



# LM/TM2500 UPGRADE SOLUTIONS

## Repower Outcomes

Model	Output (MW)	Heat Rate (BTU/kW hr)	HS Interval (hrs)	MOH Interval (hrs)	Start Time (min)	Exhaust Flow (lb/s)	Exhaust Temp. (°F)
Base SAC	23	9,813	25,000	50,000	10	156	962
Base DLE	22	9,447	25,000	50,000	10	150	993
+ SAC	30	9,377	25,000	50,000	10	195	914
+ DLE	30	8,948	25,000	50,000	10	189	967
+G4 SAC	36	9,253	25,000	50,000	10	211	952
+G4 DLE	32	8,863	25,000	50,000	10	199	984

## Upgrade Solutions

Product Offering	Description	SC Output Change (%)	CC Output Change (%)	SC Heat Rate Change (%)	CC Heat Rate Change (%)	Availability	Flexibility	Reliability	HS/MOH Life (khrs)	Emissions	Safety	Regulatory
Inlet Chilling	An inlet chilling system (chiller + inlet coils) will cool the compressor intake air, increasing the air density and engine output.	✓	✓	✓	✓		✓					
Evaporative Cooling	Provides a power output and efficiency increase for sites with high ambient temperatures and low relative humidity.	✓	✓	✓	✓		✓					
Cross Fleet Repower - Non LM to LM2500	Repowering existing non-LM units (Rolls Royce, Pratt & Whitney, Siemens, Westinghouse, etc.) with LM2500 Technology to improve efficiency, reduce emissions, increase flexibility, and modify output.	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Frame 5 Repower - Fr5 to LM2500	Repowering existing Frame 5 units with LM2500 Technology to improve efficiency, reduce emissions, increase flexibility, and modify output.	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Uprate Base SAC to +/-G4	Increasing power of existing plants by changing turbine from a Base unit to either a + or a +G4.	Up to 44% higher output	✓	Up to 10% lower HR	✓		✓			✓		
Asymmetric Diffuser	Reduces power turbine exhaust back-pressure, increases output, improves heat rate.	Up to 2% higher output		Up to 2% lower HR		✓			✓	✓		
Fuel Variability Monitoring System	A means to adjust the fuel schedule on DLE units to maintain continuous operation of the gas turbine through significant changes in gas fuel properties (heating content, composition, etc.).					✓	✓	✓		✓		
High Flow Online Water Wash	Increases the effectiveness of online water washes by improving water flow into the compressor, reducing engine performance degradation caused by compressor fouling.	✓		✓	✓	✓		✓		✓		
Conversion Gas to Dual Fuel	This upgrade provides the capability to run either on gas or liquid fuel, with or without water injection for NO <sub>x</sub> control.					✓	✓					
Conversion Liquid to Dual Fuel	Provides the capability to run either on gas or liquid fuel, with or without water injection for NO <sub>x</sub> control.					✓	✓		✓	✓		
Alternative Fuel Retrofit	Provides the capability to run on alternate fuel (LPG, Naptha, etc.).					✓	✓					
Anti-Icing Upgrade	Prevents ice related internal damage to engine blades, reducing turbine downtime and repair times.					✓		✓				
Hybrid Electric Gas Turbine (EGT)	Adding battery system and controllers to allow unit to operate in spinning reserve mode without operating the turbine. Also allows some sync condensing operations with the battery system						✓			✓		
Sync Condensing	Allows the generator to work as a sync condenser while still maintaining the ability to have a hot start back to creating power.						✓					
4-Hour Lockout Avoidance - Hydraulic Option	Mitigates the 4-hour lockout period required on LM2500 packages after a hot shutdown when the unit is not restarted during the defined period within the control system.					66% lockout reduction		✓			✓	

