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# AE94.3A

*Flexibility upgrades*





# AE94.3A

## Flexibility upgrades

In the current power generation market, the environmental, economic and regulatory factors urges gas turbine operators to be always more flexible in providing energy to the grid.

Flexibility of gas turbines is the key, both in terms of *operational* and *fuel flexibility*.

Faster start up time and grid frequency control, extended operational ranges, from Minimum Environmental Load (MEL) to Base Load, are necessary requirements in an highly dynamic dispatching mode.



Based on robust experience on the field, accumulating remarkable operation track and contributing to massive CO<sub>2</sub> saving, the extremely versatile hydrogen combustion solutions developed by Ansaldo Energia can help speed up the transition to a decarbonized energy future.

AE94.3A Flexibility Upgrades	Expected Gains	Flexibility Packages	
Operational Flexibility - MEL reduction	MEL up to – 40MW without CO Catalyst	Regulating blow off IGV turn down	CO Catalyst Anti-Icing
Operational Flexibility - Startup Time and Grid Frequency Support	Fast Start up in 17 min	Load Rate Purge Credit	
Fuel Flexibility	Natural gas H <sub>2</sub> mix 25% well-proven CO <sub>2</sub> savings up to 40,000 tons/year	Roadmap to 100% H <sub>2</sub>	

# Operational Flexibility

## Your Gas Turbine:

These packages are applicable to all version of AE/V94.3A and SGT5-4000F GTs

## Minimum Environmental Load (MEL)

The market requires Combined Cycle to be always more flexible by operating with an efficient low load, in a restrictive environmental conditions.

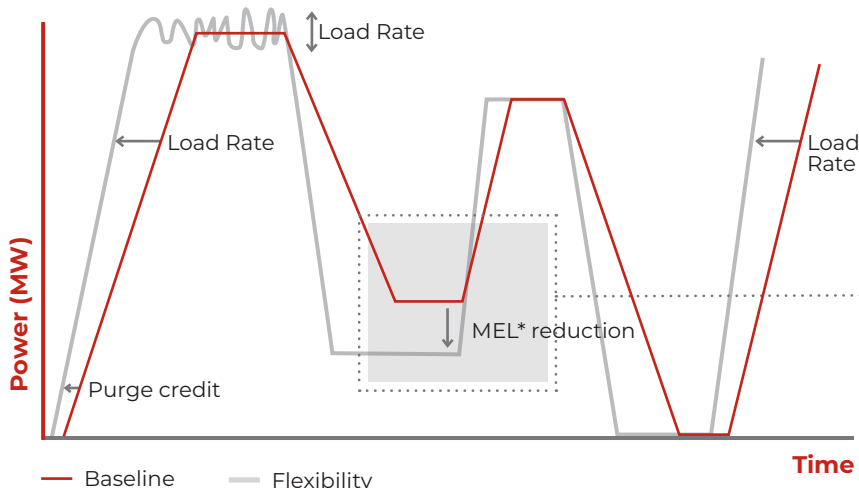
The following packages can be combined to achieve a MEL reduction up to 40MW, maximizing their effectiveness in a wide range of environmental condition:

- **Regulating blow off:** in order to reduce the load while meeting environmental limits, the two blow off valves of the compressor can be adjusted, allowing the reduction of the amount of air sent to the combustion chamber and to the turbine.
- **IGV turn down** this upgrade allows a reduction of the compressor mass flow by means of a new IGV closing position. As a consequence a minimum part load reduction is achieved, without impacting the CO<sub>2</sub> limits.
- **Anti-Icing:** the anti-icing system, which in normal operation is used for heating the compressor air inlet by spilling air from the compressor, can undergo a software modification to create an automatic control loop that spills air to the compressor. Further reduction can be achieved with our anti-icing and CO catalyst packages.

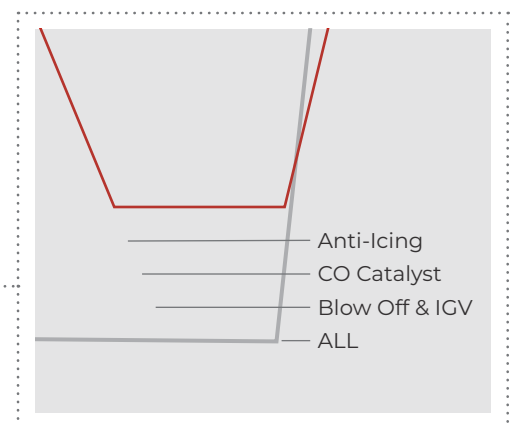
Further reduction can be achieved with:

- **CO Catalyst:** with the installation of a catalyst in the boiler, the gas turbine can be operated below IGV minimum position in compliance with CO<sub>2</sub> emissions. NOx can be controlled through pilot adjustments. The CO catalyst allows a MEL reduction up to further 20 MW. GT operation can be released for primary and secondary frequency control up to 30 MW/min even with IGV fully closed.

### High flexible operation achievement



### MEL\* Reduction



\* MEL: Minimum Environmental Load subject to allowed emission limits

## Your benefit



### PROFITABILITY

- Higher chance to stay synchronized to the grid
- Opportunity to participate to ancillary services market
- Lower fuel consumption
- Faster reaction in case of power requests from the grid than (hot) restart



### AVAILABILITY

- Higher reserve power
- No cycling event counted (in comparison to hot fast start)
- Lower (absolute) emissions
- Avoidance of risk of start-up failure

## Startup Time and Grid Frequency Support

The increasing contribution of renewables sources lead to an increased need of grid stability. Combined Cycle operators are called to meet this challenge, with faster start up and frequency control.

