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GT26
Performance and Flexibility Upgrades

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GT26 SERVICE PRODUCTS

Ansaldo Energia is dedicated to keep **thermal power plants** competitive in a challenging and transforming regulatory environment: **flexibility and expertise are key**.

Building on our global fleet and project execution experience, we partner with owners of Ansaldo Energia and other OEM equipment to help maximise **performance** and lifetime profitability while keeping **safety**, **reliability** and **environmental impact with a low carbon footprint** as top priorities.

With our performance and flexibility upgrades, Ansaldo Energia can offer you a wide range of Services to keep your GT26 competitive.

PERFORMANCE UPGRADES

GT26 MXL2

GT26 MXL3

FIND OUT MORE

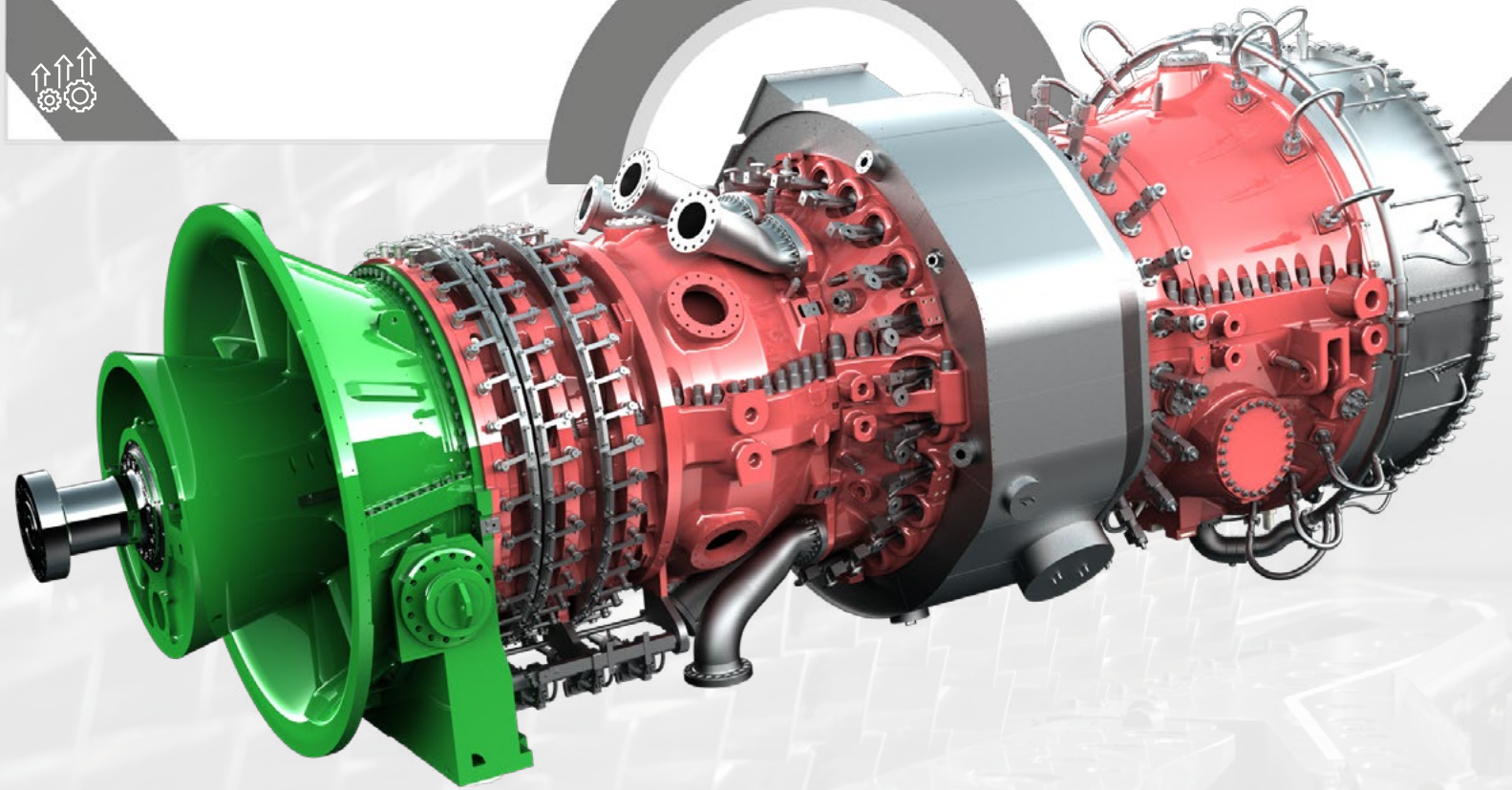
FLEXIBILITY UPGRADES

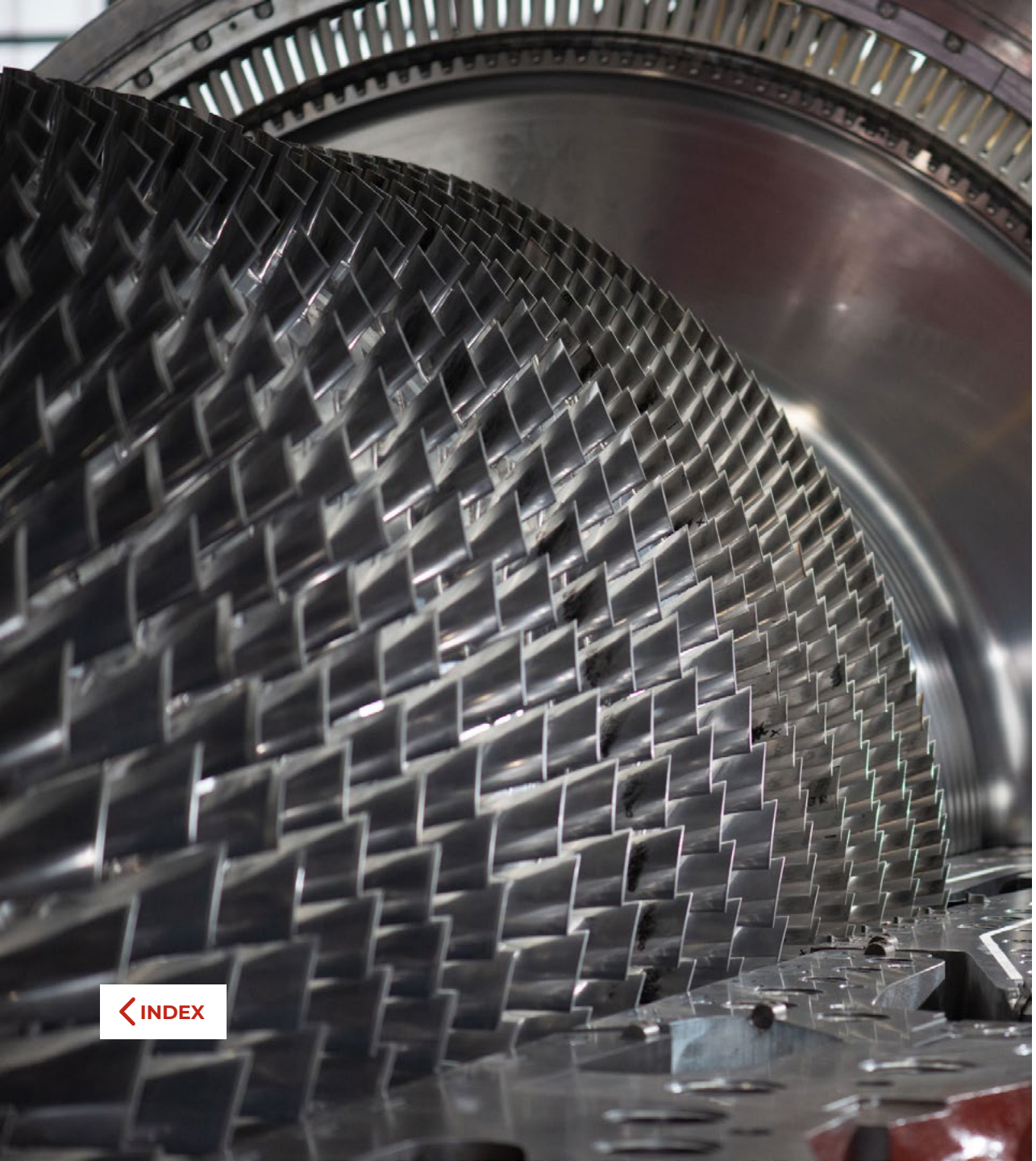
Fuel Flexibility

Extended Low Part Load Opearation (eLPL)
Extended Low Load Operation (eLLO)

Increased Load Gradient

FIND OUT MORE





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MXL2

Ansaldo Energia's MXL2 upgrade for GT26 gas turbines offers new levels of availability, flexibility and performance.
