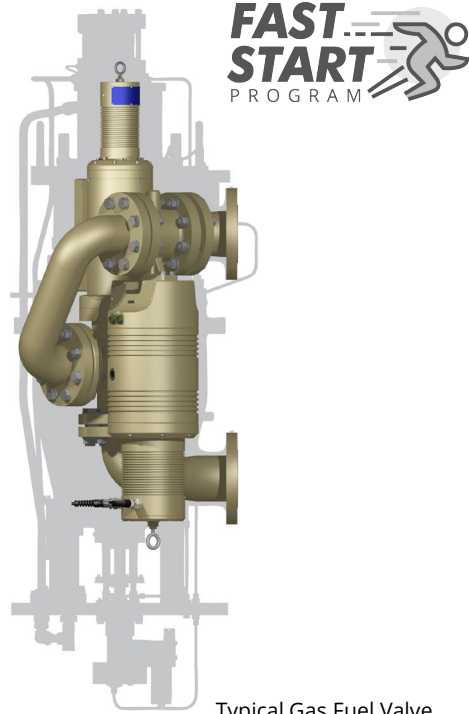




Redefining Fleet Flexibility

The DOE defines fleet flexibility... The ability of the generation fleet to change its output (ramp) rapidly, start and stop with short notice, and achieve a low minimum turn-down level.

Spinning Reserve is needed to maintain system frequency stability during emergency operating conditions and unforeseen load swings. For many operators, the goal is to be classified as Spinning Reserve where on-line reserve capacity is synchronized to the grid system and ready to meet electric demand within 10 minutes of a dispatch instruction by the ISO.



Typical Gas Fuel Valve
Frame 7 Y&F Series 7500

Components of a Startup

Phase	Time Duration is a function of:
Start Auxiliaries	Equipment Reliability - O&M
Crank to Purge	Starting Means installed - Diesel, Motor or LCI
Purge	Exhaust design, NFPA requirements
Coast Down to Ignition	Sequencing and inertia
Ignition & Crossfire	Sequencing
Turbine Warm-Up	Turbine design - constants within sequencing
Accelerate to FSNL	Turbine design - constants within sequencing
Synchronize	Sync components and governor settings
Loading	Turbine & Generator design - constants within sequencing

Fuel delivery system design is key to obtaining a Purge Credit and achieving Fast Start compliance. TTS' Fast Start Program offerings include:

- Redesign of fuel delivery system to meet the NFPA standards with Purge Credit.
- Implementation of the necessary control system changes to support the fuel system upgrade.
- Consulting with clients to provide them with the best strategies to achieve fast start on their machines.

Steps to Increase Flexibility and Reduce Start Time

TTS can provide technical services and guidance to increase the unit's flexibility and reduce overall start time. There are four key areas to focus on:

1. Testing & implementing any existing Fast Start capability.
2. Improve starting reliability through O&M practices for the fuel system and device calibration and then accessing system modifications that are in place and/or needed.
3. Establish Purge Credit if required. There are specific requirements detailed in NFPA® 85 2015 that must be adhered to in order to establish and maintain the Purge Credit.
4. Implement techniques from Advanced Class units including "Fire On The Fly" and Fast Sync.

Fast Start Flexibility already exists in some form or other for Legacy Peaking Units. There are several options to improve this Flexibility ranging from major upgrades to routine enhancements. In all cases, TTS observes the recommended Gas Turbine Operating and Maintenance Considerations specific to this benefit.

FAST START PROGRAM