Technical Proposal for Combustion Inspection (CI) Extension

GE 6FA.03 Gas Turbine – Unit GTG-2 (NSRP)

Proposed CI Extension: December 6, 2025 → April 15, 2026

OPTION 1 (STRONGLY RECOMMEND)

1. Purpose and Objective

The GE 6FA.03 gas turbine at NSRP is scheduled for Combustion Inspection (CI) in December 2025. However, the required DLN 2.6 fuel-nozzle set will not be available until the end of March 2026. To ensure continuous, safe, and reliable turbine operation during this period, this proposal presents a plan to extend the CI schedule from 8,000 operating hours to 12,000 hours (50% addition), which equals about 4,000 hours of additional operation.

2. OEM Basis for CI Interval Extension

According to GE publication GEA-17898 ("6FA DLN 2.6 Extended Interval Combustion System"), the DLN 2.6 combustion system allows operation for up to 12,000 hours between Combustion Inspections under normal base-load operation on natural gas, and up to 24,000 hours in good operating and maintenance conditions. Extending the CI by approximately six months (around 4,000 operating hours) is fully acceptable under OEM methodology, provided that turbine operation remains stable and is continuously monitored for combustion dynamics, emissions, and exhaust temperature spreads.

3. Operating Period and Calculation

Item	Details
Start Date	November 23, 2025
End Date	March 15, 2026
Total Calendar Days	113 days
Total Operating Hours	2,712 hours
Base CI Interval	8,000 hours
Projected Total Hours at CI	10,712 hours
Start Date	November 23, 2025
OEM allow	12,000 hours, 50% addition (GE standard)

After the extension, the turbine will have operated around 10,700 hours—still 1,300 hours below the OEM limit of 12,000 hours.

4. Technical Basis

The GE 6FA.03 DLN 2.6 combustion system is designed for long inspection intervals. It uses advanced materials, coatings, and optimized air-fuel mixing to reduce metal temperature and component fatigue. This allows safe operation for up to 12,000 hours when base-load operation, fuel quality, and monitoring are properly maintained.

Key conditions to maintain during the extension:
• Operate mainly at base load (avoid frequent start/stop).
• Use clean gas fuel.
• Record exhaust temperature spread and combustion dynamics daily.
• Conduct borescope inspections regularly to confirm component condition.

5. Monitoring and Inspection Plan (Dec 2025 – Apr 2026)

The following monitoring and inspection plan will be implemented during the extension period:

• Daily: Record emissions (NOx/CO), exhaust temperature spread, vibration, and dynamics amplitude.
• Weekly: Engineering review of operation data and combustion dynamics.
• Every 3–4 weeks: Borescope inspection of combustor liners, caps, and transition pieces.
• Monthly: Oil sample analysis and performance summary report.
• Immediate inspection if: exhaust spread >25% of 535 – 560 °C or emission deviation >15%.

6. Risk Assessment and Control Measures

Risk Type	Possible Cause	Impact	Preventive Actions
Combustion liner fatigue	Longer exposure to heat	Low	Perform borescope every 3–4 weeks; maintain base load.
Fuel nozzle wear	Delayed replacement	Medium	Keep stable DLN tuning; avoid fuel transfers; check emissions daily.
Combustion instability	Flame oscillation or pressure pulses	Medium	Monitor combustion dynamics; retune if deviation increases.
Fast starts/shutdowns	Thermal shock	Low	Limit to ≤ 2 starts per week; avoid emergency shutdowns.
Exhaust temperature imbalance	Nozzle or liner wear	Low	Inspect immediately if any unusual deviation from baseline occurs.

7. Expected Reliability

Based on OEM experience, the Combustion Inspection (CI) interval for the 6FA.03 DLN 2.6 system can be extended to 12,000 operating hours normally. The proposed extension of 2,712 hours, representing approximately 23% of the allowable range, remains within the OEM's reliability limits.
When operated under steady base-load conditions and with continuous monitoring of combustion dynamics, emissions, and performance trends, this extension is not expected to compromise turbine reliability, safety, or performance.

8. Deliverables During Extension

1. Weekly operational and inspection summary.
2. Borescope photos and condition reports every 3–4 weeks.
3. Monthly oil analysis and performance report.

