



Meeting Future Energy Demand: BHGE GT Family

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Energy Scenario



An aerial night view of a city skyline, featuring several prominent skyscrapers with illuminated windows and facades. The city lights extend into the distance under a dark blue sky with some clouds.

3B Growth in global population by 2050

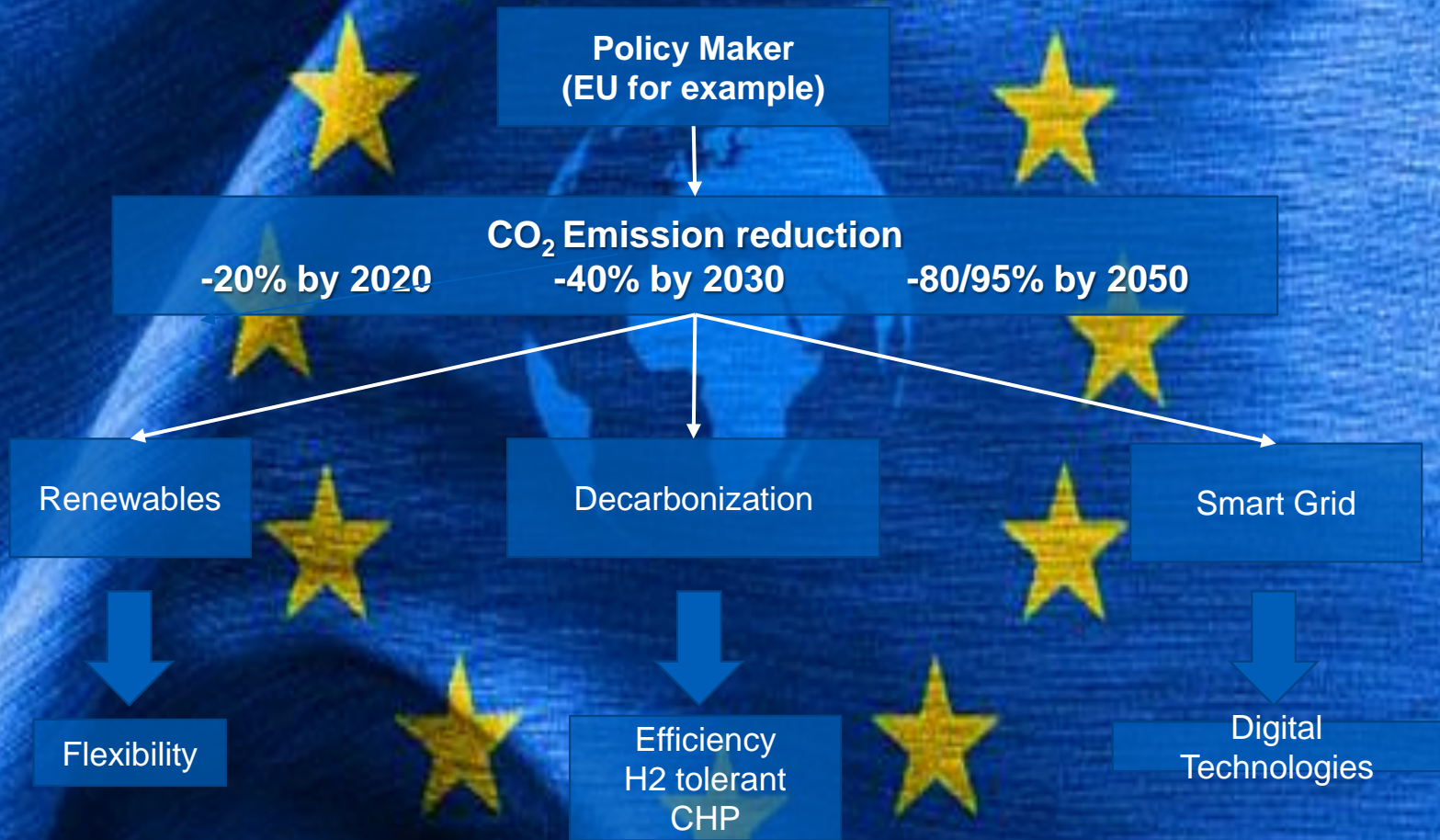
30% Increase in energy demand by 2040

30% Of the growth in global energy demand from 2014-2040 is projected to be met by natural gas

