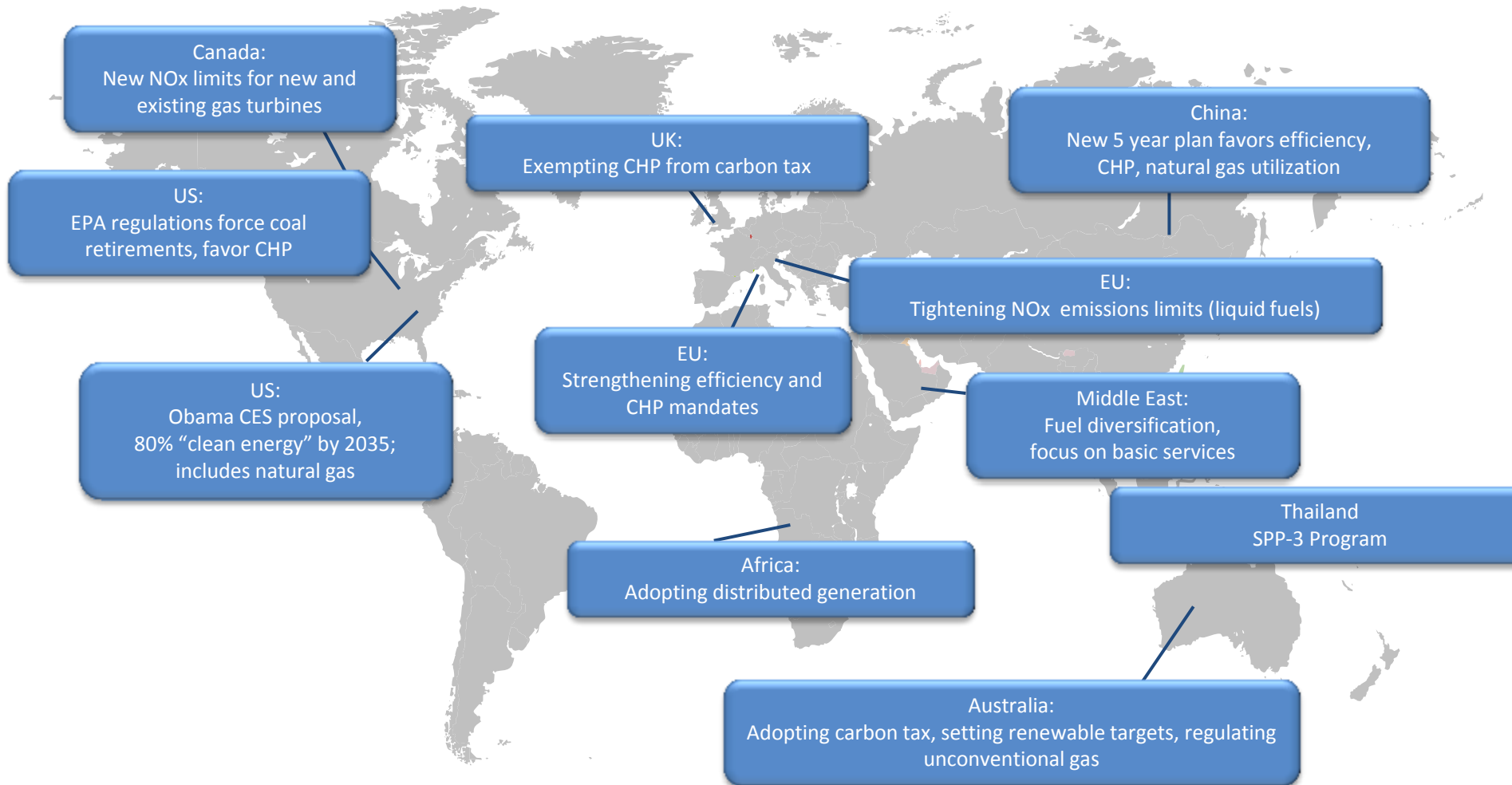
Benefits

- ✓ for **reduced** operating **costs**
- ✓ for **dependable** energy
- ✓ To **meet load variability**

- ✓ Power now ... **when you need it**
- ✓ for grid **stability** and islanding
- ✓ for **fast** project **execution**
- ✓ Ideal for **distributed power**

