



# OpFlex\* Solutions Suite

## F Class

OpFlex Solution Suite	Category	OpFlex Product Offering	Description	6FA	7FA		9FA		9FB	Compatible Mark* Controls
				DLN 2.6	DLN 2.6	DLN 2.6+	DLN 2.0+	DLN 2.6+	DLN 2.6+	
Start-Up Agility Fast, reliable, repeatable starts with low emissions	Gas Turbine	Start-up NO <sub>x</sub>	Advanced combustion control to enable low visible emissions above full speed no load and reduced cumulative start-up NO <sub>x</sub> emissions.	●	●	●		●	●	VI, VIe
		Fast Start	Shortened start-up time to full speed-full load to reduce fuel cost, reduce emissions and capture additional revenue. Enables 10-15 minute simple cycle start times.		●	○				VI, VIe
		Purge Credit	Combined control software and valve hardware system to enable purge to be conducted during prior shutdown, followed by isolation of the fuel manifold with a valve system, such that purge can be skipped on start-up, enabling 15+ min. combined cycle start time savings (NFPA-85 compliant).		●	○		●	●	VI, VIe
		Variable Load Path	Independent GT load and exhaust temperature control to customize start-up and operational load paths, enabling lower fuel burn and faster combined cycle starts (requires AutoTune MX).			○		●	○	VIe
Combustion Versatility Robust operation during weather, fuel, and grid variations	Automated Tuning	AutoTune MX	Full automated DLN tuning at all loads; extends AutoTune DX technology to all combustion modes (requires ETS).			○		●	○	VIe
		AutoTune DX	ETS plus closed-loop DLN control module using combustion dynamics feedback for Mode 6 automated tuning.	●	●	●		●	●	VI, VIe
		AutoTune LT	ETS plus continuous DLN fuel split biasing.		●					VI, VIe
		Ambient Select	DLN fuel split schedules within the control system to accommodate basic seasonal DLN tuning needs.	●	●		●	●		V, VI, VIe
	Grid Stability	Enhanced Transient Stability (ETS)	Advanced Model-Based Control (MBC) architecture for GT operation plus grid stability software package to ensure reliable transient operation.	●	●	●	●	●	●	VI, VIe
Load Flexibility Load range expansion, efficiency and responsiveness	Output	Variable Peak Fire	Online user or AGC adjustable peak fire for additional output, subject to user defined MW or emissions limitations. Peak maintenance factor applies.	●	●	●	●	●	●	V, VI, VIe
		Variable Airflow	Online, user adjustable max IGV setting for better output or better CC heat rate (requires AutoTune DX); one-time fixed adjustment possible for older controller, non-AutoTune configurations.	○	●	○		○	○	V, VI, VIe
		Cold-Day Performance	Utilizes AutoTune DX technology to allow removal of legacy cold weather firing temperature suppression, enabling higher output (+5 MW at 0°C).	●	●	○		●	●	VI, VIe
	Responsiveness	Fast Ramp	Enables faster up/down load ramping at up to 2.5x the nominal rate while in emissions compliant operation (Mode 6); (requires ETS).		●	○		●		VI, VIe
		Grid Services Package	Advanced load control software to enable compliance to global grid codes and grid testing requirements, and enable participation in grid support ancillary services markets (requires ETS).	●	●	●	●	●	●	VI, VIe
	Turndown	Extended Turndown	Combustion control software to extend the emissions-compliant load range to 5% - 10% lower load levels.	●	●			●	●	V, VI, VIe
	Efficiency	Variable Inlet Bleed Heat (IBH)	Replaces static IBH schedule logic with online models to enable part load heat rate benefit of 1% or more (requires AutoTune DX).	○	○	○		●	●	VI, VIe
System Reliability Enhancements for reliable, cost effective operations	Operational Packages	Start-Up Reliability	Redesigned start permissives, automated system pre-start checks (various pumps, fans, valves), and HMI start-up sequence screens to reduce the number of failed starts.	●	●	●		●	●	VIe V, VI (future)
		Diagnostics & Productivity	Software enhancements that improve operator's capability to quickly diagnose and resolve system issues and efficiently execute system tests and procedures.	●	●	●		●	●	VIe V, VI (future)
		Trip Prevention	Enhanced protection logic to avoid gas turbine trips related to problematic exhaust conditions (spreads, over temp., over press.), IBH control, fuel pressure, GCV calibration, etc.	●	●	●		●	●	VIe V, VI (future)
	Fuels Packages	Liquid Fuel Reliability	Enhanced control logic to avoid trips during fuel transfers, improve atomizing air sequencing, and reduce recirculation system parasitic loads.	●	●	○		●	●	VI, VIe

