In the current power generation market, economic and regulatory factors are forcing Gas Turbine operators to be more flexible in terms of faster startup times and extended operational ranges, from Minimum Environmental Load (MEL) to Baseload operation.

Ansaldo Energia has developed an extensive portfolio of hardware upgrade solutions and control software packages for your gas turbines that, in single or combined cycle mode, are focused on four goals:

**MEL reduction - up to 80 MW**
- Regulating blow off valves
- CO catalyst installation
- Anti-icing for minimum load reduction

**Extended load gradients - up to 50 MW/min**
- Cooling valve GV2- GV3 optimization
- Humming Active Control
- Load ramps improvements

**Reduced startup times - up to 17 minutes saved**
- Up to 22MW/min cold startup gradient
- Purge Credit - TILS1142

**How You Benefit**
These packages are applicable to AE/V94.3A and SGT5-4000F GTs. All the hardware packages (Blow off, CO catalyst, SAS UP, Purge Credit) can be implemented during a mechanical maintenance, and the software packages (anti icing, cooling valves, humming active control, load ramp improvements, cold startup gradient improvement) can be applied during a minor inspection or a scheduled stop of a few days.

All the software modifications are engineered and tailored for any control system model, with a factory simulation prior to site installation.

**CUSTOMER BENEFITS**
- Enhanced market competitiveness
- Improved plant availability
- Increased plant profitability

**TECHNICAL ADVANTAGES**
- MEL Reduction
- Extended Load Gradient
- Power Augmentation
- Startup Time Reduction
- Emissions Reduction
Technical Specifications

Blow off regulating valves
In order to reduce the load while meeting environmental limits (MEL), the two blow-off valves of the 5th compressor stage E1.1 (MBA41AA151) and E1.2 (MBA42AA151) can be adjusted, allowing part of the compressor air to be released which reduces the amount of air sent to the combustion chamber and to the turbine, resulting in an MEL reduction of up to 10MW dependent on external ambient conditions.

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

Anti-icing for Minimum Load reduction
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 thus reducing MEL up to 10MW.
Cooling valves GV2- GV3 optimization

With this upgrade, the cooling air flow through the 2nd and 3rd turbine stage vanes is optimized, moving it from a constant set point to variable set points depending on operating conditions. Cooling air valve movements give a higher stability margin for load ramps, increasing GT performance at base load, and enabling an MEL reduction of up to 3 MW.

Humming Active Control

Software modifications within the GT controller that provide feedback on combustion frequencies coming from an additional Vibrometer card, enable a specific combustion analysis. This increases reliability during ramps and base load operation and achieves load ramps of up to 50 MW/min.
Load ramps improvements
This package consists of GT controller modifications on IGV, OTC and load control functions that give higher stability during fast up and down ramps. Special sessions of combustion tuning and parameter adjustments are necessary in order to check combustion stability and controller actions.

SAS UP - Secondary Air System Upgrade
A GT performance increase can be realized through making available a higher amount of primary air for combustion with enlarged cooling holes, improved cooling hole patterns and the use of special ceramic heat shields.
Cold Startup Gradient Improvement

The ability to startup as quickly as possible is valued by operators who must respond to quick changes in power grid demand. With the successful verification of the turbine’s structural integrity, it is now possible, after synchronization, to load the GT with a gradient up to 22 MW/min with no impact in the Equivalent Operating Hours (EOH) counter.

Startup Purge Credit

Referring to the National Fire Protection Association’s Standard #85, “Boiler and Combustion Systems Hazards Code” (NFPA85), the AEN gas turbine’s fuel gas supply system is designed such that the power plant’s heat recovery steam generator (HRSG) can be purged during the gas turbine shutdown and maintained compliant with NFPA85 for up to 192 hours - thus a cold start HRSG purge is not required in this timeframe. This design robustness and operational flexibility saves up to 17 minutes of a typical cold startup time, saving the operator fuel costs and increasing availability.

The Purge Credit modification includes:

- Hardware installation of additional ESV, vent valve and instrumentation required
- Software configuration of GT controller for valve management and GT sequence adaptation to the new operating mode