- **Load Rate** to achieve faster up and down ramps. This package includes GT controller modifications on IGV, OPERational Concept (OPC) and load control functions. Special sessions of combustion tuning and parameter adjustments are necessary in order to check combustion stability and controller actions. Further load rate improvement can be obtained with Autotune.
- **Purge Credit** engineered and tailor-made solutions in order to achieve purge credits which are fully compliant with safety regulation NFPA85\*. Existing plants can be retrofitted with additional gas valves, skid and piping adjustment, and update of I&C. In such a way, the boiler purge executed during GT shutdown become a credit purge for up to 192 hours. This design robustness and operational flexibility save up to 17 minutes of a typical cold start-up time, leading to fuel costs-savings and increased availability.

**AutoTune**

### ***Autotune increases the flexibility of your power plant.***

Leads to self-optimization, performance increase, emission control improved reliability, reduced external intervention:  
find **Autotune in our Digital offering.**

\* National Fire Protection Association's Standard #85, "Boiler and Combustion Systems Hazards Code" (NFPA85)



## Fuel Flexibility – Hydrogen co-firing

The nowadays markets rules lead energy providers to meet European carbon reduction targets.

Most of the existing gas turbines can already burn hydrogen blended in the gas network with very limited components changes: the main modifications are adaptations in the gas turbine and plant operation system that can be made during a standard outage.

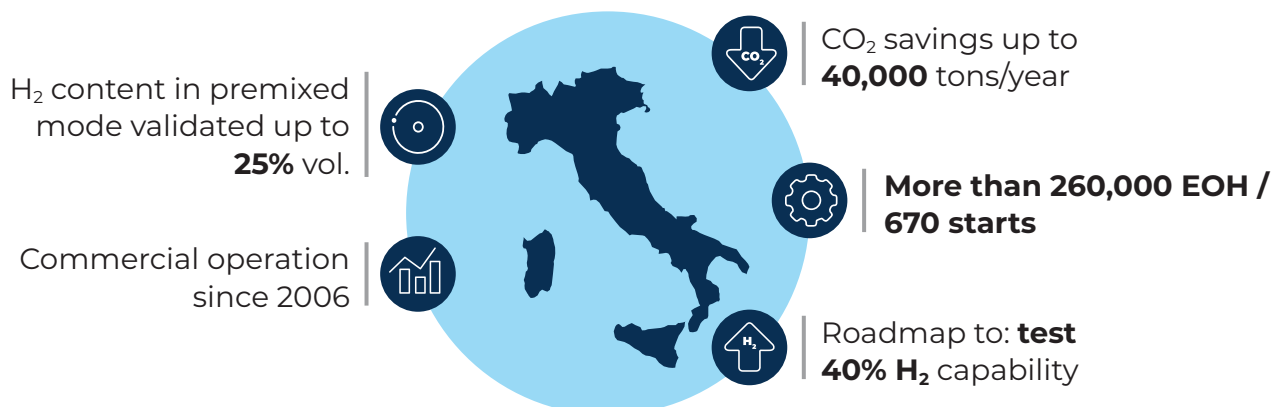
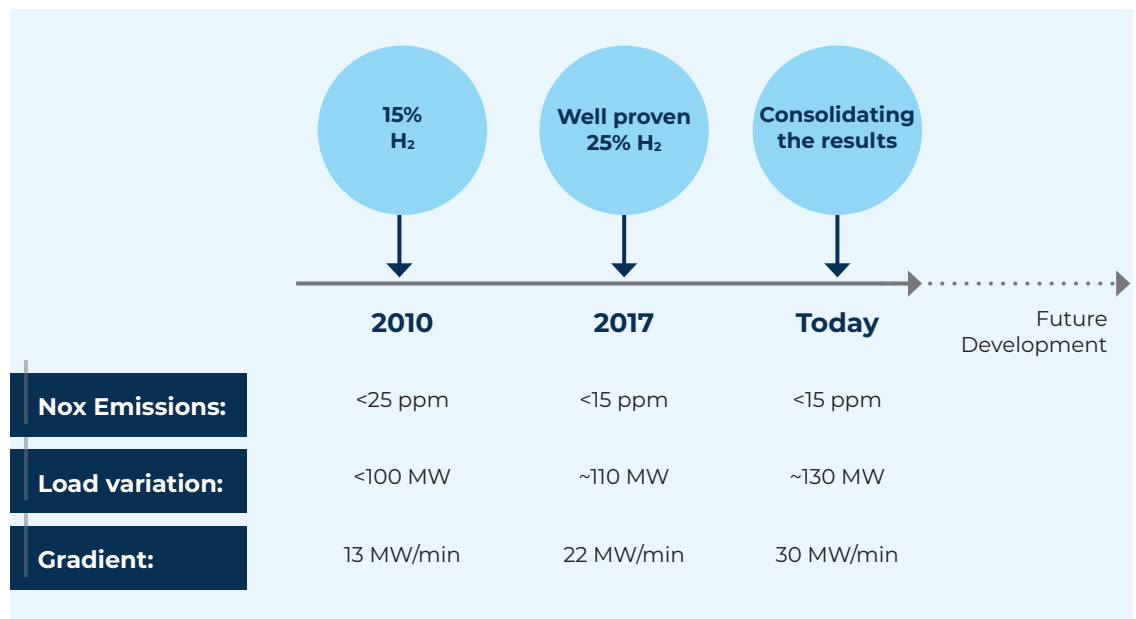
Thanks to R&D achievements, we can already burn 25% hydrogen, with a roadmap to reach 100% in 2030.

Significant quantity of hydrogen in the blend would allow energy producers:

- to reduce CO<sub>2</sub> emission
- to guarantee supply continuity
- to avoid stranded assets, protecting power generation investments.

Ansaldo Energia proven track record: the Brindisi Power Plant business case.

2 Units in CCPP with H<sub>2</sub> supplied by a chemical plant next to the plant.





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