Built on our successful products for the Frame 7F, PSM offers combustor and turbine components for Frame 9F. Design improvements developed for the 7F and validated in multiple applications are the basis for PSM’s 9F portfolio. Improved durability and lower life cycle cost are achieved using PSM’s component and system level product modeling and data evaluation tools, to identify the issues and failure modes in current OEM designs.

Combining technical expertise, speed to market, flexible solutions, tools, and multiple OEM cross-platform experience, PSM is the industry leading F-Class alternative products and services supplier.

**Design Improvements**

+ Interchangeability with OEM hardware

+ $\leq 9$ ppm NOx & CO emissions over normal premix operating load range

+ All parts are designed to deliver 24,000 Factored Hours (FH) and 900 Factored Starts (FS) inspection intervals or better
Creating longer lasting, more dependable parts for your 9F gas turbine provides better power plant availability and profitability in the marketplace. PSM’s line of Frame 9F compatible parts have redesigned the original parts where necessary to address the life-limiting elements of existing designs. PSM’s hot gas path components utilize advanced materials, coatings, cooling schemes, and design features to maximize durability and reliability.

Components are upgraded by PSM following a proven design approach:

- Identify the current component issues/failures
- Use state-of-the-art analytical tools, metallurgical evaluations, and engine test data where possible to determine the root cause of the issues/failures
- Use this data to design and fabricate new hardware with design features that better maximize durability and reliability

Co-locating R&D engineering with the PSM repair workshop, our design engineers collect continuous feedback on the performance of PSM’s and competitors’ designs and proactively address emerging fleet issues. With these capabilities PSM has introduced designs that can align combustion and hot gas path inspections and reduce repair scopes, providing customers with reduced lifecycle costs.

**Hot Gas Path**

**1st Stage Nozzles**
Upgraded with Full Surface Thermal Barrier Coating
- Alloy upgrade to PSM 109 (Nickel base)
- Enhanced Platform cooling

**1st Stage Buckets**
- Alloy upgrade with improved Low Cycle Fatigue (LCF) and Creep Capability
- Cast in Tip Plate facilitates lower repair cost
- Improved Platform and Tip cooling

**2nd Stage Nozzle**
- Alloy upgrade with improved LCF and Creep Capability

**2nd Stage Buckets**
- Alloy upgrade with improved LCF and Creep Capability
- Improved cooling design reducing shroud metal temperature

**3rd Stage Nozzle and Buckets**
- Alloy upgrade with improved LCF and Creep Capability
Combustion System

Transition Piece
+ Improved durability through PSM design features
+ Patented cooling features reduce metal temperature
+ Thermally free mount to 1st stage nozzle

Liner
+ Improved durability with conical design and upgraded material
+ Improved impingement cooling for enhanced durability
+ Improved assembly and sealing with double-ply, forward facing hula seal design

Liner Cap
+ Improved durability through PSM design features
+ Upgraded Effusion plate material to Haynes 282 for increased LCF capability

AutoTune

PSM’s AutoTune enables automated combustion tuning to maintain emissions and combustion dynamics within specified limits under varying ambient conditions (temperature and humidity), engine deterioration or while using a range of natural gas or liquefied natural gas.

Optimize Unit Operation

The AutoTune system incorporates features which result in optimal operation from a power and heat rate standpoint, as well as maximizing operability such as lowering turn down and transient tuning under Automatic Grid Control (AGC). The result is improved emissions control, hardware life, reliability and operability.

Optional Software Components

Fuel gas temperature optimization, Power+ for maximum power, and optimization for LNG are all options to achieve the ideal power output and increase hardware life.
Additional Services and Product Offerings:

GE 7FA, 7EA, SW 501F, MHI 501F, GE 6B, 9E, 9FA

| Field Services & Outage Management | including on-staff bladers and supply of labor for gas turbines, steam turbines and generators worldwide for GE B,E & F-class, SW & MHI F-class. |
| Reconditioning & Repair | of all turbine airfoils and combustion system components, including fuel nozzle overhaul for GE 9F. |
| Combustion System Engine Tuning including Monitoring & Diagnostics | Support for all rotating equipment (e.g. remote monitoring) of gas turbines worldwide. |
| Rotor Rebuild & Inspection | including disk repairs, low speed or high speed vacuum balance and rotor life extension/assessment. |
| R&D, Engineering Assessments, Root Cause Analysis | and system technical support for gas turbines. |
| Flexible Long-Term Parts and Service Agreements (LTSA) | combine all of your products and services for a custom solution that meets your needs. |
| Power Plant Solutions | provide integrated services and upgrades for all your critical power plant components and systems. We provide a single point of contact for maximizing your plant’s performance potential, increasing operational flexibility, and outage management. |
| AutoTune | offers autonomous, real-time combustion system control tuning packages for optimizing combustion dynamics/pulsations, emissions and output on GE 9F gas turbines. |