It allows power plant operators to adapt to fluctuating market demands, enhancing performance and reducing maintenance costs.

The MXL2 Upgrade comes with a maintenance interval of 40.000 EOH.

MORE PERFORMANCE, LIFETIME AND FLEXIBILITY

The GT26 MXL2 upgrade is an evolutionary product that combines technological advances and many years of operational experience into a single attractive upgrade package for GT26 gas turbines.

The baseline for MXL2 upgrades is rating 2006 but the upgrade is also applicable to earlier GT26 ratings.

MXL2

HOW YOU BENEFIT

THE MXL2 UPGRADE ALLOWS OPERATORS TO SWITCH BETWEEN TWO MODES OF OPERATION: M-MODE AND XL-MODE. ONLINE SWITCHING IS ACHIEVED AT THE TOUCH OF A BUTTON.

M MODE

In the M mode, power output can be increased up to 25 MW in combined cycle, and the combined cycle efficiency by 0.8%. Maintenance Intervals are extended by 4.000 operating hours.

+25 MW
increasing of power output

+0,8%
combined cycle efficiency

+4.000
operating hours

XL MODE

In the XL mode, maintenance intervals are further extended up to 12,000 operating hours, increasing availability and reducing maintenance costs. The overall plant power output can be increased up to 12 MW and the combined cycle efficiency by 0.5%.