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4-Hour Lockout Avoidance – DC Motor Option	Mitigates the 4-hour lockout period required on LM2500 packages after a hot shutdown when the unit is not restarted during the defined period within the control system.					66% lockout reduction		✓			✓	
Automatic Vent Fan Lube	Automatic lubrication system will allow adequate lubrication on the ventilation fan and motor bearings to reduce regular maintenance.							✓	✓			
MicroNet* Plus Controls Upgrade	Replacement of existing controllers with a MicroNet* Plus Controls System.					✓	✓	✓				
Core Software Upgrade	Latest core software with the latest reliability, availability and maintenance options built in to improve turbine performance. DLE units specifically have improved CDP valve logic.					✓	✓	✓		✓		
Direct Drive Ventilation Fans	Drop-in replacement upgrade for belt-driven fans for GE packages. Includes options for package and generator.					✓		✓				
Remote VSV Monitoring	A Linear Variable Differential Transducer (LVDT) system is installed that allows remote monitoring of the Variable Stator Vanes (VSV) positions without having to enter the package and take manual readings during engine operation.					✓					✓	
Integrated Electronic Control Variable Stator Vanes (VSV)	Conversion from hydro-mechanical to integrated electronic control VSV to improve positioning and to regain power lost due to stator drift.	Up to +.5% higher output depending on condition of current VSV's				✓		✓			✓	
TDI Clutch	A more robust and reliable hydraulic starter clutch that extends turbine operation hours between maintenance intervals and improves reliability and availability of the hydraulic start system.					✓		✓	✓			
Base Xtend* Hot Section Upgrade – DLE	Increases the hot section life to 50,000 hours, reduces lifecycle costs, and increases site availability.					✓		✓	2X HS life			
Base Xtend* Hot Section Upgrade – SAC	Increases the hot section life to 50,000 hours, reduces lifecycle costs, and increases site availability.					✓		✓	2X HS life			
Vibration System Upgrade	The Bently Nevada 3500 or 3701 Vibration Monitoring System provides continuous, online vibration monitoring.					✓		✓				
Automatic Voltage Regulator Upgrade	The EX2100e excitation control is GE's advanced platform for generator excitation systems.					✓	✓	✓				
MetalSCAN	System used to better monitor bearing life and predict bearing issues. Tracks metal chip count in each turbine lube oil sumps during operation.					✓		✓				
Human Machine Interface (HMI) Upgrade	Allows the user to control the gas turbine more effectively during operation, as well as to monitor live and historical turbine operating data.					✓	✓	✓				
SAC to DLE Conversion	Converting a SAC engine to a DLE to eliminate water while maintaining emissions.								✓	✓		✓
Fire Protection Panel Upgrade	Replaced with an updated, NFPA-compliant fire protection panel.					✓					✓	✓
Water Injection For NO <sub>x</sub> Reduction	For non-Dry Low Emissions (DLE) turbines without a NO <sub>x</sub> abatement system, a water injection system can be added that lowers NO <sub>x</sub> to 25 ppm (gas fuel) or 42 ppm (liquid fuel).	✓								✓		✓
AssetPerformance Management (APM)	Identify the impact of each critical failure mode on total plant reliability, mitigate each with digital solutions, to the extent possible, and measure the effect of the solution as reliability improvement.					✓		✓			✓	



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GE VERNOVA

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Asymmetric Diffuser	Reduces power turbine exhaust back-pressure, increases output, improves heat rate.	Up to 2% higher output		Up to 2% lower HR		✓			✓	✓		
Fuel Variability Monitoring System	A means to adjust the fuel schedule on DLE units to maintain continuous operation of the gas turbine through significant changes in gas fuel properties (heating content, composition, etc.).					✓	✓	✓		✓		
High Flow Online Water Wash	Increases the effectiveness of online water washes by improving water flow into the compressor, reducing engine performance degradation caused by compressor fouling.	✓		✓	✓	✓		✓		✓		
Conversion Gas to Dual Fuel	This upgrade provides the capability to run either on gas or liquid fuel, with or without water injection for NO <sub>x</sub> control.					✓	✓					
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4-Hour Lockout Avoidance – DC Motor Option	Mitigates the 4-hour lockout period required on LM2500 packages after a hot shutdown when the unit is not restarted during the defined period within the control system.					66% lockout reduction		✓			✓	
Automatic Vent Fan Lube	Automatic lubrication system will allow adequate lubrication on the ventilation fan and motor bearings to reduce regular maintenance.							✓	✓			
MicroNet* Plus Controls Upgrade	Replacement of existing controllers with a MicroNet* Plus Controls System.					✓	✓	✓				
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