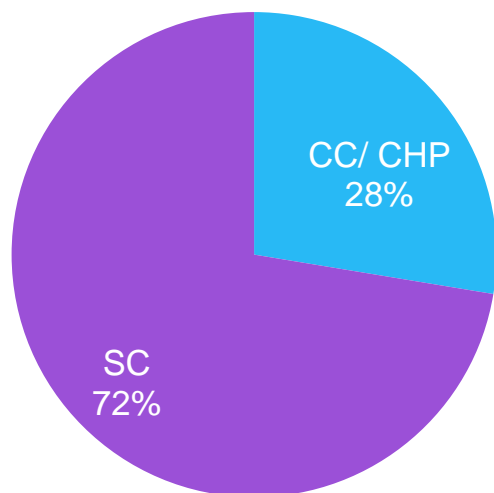


Global policy landscape



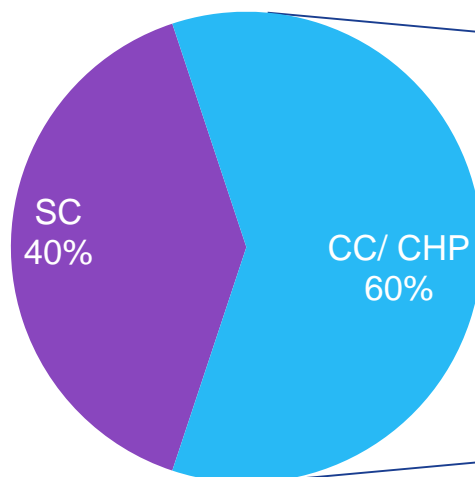
Government benefits of CHP

CCGT+CHP expected growth



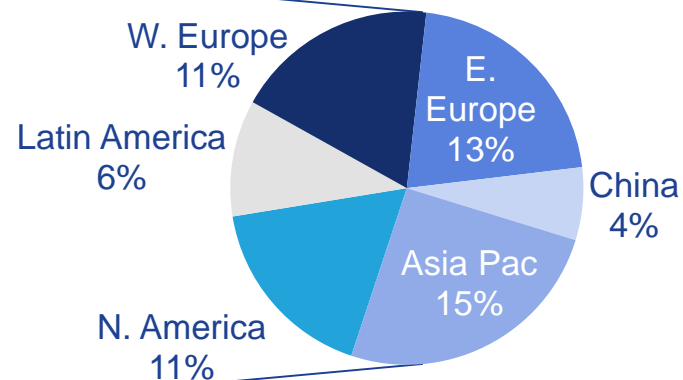
Aeroderivative

Installed Base (FLEET)



Expected growth

CTG volume projection shifting into CC+CHP regions



CC/CHP Dominating Regions (% of Opp.)

America: 60%

Russia: 100%

Asia: 66%

E. Europe: 91%

Halle Power Station: Halle, Germany

Situation

Retire two 33-year-old
CHP boiler steam units

Solution

- Two 40MW DLE LM2500+
combined cycle CHP
units installed
- Two HRSGs supplied by
Bertsch



Benefits

- 25 ppm NO_x ref 15% O₂
- Reduced CO₂ emissions
- Depressurized steam generates ~80
MMt
- Total thermal efficiency ~85%

Texas Medical Center in Houston



- ✓ 6,500 hospital beds
- ✓ 900 bassinets
- ✓ \$1B of medical research
- ✓ 5.5 million patient visits
- ✓ 8 Hospitals
- ✓ 8 colleges/universities

TECO's total plant capacity

- ✓ 122,000 tons chilled water
- ✓ 850,000 PPH steam
- ✓ 61MW power generation
- ✓ 82% energy efficiency
- ✓ Substantial environmental benefits



LM6000 providing CHP to critical infrastructure

Major airports with GT cogen facilities

Toronto, Pearson
2 x LM6000

Paris, Charles de Gaulle
1 x LM1600

London,
Heathrow
1 x LM1600

San Francisco
1 x LM2500

New York, JFK
2 x LM6000

Osaka,
Kansai
2 x LM2500

Kuala Lumpur,
KLIA
2 x LM2500

Meeting electrical, heating and cooling needs

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Thank you!

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