+12 MW
increasing of power output

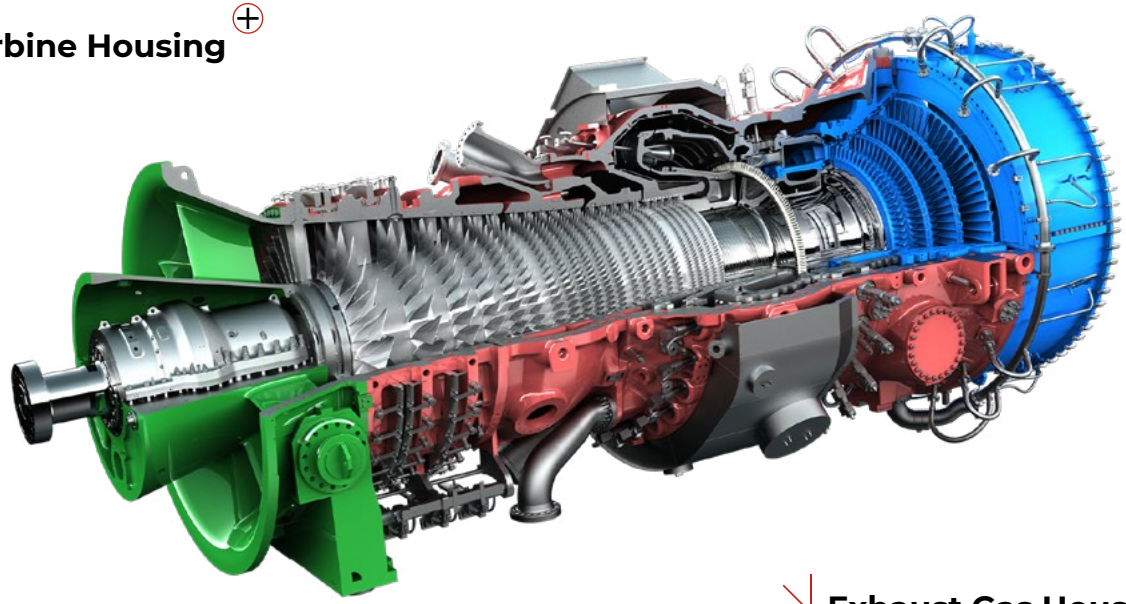
+0,5%
combined cycle efficiency

+12.000
operating hours

MXL2

SCOPE

- Low Pressure Turbine (LPT)
- SEV Combustor
- Turbine Housing



- Exhaust Gas Housing
- Turbine Vane Carrier (TVC)
- Rotor

MXL2

LOW PRESSURE TURBINE

Based on proven technology shared with the latest GT26 rating 2011, all four stages of the LPT, have been redesigned:

- 3D airfoil profiling was applied to all stages to achieve highest aerodynamic efficiency, and the flow path diameter at the turbine outlet is increased.
- To support the increased turbine inlet temperature, the components protection by thermal barrier coating has been enhanced.
- Optimised part count: Lowering the vane part count in the LPT vane rows 1 and 2 reduces the required cooling air, thereby increasing the overall turbine efficiency.
- The cooling schemes of all components have been optimised.
- Reduced losses: Improved shroud design of LPT blades and vanes leads to a reduction in over-tip leakages enhancing the aerodynamic turbine efficiency.

Click on the button and discover in detail the redesigned LPT

LOOK IN DETAIL

MXL2

KEY FEATURES

CUSTOMER BENEFITS

Improved operational flexibility Operational flexibility with online switching between M and XL modes.

- Increased performance up to 456 MW power output and and 59.8% efficiency in combined cycle operation.
- Reduced maintenance costs Inspection interval extended up to 12,000 operating hours.

TECHNICAL FEATURES

Flexible mode switching, the perfect response to fluctuating market demand.

- When market demand is high, plant operators can instantly switch to the M mode for maximum power and efficiency.
- When demand is lower, operators can switch to the XL mode with a temperature drop that reduces the thermal loading on components.
- The XL mode translates into an extension of the maintenance interval by 12,000 operating hours, thereby reducing maintenance costs.
- The GT26 MXL2 Upgrade brings class-leading flexibility, opening up new revenue opportunities to plant operators meeting increasing grid challenges.

GT performance gain*	
Power Output Improvement	**Up to 25 MW_{cc}**
Efficiency Improvement	**Up to 0.8 %**
Maintenance Interval Extension OH	**Up to 12000**

**Reference values in ISO conditions, specific data to be evaluated case by case*

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MXL3

Ansaldo Energia's MXL3 Upgrade is the latest member in the family of Ansaldo Energia's modular Upgrades for its GT26 gas turbines.
It takes availability, flexibility and performance of the gas turbine to H class levels.
These outstanding features allow power plant operators to adapt to fluctuating market demands, enhancing output and reducing maintenance costs.

THE MXL3 UPGRADE CAN BE FITTED INTO MOST EXISTING POWER PLANT CONFIGURATIONS WITHOUT THE NEED TO MODIFY ANY PLANT COMPONENT.

The baseline for the GT26 MXL3 upgrade is the GT26 MXL2 but the upgrade is also applicable to earlier GT26 ratings.

MXL3

HOW YOU BENEFIT

GT26 MXL3 UPGRADE OFFERS AN UNRIVALLED OPERATIONAL FLEXIBILITY ON BLENDS OF NATURAL GAS AND HYDROGEN UP TO 45 VOLUME %.

In analogy to the flexible operation mode introduced with the MXL2 Upgrade, operators can switch between two modes of operation in the MXL3 Upgrade: M-mode and XL-mode by means of pushing a button on the operator station.

Combined Cycle Performance Improvements*

M MODE

In M mode, power output can be increased up to 35 MW in combined cycle. Simultaneously the combined cycle efficiency increases by up to 1.6%. Maintenance Intervals are extended by 4.000 operating hours.

+35 MW
power output

+1,6%
efficiency

+4.000
operating hours

XL MODE

In XL mode, maintenance intervals are further extended up to 12,000 operating hours, resulting in increased availability and a reduction of maintenance costs. The overall plant power output can be increased up to 22 MW and the combined cycle efficiency by up to 1.3%.