1/4 Of the world's energy is expected to be provided by oil in 2040...The era of oil is not yet over

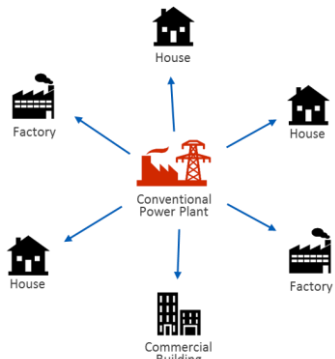
2/3 of global energy investment will be in renewables

(Source: IEA)

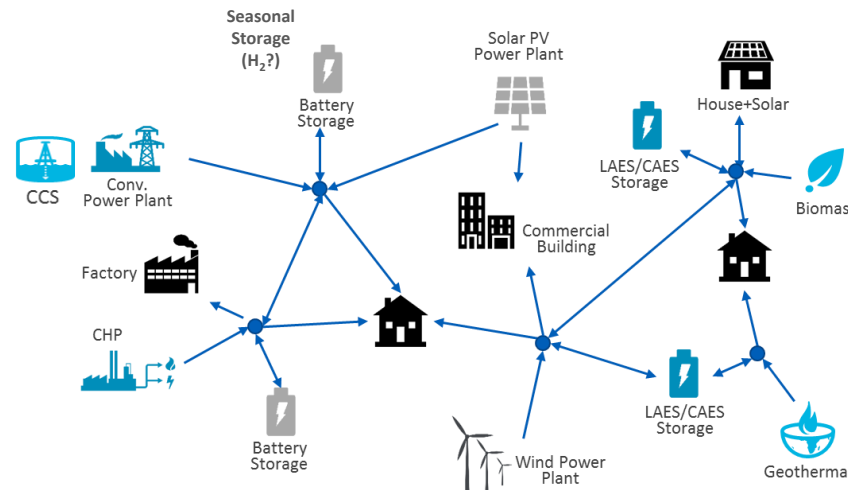


New Era in the power market ... smaller, flexible, decentralized

From Centralized power



To Clean, Local power



- **Power generation ... BHGE leadership position** ... proven gas turbine <20MW and Steam Turbine technology
- **Energy recovery** ... ORC, super critical CO₂ to convert heat to power and pressure let down
- **Energy Storage** ... BHGE's to support the growth of renewable energy ... LSES
- **Low Carbon and heat efficiency** ... CCS with proven Chilled Ammonia Process to capture CO₂



New business models, ad hoc financials solutions... capex to opex

PREDIX

Digitization, power integration, increase efficiency and productivity enhancement

Our Pillars and LT Product Line

BHGE Family Pillars



Efficiency & Flexibility

- High electrical and CHP efficiency.
- High performance over a large range of load to reduce CO₂ Footprint

Fuel Flexibility

- Manage H₂ fuel for Green Application
- Burning out of standard fuel burning minimizing emissions

Additive Manufacturing

- Simplify engine assembly
- Improve Reliability and Performances

Digital

- Allow unmanned operation
- Auto-adapt control strategy vs fuel composition changes
- Embedded parts life estimation for maintenance plan optimization
- Model Based Control adoption