DLN = Dry Low NO<sub>x</sub> combustor

● Available  
○ Coming Soon

## B-E Class

OpFlex Solution Suite	Category	OpFlex Product Offering	Description	6B		7EA		9E		Compatible Mark Controls	
				STD	DLN 1/1+	STD	DLN 1/1+	STD	DLN 1/1+		
<b>Start-Up Agility</b> Fast, reliable, repeatable starts with low emissions	Gas Turbine	Fast Start	Shortened start-up time to full speed-full load to reduce fuel cost, reduce emissions and capture additional revenue. Enables 10-15 minute simple cycle start times.	○	○	●	●	○	○	V, VI, VIe	
		Automated Tuning	AutoTune DX	Automatic tuning of the DLN fuel splits based on continuous emission monitor feedback to improve GT performance and reduce combustion dynamics.		●		●		○	VI, VIe
			AutoTune LT	Automatic tuning of the DLN fuel splits based on control system calculated values to improve GT performance and reduce combustion dynamics.		●		●		●	V, VI, VIe
			Ambient Select	DLN fuel split schedules within the control system to accommodate basic seasonal DLN tuning needs.		●		●		●	V, VI, VIe
Reliability	AutoRecover	Automated detection of and recovery from DLN1/1+ Primary Re-Ignition (PRI) events, providing fast premixed mode with no interruption of high/baseload operation.				●		●	V, VI, VIe		
<b>Load Flexibility</b> Load range expansion, efficiency and responsiveness	Output	Variable Peak Fire	Online user or AGC adjustable peak fire for additional output, subject to user defined MW or emissions limitations. Peak maintenance factor applies.	●	●	●	●	●	●	V, VI, VIe	
	Turndown	Extended Turndown	Combustion control software to extend the emissions-compliant load range to 5% - 10% lower load levels.		●		●		●	V, VI, VIe	
	Efficiency	Variable Inlet Bleed Heat (IBH)	Replaces static IBH schedule logic with online models to enable part load heat rate benefit of 1% or more (Requires AutoTune DX).		●		●		○	VI, VIe	
<b>System Reliability</b> Enhancements for reliable, cost effective operations	Operational Packages	Start-Up Reliability	Redesigned start permissives, automated system pre-start checks (various pumps, fans, valves), and HMI start-up sequence screens to reduce the number of failed starts.		●		●		●	VIe V, VI (future)	
		Diagnostics & Productivity	Software enhancements that improve operator's capability to quickly diagnose and resolve system issues and efficiently execute system tests & procedures.		●		●		●	VIe V, VI (future)	
		Trip Prevention	Enhanced protection logic to avoid Gas Turbine trips related to problematic exhaust conditions (spreads, over temp., over press.), IBH control, fuel pressure, GCV calibration, etc.		●		●		●	VIe V, VI (future)	
	Fuels Packages	Liquid Fuel Reliability	Enhanced control logic to avoid trips during fuel transfers, improve Atomizing Air sequencing, and reduce recirculation system parasitic loads.		○		○		○	VI, VIe	
		Heavy Fuel Oil (HFO) Package	Model-Based Control of GT operation to better compensate for hot gas path fouling due to HFO operation, plus a smart cooldown process and optional automated wash system to shorten offline water wash cycles to recover performance.	●		●		●		VI, VIe	

## Plant

OpFlex Solution Suite	Category	OpFlex Product Offering	Description	Steam Turbine	HRSG	Compatible Mark Controls
				A/D-class	All OEM	
<b>Start-Up Agility</b> Fast, reliable, repeatable starts with low emissions	Steam Turbine	Steam Turbine Agility	Automated start-up control plus revised permissives and rotor stress limits to enable fast, repeatable steam turbine start times.	●		V, VI, VIe; GE or non-GE DCS
	HRSG	Attemperator Control	Model-Based Control (MBC) of attemperation flow to better regulate steam temperature during start-up and transients, enabling more stable operation, fewer trips, and improved efficiency.		●	V, VI, VIe; GE or non-GE DCS
		SCR Control	Model-Based Control of Selective Catalytic Reduction (SCR) system ammonia flow to enable enhanced operation during start-up and transients, resulting in less ammonia slip and lower overall NO <sub>x</sub> emissions.		●	V, VI, VIe; GE or non-GE DCS
		AutoBlend	Model-Based Control of the blending process to better manage steam temperature and flow when bringing a second or third GT online in combined cycle plants.		●	V, VI, VIe; GE or non-GE DCS
		Drum Level Control	Model-Based Control of HRSG drum level to enable more stable operation during starts and transients, and fewer trips.		○	V, VI, VIe; GE or non-GE DCS

DLN = Dry Low NO<sub>x</sub> combustor  
STD = Standard Combustor

● Available  
○ Coming Soon

To learn more about this offering, contact your GE sales representative or visit: [www.gepower.com](http://www.gepower.com).

\* OpFlex and Mark are Trademarks of General Electric Company.  
Copyright © 2016 General Electric Company. All rights reserved.

GEA19566B (02/2016)