+22 MW
power output

+1,3%
efficiency

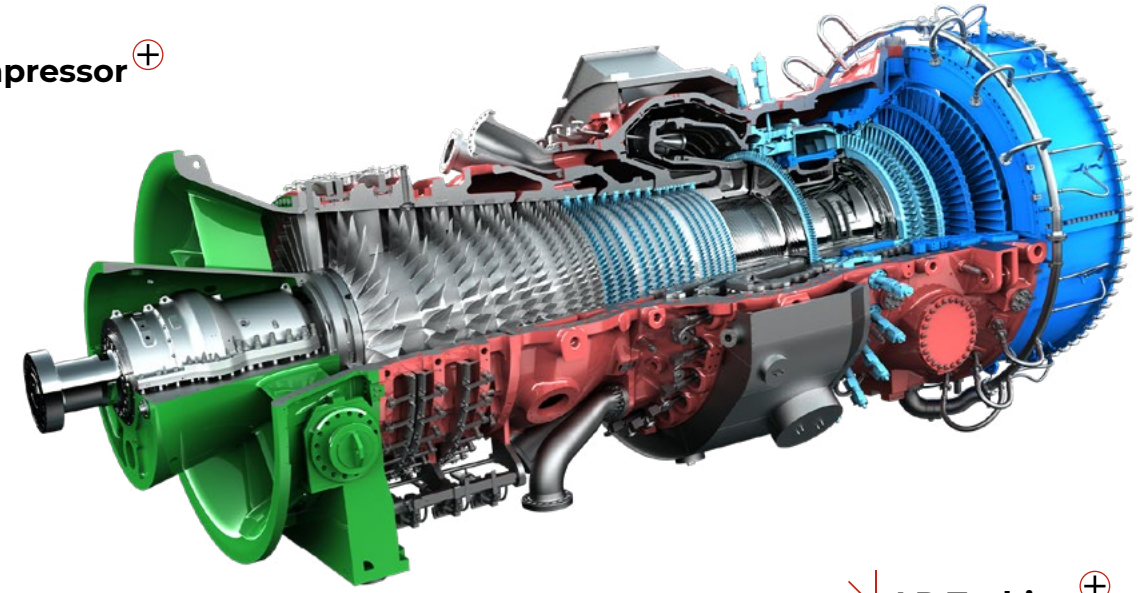
+12.000
operating hours

*Depending on site conditions

MXL3

SCOPE (RELATIVE TO MXL2)

Compressor ⊕



LP Turbine ⊕

SEV Combustor ⊕

MXL3

LOW PRESSURE TURBINE

Redesigned Turbine front stages to increase performance and enable a modular upgrade incorporating latest H-class technology.

Click on the button and discover in detail the redesigned LPT front stages with latest H class technology

LOOK IN DETAIL

MXL3

KEY FEATURES

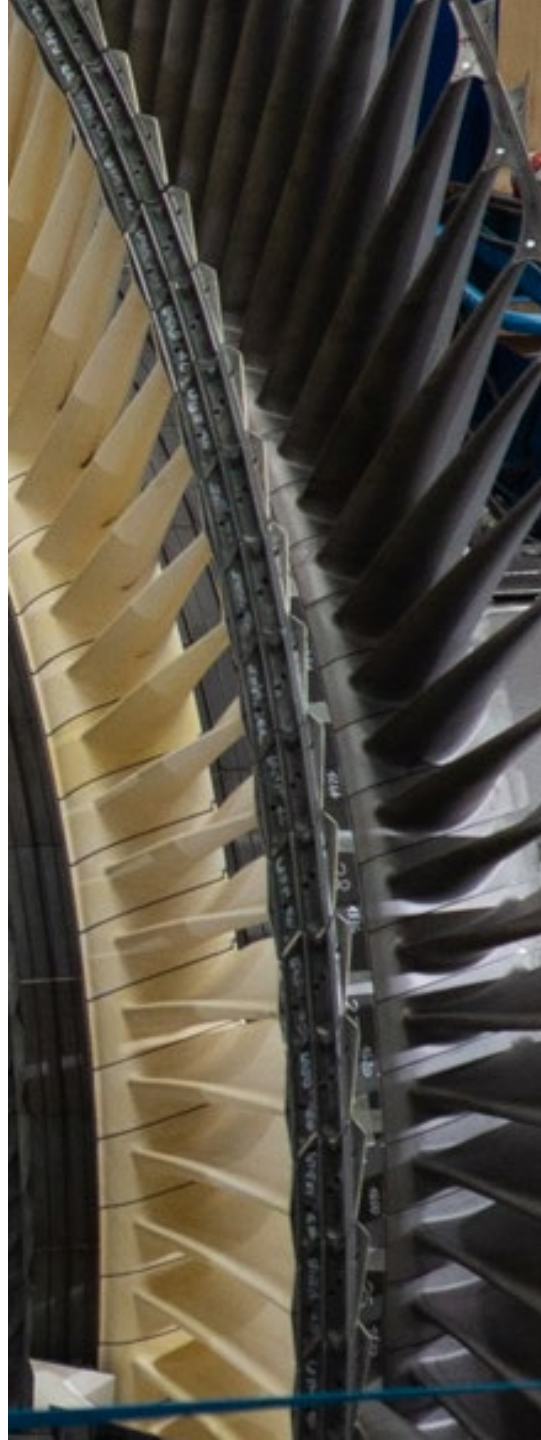
COMPONENT REDESIGN

- New SEV burners lances and introduction of Low Frequency Dampers.
- Redesigned stages 1 and 2 of Low Pressure Turbine.

For increased firing temperature.