Fast Response

- Integration with renewable energy maintaining stable grid operation

NovaLT... from 5 to 16MW

The latest BHGE industrial gas turbine family

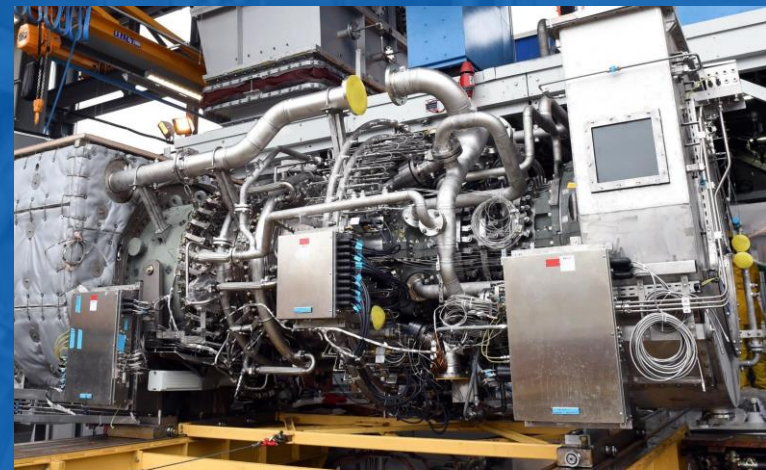
Wide coverage: NovaLT5, NovaLT12, NovaLT16

New and proven: use of technology with Fleet-wide experience from industrial Power Generation to Oil & Gas

Efficiency & flexibility: up to 36% electrical and 85% CHP efficiency... high performance over a large range of operations



NovaLT5

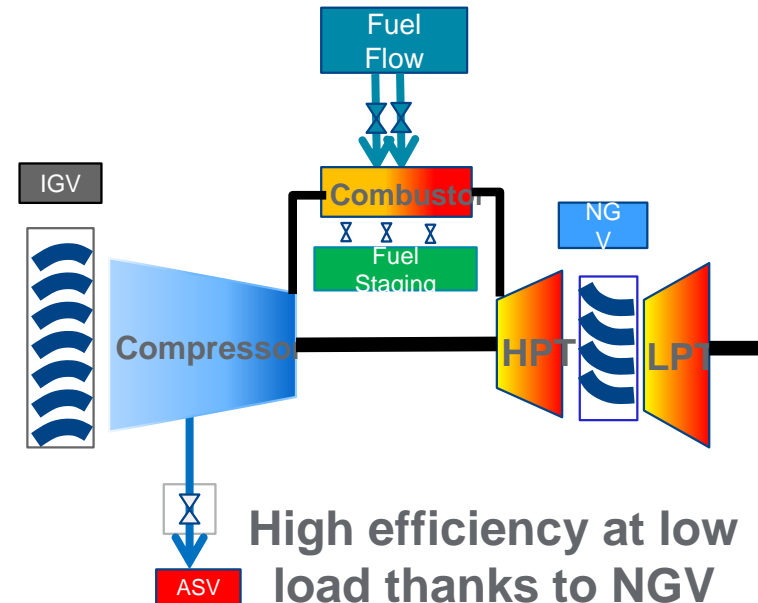
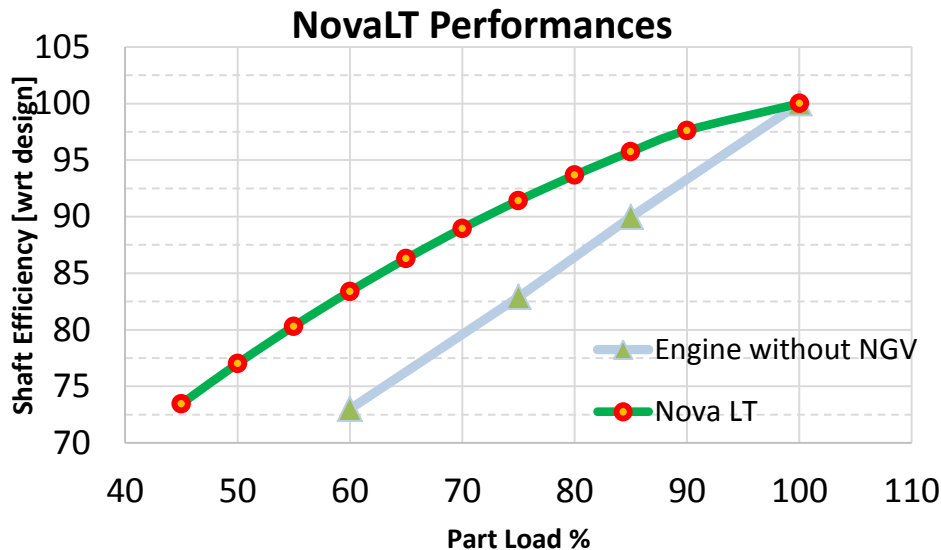
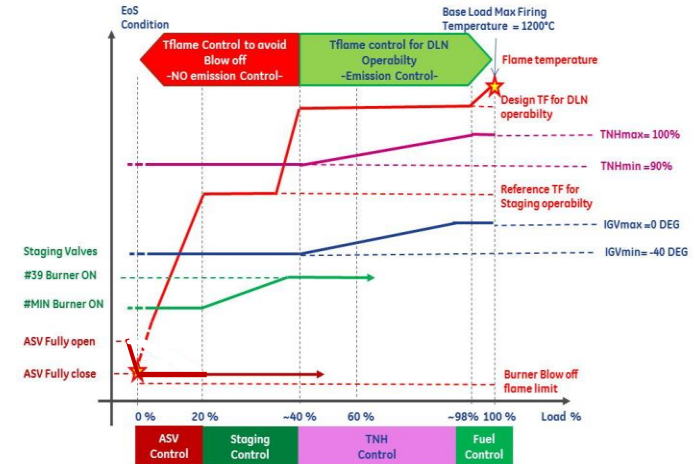


