



# OpFlex\* Software Enhancement Modules

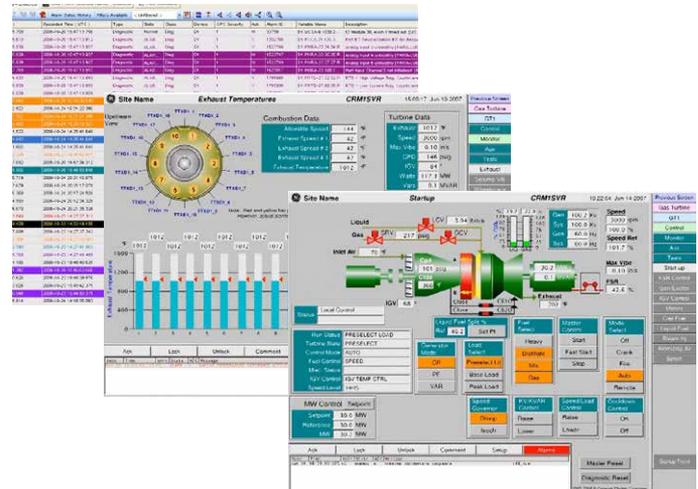
## Trip Prevention Package

### Enhanced System Features and Functionality

GE is proud to provide controls you can trust. You can now benefit from new and improved features on your Mark\* Vle control system and add significant new performance enhancements that provide improved Reliability, Diagnostic, Trip Prevention, and Productivity capabilities to your Mark Vle turbine control.

### Benefits

- Improved availability and system reliability
- Improved operator understanding of gas turbine operation
- Improved fault detection and trip avoidance
- Reduced false and spurious trips and alarms



The Trip Prevention Package consists of the following modules:

#### Upgraded Exhaust Spread Monitoring

Advanced features for sensor fault detection, improved combustion spread monitoring, and TC adjacency logics. These additional features result in improved fault detection to more accurately differentiate between an actual combustion spread event and a false indication due to failed sensors.

#### Exhaust Over-Temperature Transient Protection

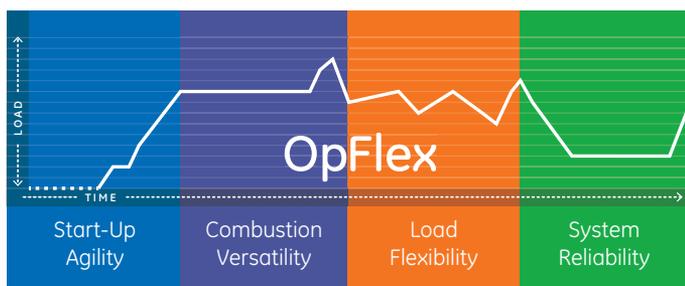
The Exhaust Over-Temperature Transient Protection Flexibility package will increase the time allowed above the exhaust over-temperature trip limit for a short duration to mitigate transient events that cause temporary spikes in exhaust temperature—such as load rejections, gas/liquid fuel transfers, or mode transfers. This will help prevent trips due to temporary spikes in exhaust temperature during transient events. It increases limits only for duration of transients to maintain unit protection.

#### Exhaust Duct Overpressure Protection

Gas turbine exhaust duct overpressure protection is necessary to prevent duct mechanical damage and personnel hazards resulting from restrictions in the gas turbine exhaust path. This protective function involves pressure sensing in the gas turbine exhaust duct prior to any potential flow restrictions. This package updates the existing exhaust overpressure protection control scheme to reduce false trips due to condensation in the exhaust pressure sensing line.

#### Enhanced Inlet Bleed Heat (IBH) System Reference Ramp Rate

During the operation of the inlet bleed system it is possible that the position of the valve is unknown due to a transmitter going out of tuning or failing. This causes a fault in the IBH system and the valve will step either open or closed, depending on the frame size of the unit. An IBH fault can also be generated when the compressor-operating limit has been reached. When this fault occurs undesirable dynamics may result, and may cause turbine trips from high exhaust spreads. The IBH ramp reference software helps to alleviate the turbine dynamics during an IBH fault, resulting in fewer turbine trips.



### Null Bias Adjustment

Null bias compensation actively adjusts the electrical null bias on the valves as the mechanical bias drifts to reduce the error between the feedback and the reference—thereby reducing valve-not-tracking trips, improving Dry Low NO<sub>x</sub> (DLN) split accuracy, and improving liquid fuel light-off reliability.

### Applicability

Feature	Package	Frame Applicability								
		2-Shaft		3-Shaft						
		32	52	B/E Class			F Class			
		51	6B	7E	9E	6FA	7F	9F		
Enhanced IBH reference Ramp Rate	Trip Prevention	0	0	X	X	X	X	X	X	X
Exhaust Duct Over Press Protection	Trip Prevention	0	0	X	X	X	X	X	X	X
Exhaust Over Temp Protection Logic	Trip Prevention	0	0	0	X	X	X	X	X	X
Null Bias Adjustment	Trip Prevention	X	X	X	X	X	X	X	X	X
Upgraded Exhaust Spread Monitoring	Trip Prevention	0	0	X	X	X	X	0	X	X

Note: "X" indicates available feature. "0" means feature not available.

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