MXL3 UPGRADE COMPATIBILITY

- The MXL3 Upgrade can be installed in any GT26 Rating 2006 independent if an MXL2 Upgrade has been previously installed.
- Applicable to all GT26 Ratings prior to Rating 2011 with pullable EV burners.
- The MXL3 Upgrade is compatible with any Ansaldo Energia Flexibility Upgrade such as Extended Low Part Load Operation (eLPL) or Extended Low Load Operation (eLLO) as well as.
- Fuel Flexibility Package



MXL3

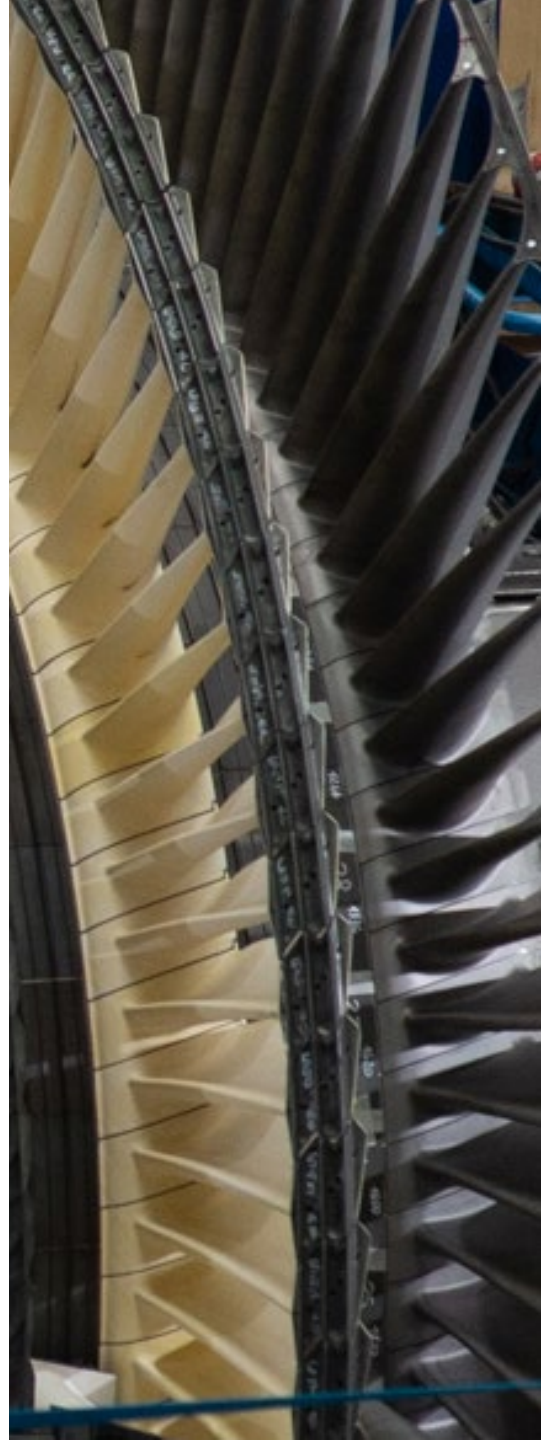
KEY FEATURES

CUSTOMER BENEFITS

- Designed to fit into existing power plant configuration.
- Modular GT upgrade with low level of intrusion.
- Increased performance (up to 35 MW / 1.6 % more).
- Significant reduction of specific greenhouse gas CO_2 emissions.
- Reduced maintenance costs (up to 12’000 hours inspection interval extension).
- Fuel Flexibility from 0 to 45 volume % H_2.
- Improved operational flexibility (M / XL mode).

TECHNICAL FEATURES

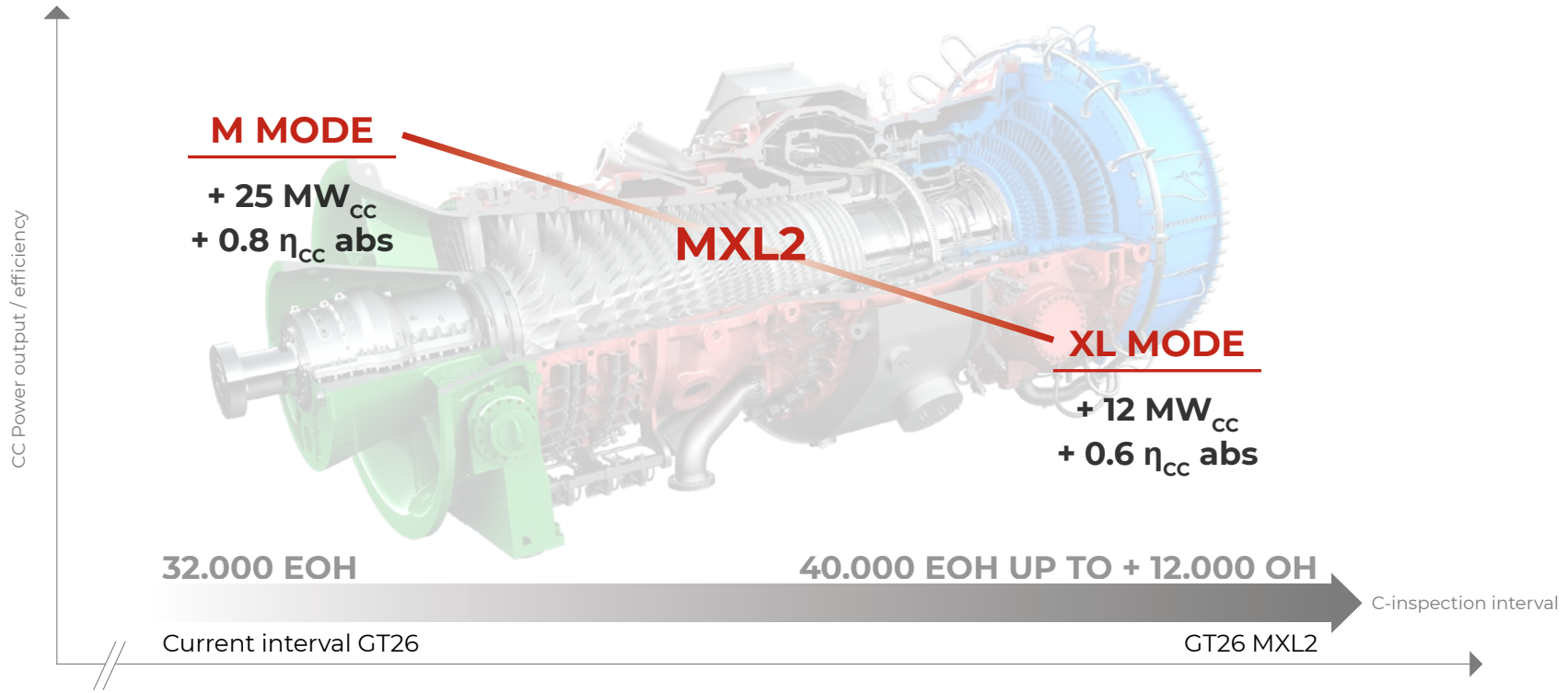
- Implementation of H class technology.
- Partially redesigned compressor for optimized stability.
- Retrofit of proven GT26 Rating 2011 SEV combustion chamber to guarantee emission and combustion compliance dynamics at increased firing temperatures.
- Redesigned stages 1 and 2 of Low Pressure Turbine to accommodate for increased firing temperature.