NovaLT12 & 16

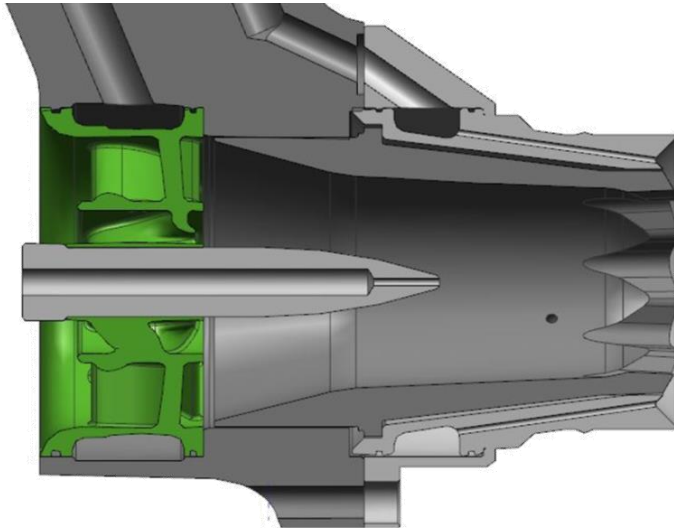
	NovaLT5	NovaLT12	NovaLT16
Electrical Output (*)	5.6MW	12.2MW	16.2MW
SC Efficiency (%)	30.7%	35.8%	36%
CHP efficiency	85%	81.4%	81%
Steam production (10 bar/a dry (t/hr)	15	23	30
NOx Emissions	15ppm	15ppm	15ppm
CO Emissions	20ppm	20ppm	20ppm
MTBM	24K hrs	35K hrs	35K hrs

Exploiting Efficiency and Flexibility

- Variable Area Turbine Nozzle (VATN) for **wide efficiency range** and bleed avoidance during load operation
- Control philosophy developed to eliminate the need of fuel composition input



Exploiting Fuel Flexibility



- Same Burner concept across the entire family
- Designed to accept wide fuel composition range
- No Combustion mode change.... diffusion to premix smooth change
- Dynamic pressure probe signal utilized for engine control
- Pilot split is roughly mapped at commissioning and then the **auto tuning system** takes care of all variations like load, ambient temperature and fuel composition.... No need for seasonal DLN tuning

