

# MS5001N-P Advanced Technology Uprate

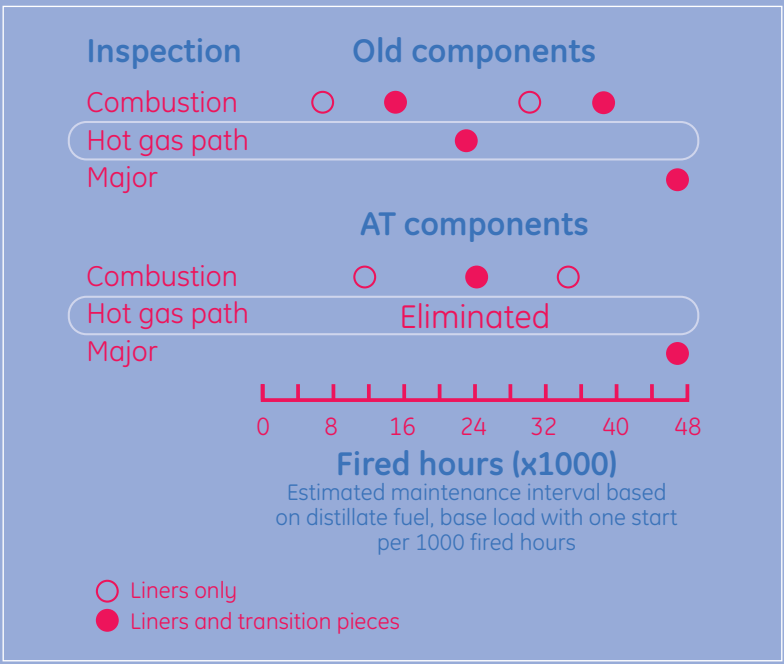
## Benefits

- ■ ■ Increased production
- ■ □ Higher efficiency
- □ □ Compliance with environmental regulations
- ■ ■ Availability and Reliability
- ■ □ Life extension

This upgrade package improves efficiency and output and extends maintenance intervals. Output increases by approximately 6%, heat rate decreases by about -2%, and exhaust temperature increases by 10°F degrees Fahrenheit. This new technology uprate extends the recommended combustion inspection intervals by as much by up to 50% and allows the hot gas path inspection to coincide with the major inspection thereby reducing planned outages.

Performance	MS5001P	MS5001PA (*)	Δ
Power kW	24,600	26,300	+6%
Heat rate kJ/kW h	12,950	12,650	-2%

(\*) New and clean expected values obtained with natural gas at ISO Condition



## What it is

The MS5001 unit was first introduced in 1957. Various improvements in combustion and turbine hot gas path design have been made over the years, as the unit was uprated from the MS5001A to MS5001P model. This unit is suitable for both mechanical and generator drive applications. The original MS5001N and P gas turbines were introduced in 1970s with firing temperatures of 1,730°F and outputs from 24,600kW. Changes made to the original designs and in materials over the years have enhanced performance and reliability while decreasing the need for maintenance.

These advancements, now available for retrofits as an advance technology uprate package, can increase your MS5001's power output and firing temperature to 1,765°F and outputs to 26,300kW respectively. Combustion inspection at 2,400 firing hours has been eliminated.

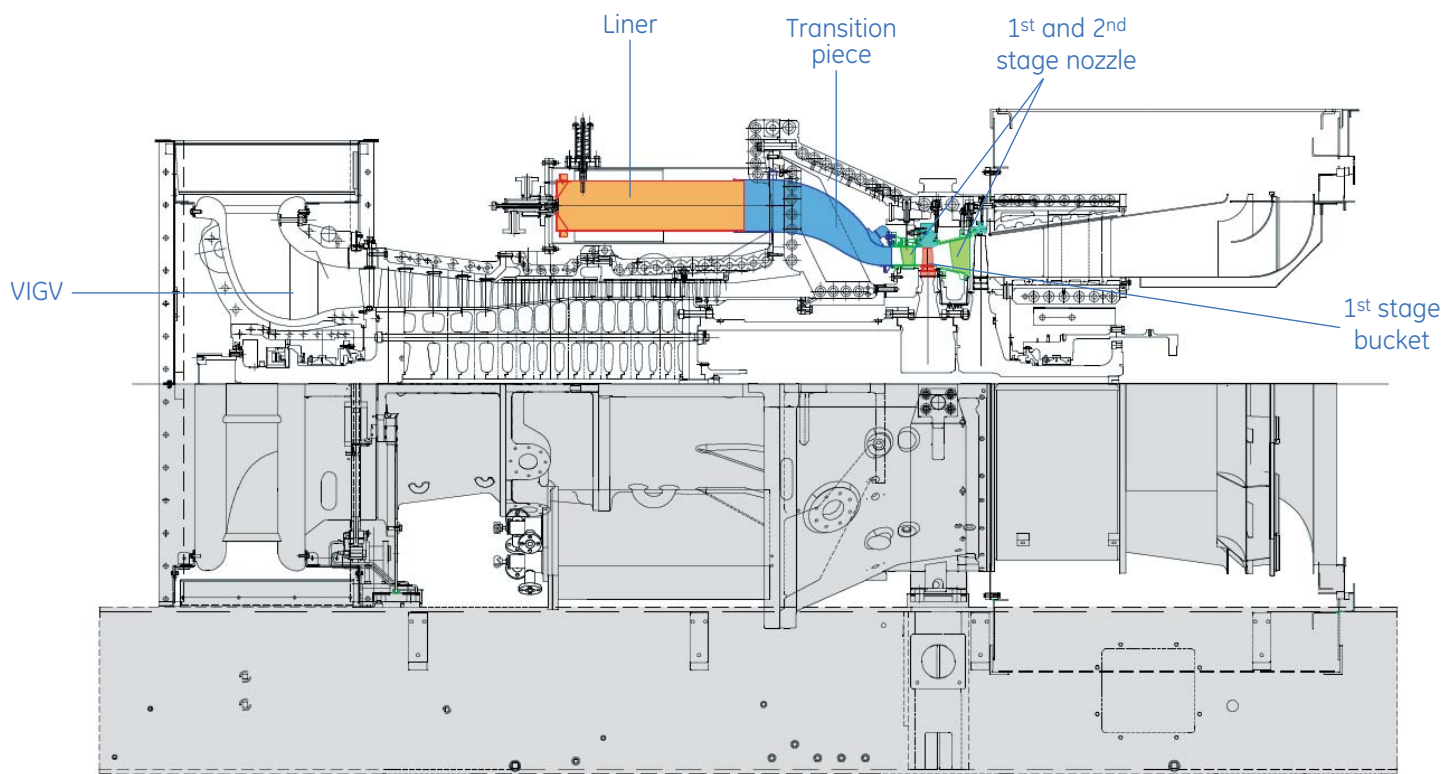
Examples of these developments include:

- New bucket materials to permit higher firing temperatures with concurrent efficiency/output gains

- New coating and coatings techniques
- New combustion components, designed for extended component life

This uprate is a well-proved technology and several units with advanced technology parts have had more than 50,000 operating hours since the uprate.

Model	MS5001N (G5251)	MS5001P (G5341)
Compressor stages	16	16
Firing temperature (F°)	1,730	1,730
Exhaust temperature (F°)	940	898
Air flow (10 <sup>3</sup> Lb/hr)	850	928.5
Output (kW)	21,392	24,700
Heat rate (kJ/kW-h)	13,740	12,950
Efficiency %	26.2	27.8



## How it works

The new technology uprate offers an improvement in output power and in heat rate, due to both the improved aerodynamics and the increased firing temperature.

The P N/T package improves output power by several percentages due to improved aerodynamics, primarily due to an increase in firing temperature. Output is further improved with the recommended options of reduced camber IGV's and advanced seals. Fuel efficiency is also improved. The new technology hardware is more robust compared to original hardware (pre-1987), and offers a substantial maintenance improvement. The new technology hardware includes the hot gas path hardware from the combustion liners through to the second stage bucket.

Higher NOx would accompany the increased firing temperature. To counter the higher NOx level, GE offers the Low NOx LHE liner, which can be substituted into uprates without any performance penalty. The MS5001P advanced technology uprate package was developed for increased output and increased maintenance intervals. The modification kit replaces existing main components (1<sup>st</sup> stage bucket and nozzle, support ring, combustion liners, transition pieces, etc.) with advanced technology components. The advanced technology combustion system includes new technology combustion liners with TBC coating, splash plate cooled crossfire tube collars, longer hula seals and hard facing on the crossfire tubes.

Replacement of uprated parts can be done during a major inspection.

### Scope of Supply

The scope of supply for this uprate include the following:

- New fuel nozzle tips
- New hard faced cross fire tubes
- New transition pieces
- New combustion liners
- New 1<sup>st</sup> stage shroud
- New 2<sup>nd</sup> stage shroud
- New 1<sup>st</sup> stage rotor buckets
- New 1<sup>st</sup> stage nozzle arrangement
- New 2<sup>nd</sup> stage nozzle arrangement
- New cooling and sealing piping arrangement
- Control system modifications

Flame detectors and new Inlet Guide Vanes kit will be added as needed.

	Package 1	Additional
<b>PERFORMANCE</b>	<b>AT uprate</b>	
	<b>5001N G5251</b>	<b>5001P G5341</b>
Firing temperature	1,765 °F	
<b>Output</b>	<b>+ 20.0%</b>	<b>+6.0%</b>
<b>Heat rate</b>	<b>- 8.0%</b>	<b>-2.0%</b>
Exhaust temperature	910 °F	
Exhaust flow	985 klb/hr	
<b>MAINTENANCE</b>		
Reliability/availability	X	
<b>SCOPE</b>	<ul style="list-style-type: none"> <li>• Fuel nozzle tips</li> <li>• Hard faced cross fire tubes</li> <li>• Transition pieces</li> <li>• Combustion liners</li> <li>• 1<sup>st</sup> stage shroud</li> <li>• 2<sup>nd</sup> stage shroud</li> <li>• 1<sup>st</sup> stage rotor buckets</li> <li>• 1<sup>st</sup> stage nozzle arrangement</li> <li>• 2<sup>nd</sup> stage nozzle arrangement</li> <li>• Cooling and sealing piping arrangement</li> <li>• Removable wheel space thermocouple</li> <li>• Wheel space thermocouple conduit arrangement</li> <li>• Control system modifications</li> <li>• Bearing #2 modification</li> </ul>	<ul style="list-style-type: none"> <li>• Compressor reblade</li> <li>• Simple to regenerative cycle conversion</li> <li>• Regenerative to simple cycle conversion</li> <li>• LHE liner</li> <li>• DLN-1 system</li> <li>• Advanced sealing system</li> </ul>



GE imagination at work

GE Oil & Gas  
via F. Matteucci, 2  
50127 Florence - Italy  
T +39 055 4272500  
F +39 055 4232800

Nuovo Pignone S.p.A.

E [customer.service.center@ge.com](mailto:customer.service.center@ge.com)  
[www.ge.com/oilandgas](http://www.ge.com/oilandgas)

COMK/MARK 839/II - Designed by: Studio Tre Fasi  
Printed by: Sagraf - 1-2008  
©2008 Nuovo Pignone S.p.A. all rights reserved