MXL2 & MXL3

UPGRADE PERFORMANCE

FLEXIBLE OPERATION MODES



Baseline for MXL2 Upgrade: One GT26 (2006)

MXL2

MXL3

FUEL FLEXIBILITY

MARKET BACKGROUND

Nowadays the demand to increase CCGT flexibility is also expanded to operate on gaseous fuels with **fluctuating compositions**. Such fluctuations can occur more frequently as gas supply disruptions are becoming more common and Liquified Natural Gas (LNG) shipments are ramping up globally.

Furthermore, an increase of the **hydrogen content** of gaseous fuels in the mid future seems to be a viable way to **produce low carbon emission energy** with combined cycle power stations.

With Ansaldo Energia's Fuel Flexibility Package, your plant will be able to respond rapidly and reliably to these changing boundary conditions and have the agility to take **advantage of favourable commercial conditions** for fuels on the spot market.

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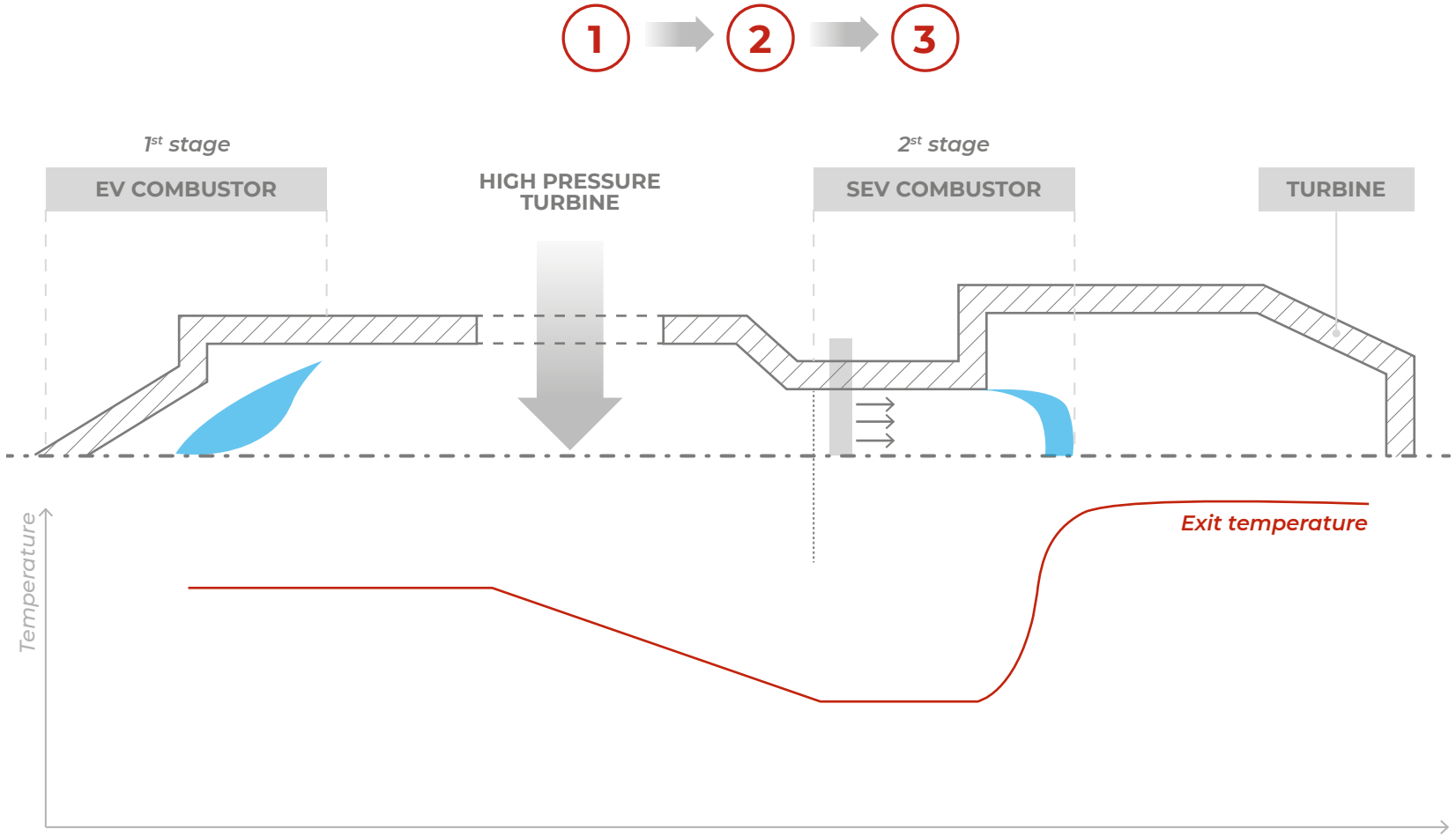
FUEL FLEXIBILITY