Exploiting Additive Manufacturing

Fewer parts
Increased reliability
Lower Lifecycle Impact

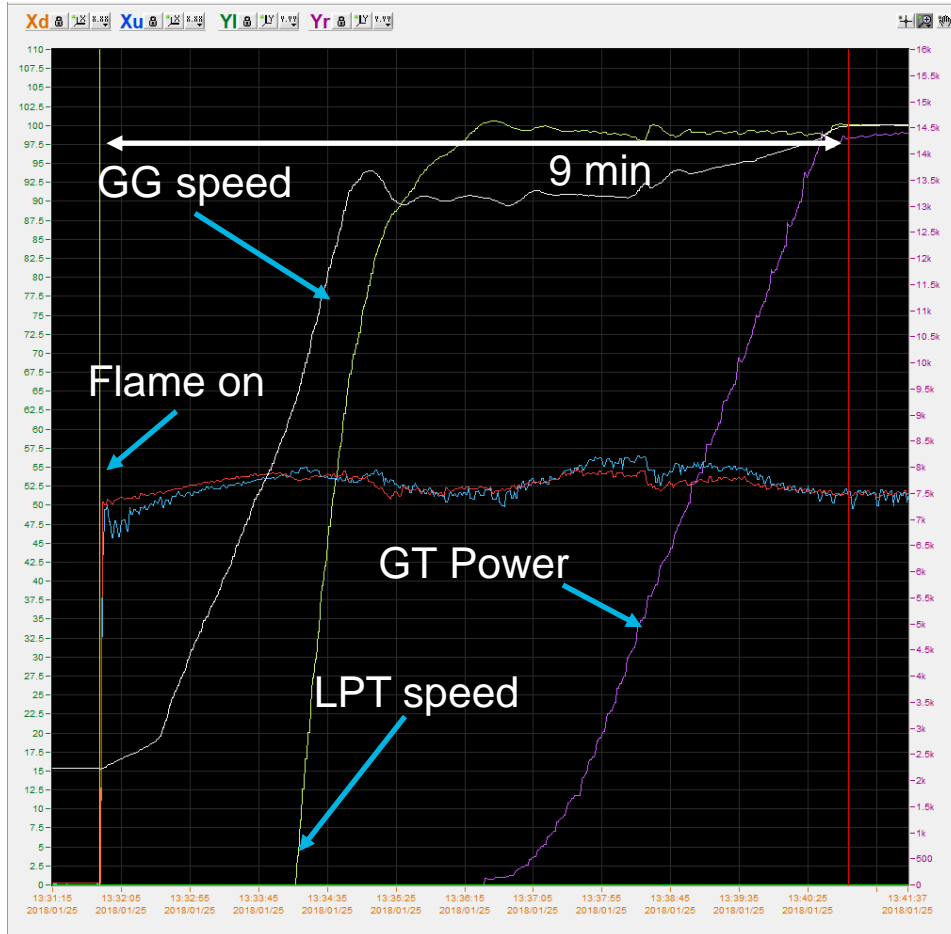


Optimized design
for performance

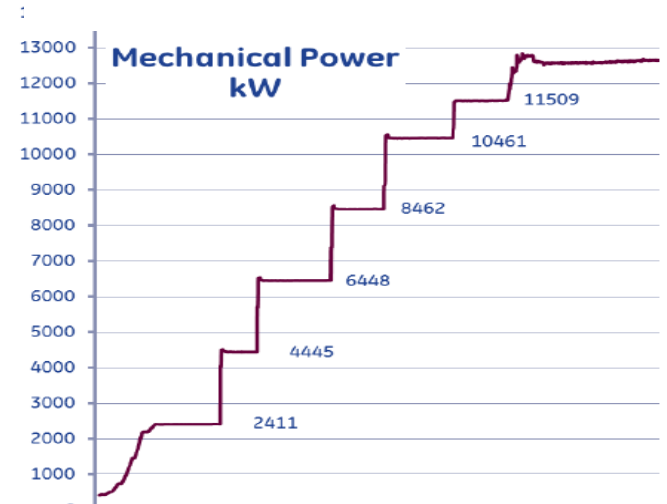
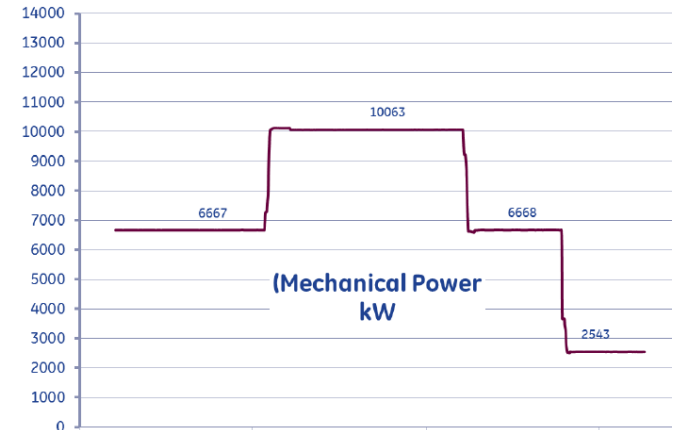