PACKAGE

Schematic representation of sequential combustion flexibility.



FUEL FLEXIBILITY

HOW YOU BENEFIT

SOLUTIONS

Ansaldo Energia has developed new control concepts using fast gas analysers to detect the current fuel composition in real time and consequentially adjust the GT operation concept automatically to utilize the current gas in the most effective way without derating the engine or increasing pulsations beyond tolerable limits. Whereas traditional gas chromatographs have response times of the order of 15 minutes, the 20 second response time of infrared sensors allows near real-time optimisations of the operating concept for the current fuel compositions.

With Ansaldo Energia's Fuel Flexibility Package, your plant will be able to adapt quickly and reliably to changing compositions and variations of the Wobbe Index of gaseous fuels.
Additionally, there may be the future need to increase the hydrogen content in the fuel gas to reduce carbon emissions and thus make your plant produce greener energy. However, the existing combustion technology of all major OEM's is designed for low hydrogen contents only. The use of the Fuel Flexibility Package in combination with Ansaldo Energia's sequential combustion technology and the latest available hardware enables the GT26 to operate on hydrogen contents up to 40 % already today.

Fuel Type	Fuel Mix Fluctuations
C_2+	**0 to 16**
H_2	**0 to 45%**
WOBBE INDEX	**31 to 52 MJ/m³**

FUEL FLEXIBILITY

HOW YOU BENEFIT

VARIATION OF HIGHER HYDROCARBONS (C_2+) LOOK AT THE GRAPH

The fuel flexibility package can detect immediate fluctuations of C_2+ contents in the fuel which are impacting the combustion dynamics throughj the fast responce infrared sensors gas chromatographs.
This allows a quicker adjustment of the operation concept and thus reduces the risk of experiencing emissions and/or pulsations that are out of the permissible range. Especially the latter is beneficial for the life time of your GT26's components.

INCREASING HYDROGEN CONTENT (H_2)

As a contribution to reduce the emission of carbon dioxide an increase of hydrogen content in gaseous fuels can be an option. In combination with the benefits of Ansaldo Energia's unique sequential combustion system of your GT26, the Fuel Flexibility Concept can be used to adapt the GT operation concept to fluctuating hydrogen contents that can range from 0 up to 25% with Rating 2006/MXL2 combustor hardware. The combustion hardware used in the GT26 MXL3 upgrade package can extend the hydrogen content in the fuel to a maximum of 45% hydrogen without impact on the performance.

VARIATION OF WOBBE INDEX (WI)

The Ansaldo Energia fuel specification for GT26 Rating 2006 allows a fluctuation of the Wobbe Index of the fuel between 36 and 52 MJ/m^3. The Fuel Flexibility Package extends the lower limit to 31 MJ/m^3.
It is also connected to the fuel heater control, adjusting the fuel temperature to get the optimum efficiency of the gas turnbine, while keeping the wobbe index within the permissible range.

EXTENDED LOW PART LOAD & EXTENDED LOW LOAD OPERATION

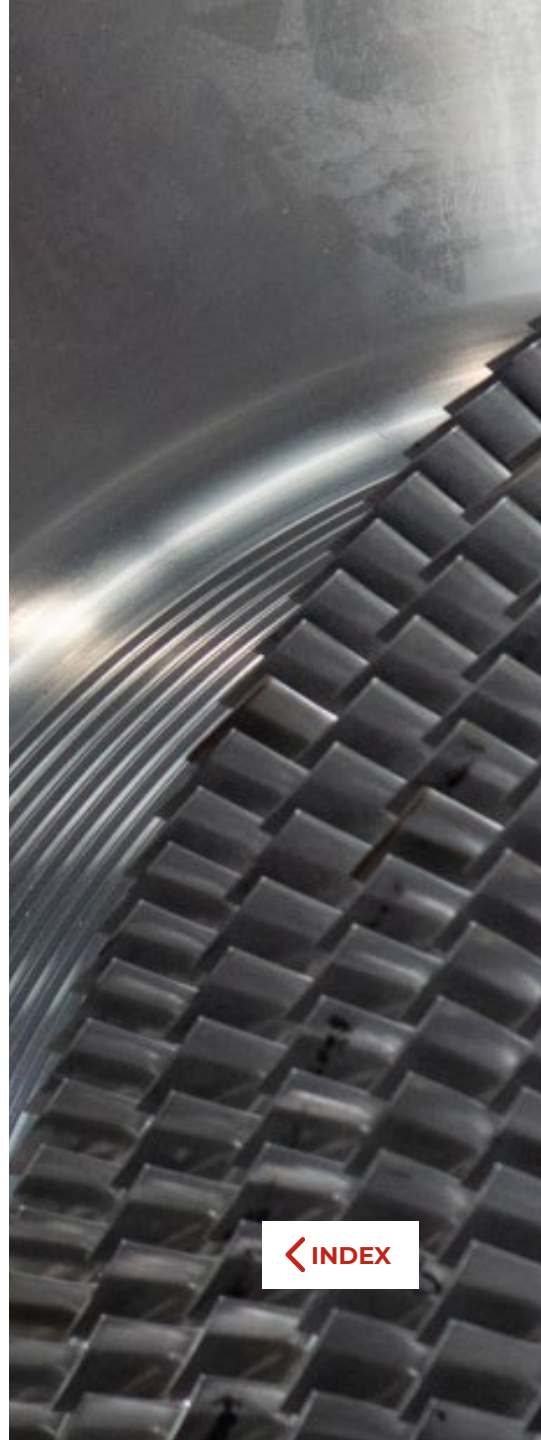
eLPL

The market requirement to extend plant operating ranges by turning down to lower loads led Ansaldo Energia to develop the Extended Low Part Load Opearation (eLPL), an emission compliant flexibility solution.

- Additionally, frequency response capability is available over the entire load range.
- Gas turbine load is controlled by temperature and mass flow.
  Normal operation foresees that both combustion chambers are turned on.
- GT26 eLPL operation benefits from the sequential combustion architecture.
  It adjusts the load by controlling the number of SEV burners in operation.
  This ensures low CO emissions are achieved and the plant's Minimum Environmental Load (MEL) can be reduced.

eLPO

Extended Low Load operation (eLLO) is now seamlessly integrated to further extend the operation range towards even lower plant loads. During eLLO only the first combustor is in operation.



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eLPL/eLLO

HOW YOU BENEFIT

- Increased load flexibility
- Reduced fuel costs at minimum environmental load
- Larger spinning reserve
- Frequency response capability over the entire load range
- Full fuel flexibility
- Best-in-class turn-down while maintaining low emissions and high efficiency

REDUCING COST OF ELECTRICITY

<20% minimum environmental load achieved, reducing fuel cost

LOWERING ENVIRONMENTAL FOOTPRINT

LOW CO & CO_2 thanks to reduced minimum environmental load

INCREASING FLEXIBILITY & RELIABILITY

>80% load range achieved, maintaining emission and frequency response compliance

eLPL/eLLO

KEY FEATURES

Extended Low Part Load Opearation (eLPL) solution consists of sequential switch off of single SEV burners*; this allows the extension of the combined cycle load range below 20%, while maintaining an efficiency of 45% thereby reducing fuel costs.

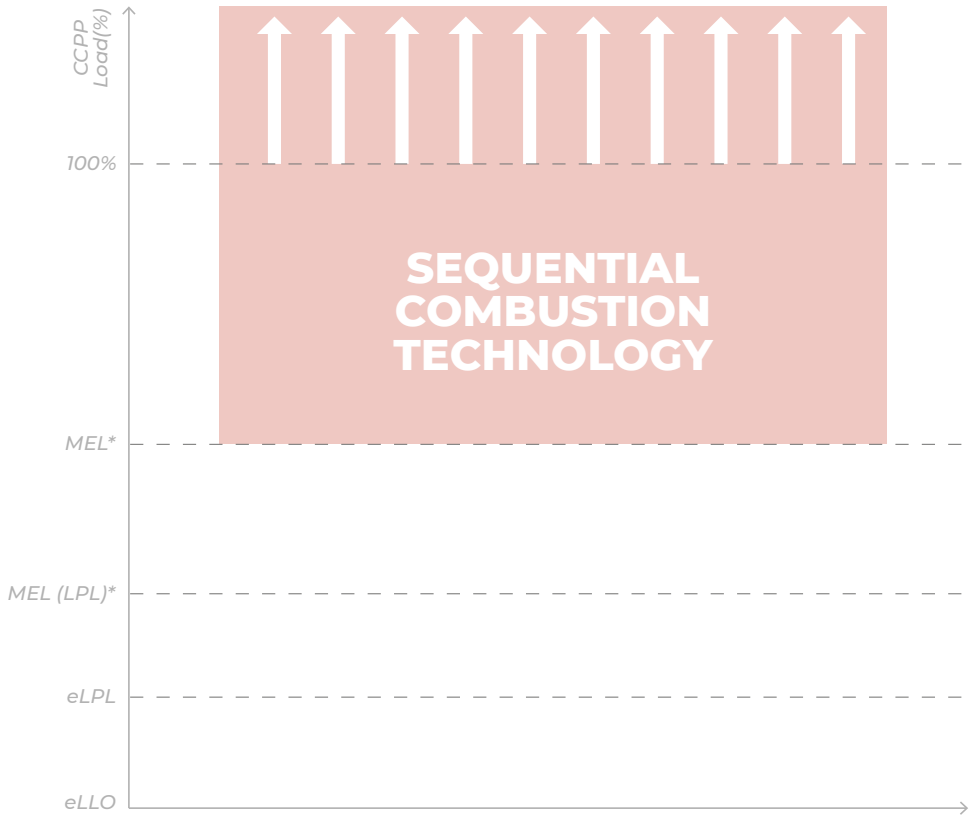
A further reduction, the Extended Low Load Operation (eLLO), could be achieved with additional hardware modification.

- Operation window from near zero GT load to full load
- Full NOx and CO compliance
- No “gaps” in operation range seamless transition between eLPL and eLLO
- No preparation time for WSC
- Frequency response capability
- Compatibility with Autotune

* Additional shut off valves are required if your GT is not equipped with LPL

SELECT YOUR CURRENT GT TURNDOWN

MEL **MEL LPL**



*MEL: Minimum Environmental Load subject to allowed emission limits

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