Exploiting Fast Response

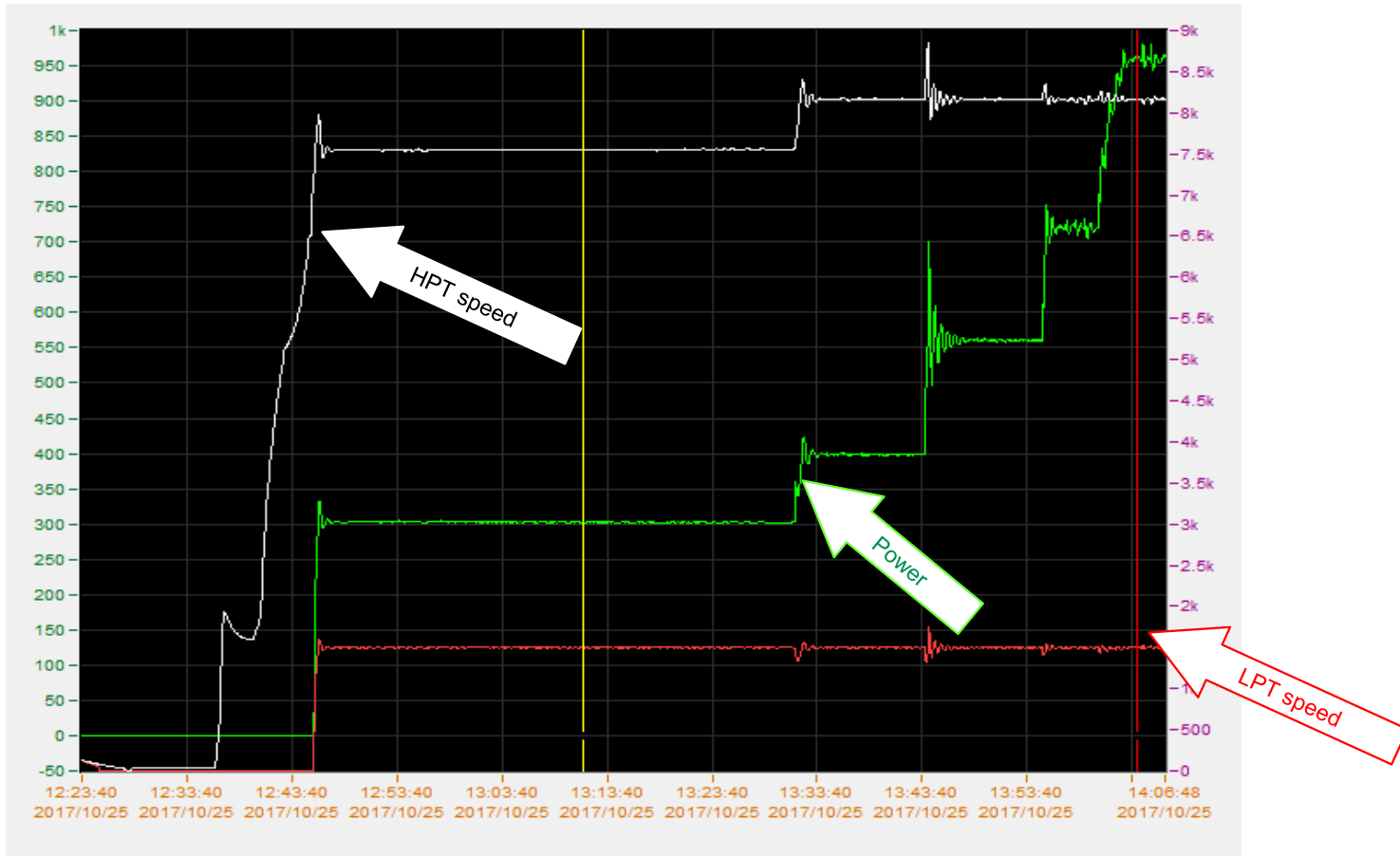
Fast Start



Load Steps



NovaLT16 motoring capability



Demonstrated capability to keep low speed turning capability in case of rotor straightening needs...without need of turning gear on driven compressor

BAKER
HUGHES
a GE company





ecomagination



Main features for mech drive LM9000

Highest availability **Lowest** \$/kW & total cost of ownership **Best** fit for LNG

PROVEN

- BASED ON THE GE90 (777 JET ENGINE)
- >2,000 UNITS
- >43 MILLION OPERATING HOURS

EMISSIONS

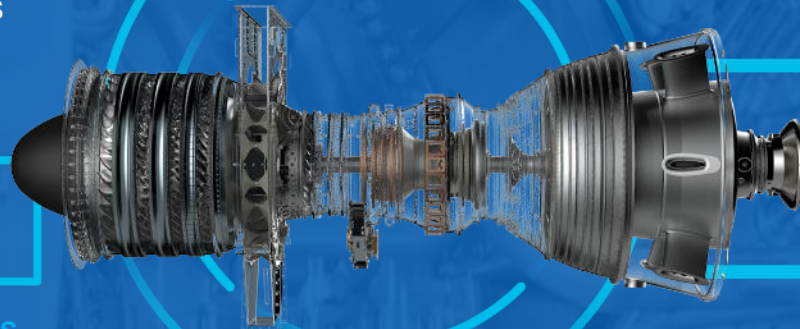
15
PPM NO_x

25
PPM CO

LONGER MAINTENANCE INTERVALS

36K
HOT SECTION

72K
OVERHAUL



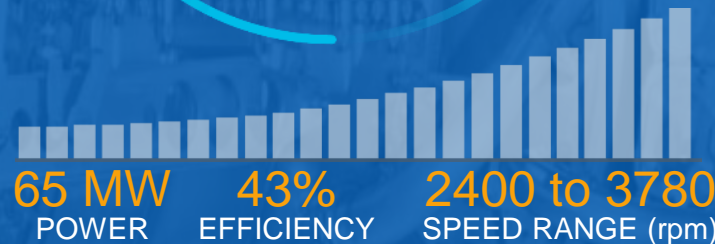
APPLICABILITY

- NEW & RETROFIT
- EXPORT & OIL
- ONSHORE & OFFSHORE

PROPOSED LNG PROJECTS
NOT VIABLE AT TODAY'S PRICES
THE INDUSTRY NEEDS LM 9000

VS. TYPICAL 60 MW NON-GE ALTERNATIVE

- 50% LONGER MAINTENANCE INTERVAL
- 20% MORE POWER
- 40% LOWER NO_x EMISSIONS
- 20% LOWER TOTAL COST
- 25% FEWER TRAINS NEEDED



LM6000-PF+

- 20+ years of proven global experience of 1,200 LM6000-PH and -PF... 33 million combined operating hours
- Largest gas turbine installed offshore... fleet leader with >100,000 hours
- Fully interchangeable to PF...
- +22% more power in same footprint
- Two-spool design... pressurized LNG start-up capability without helper motor
- Excellent reliability and fuel flexibility in both power generation and mechanical-drive applications
- 54.3 MW ISO rating
- 99.6% reliability
- 98.4% availability
- 42.7% efficiency in simple cycle
- 56% efficiency in combined cycle
- Speed range: 50% to 105%

Reduced overall package size and weight — for an exceptional fit on land and sea