9. Conclusion

Base on GE publication GEA-17898 ("6FA.03 DLN 2.6 Extended Interval Combustion System"), the DLN 2.6 combustion system allows operation for up to 12,000 hours between Combustion Inspections under normal base-load operation on natural gas, and up to 24,000 hours in good operating and maintenance conditions.

The proposed extension from November 23, 2025 to March 15, 2026 adds approximately 2,712 operating hours, keeping total operation well within OEM limits. With continuous monitoring, borescope inspections, and stable load operation, the turbine will remain safe and reliable until the CI and fuel-nozzle replacement in March or April 2026.

OPTION 2

Two-Phase Combustion Inspection (Alternative Plan)

While our primary proposal is to extend the Combustion Inspection (CI) to early April 2026 under a controlled condition-based monitoring plan, an alternative option is to conduct two separate CIs to balance operational safety and schedule constraints.

Phase 1 – Partial CI (November 2025):

In this approach, we perform a limited-scope inspection during November 2025 to replace liners, transition pieces, and end caps. The existing fuel-nozzle assemblies will remain in service after cleaning, borescope verification, and functional checks. This will help secure combustion stability and safe turbine operation during the extension period.

Phase 2 – Completion CI (April 2026):

When the refurbished fuel-nozzle assemblies become available by March 15, 2026, we will perform a second CI to complete the full replacement and restore the combustion system to optimal operating conditions. During this April intervention, we will also recheck dynamics, spreads, and emissions tuning.

Pro of this approach:

• Ensures continuous plant operation through the fuel-nozzle delay period.
• Provides an additional opportunity to verify component condition and combustion performance.

This two-phase plan is proposed only as a secondary option; our first recommendation remains a single CI in April 2026 with strict monitoring and life-extension control measures.

Con of this Approach

- Requires performing a second CI, which adds additional cost and scheduling effort.
- UNEW fully understands this unexpected and undesired delay. To support NSRP and maintain cooperation, UNEW will share the cost burden by reducing the second CI cost by 25%.

GE Energy

DLN 2.6 Extended Interval Combustion System (EICS) and retrofit for 6FA gas turbines

fact sheet

Operational availability and emission compliance is critical in today's power generation industry and even more so in industrial applications. The 6FA gas turbine is a leader in advanced technology availability and emission levels, but customers can realize even higher availability through the DLN 2.6 Extended Interval Combustion System (EICS). The DLN 2.6 EICS system will allow turbine owners to operate for 24,000 factored hours—or 450 factored starts—between Combustion Inspections (CI). This extension in outage intervals translates to greater operational availability and readiness to serve.

The 6FA.01 can now also be retrofitted to DLN 2.6 and benefit, as the 6FA.03, from EICS and from reduced emissions when operating on natural gas.

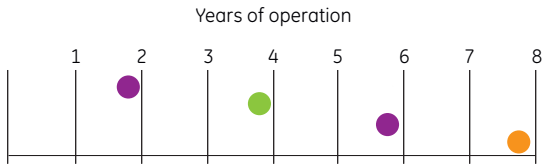
How It Works

The EICS is based on the world-class experience of the DLN 2.6 combustion system, which has logged more than 13 million hours and 430,000 starts in operation. The enhancements that deliver this increased availability are based on technology advancements in combustion materials and coatings, as well as the incorporation of monitoring systems to detect operability shifts early, allowing operators to make tuning corrections and keep the combustion at peak performance. Some of the factors monitored are dynamics and emissions. These are key signs of operability that, if gone unmonitored, can allow combustion shifts that may cause early repair outages.

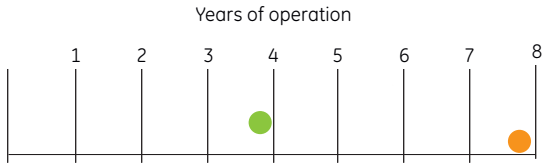
CI Maintenance Intervals and Expected Emissions with Natural Gas

6FA.01	6FA.01 and 6FA.03	6FA.01 and 6FA.03
DLN2.0	DLN2.6	DLN2.6 EICS
8,000 hours	12,000 hours	24,000 hours
25 ppm NO_x	15 ppm NO_x	15 ppm NO_x
70% turndown	45% turndown	45% turndown

DLN 2.6 Standard Combustion System Outage Profile



DLN 2.6 Extended Interval Combustion System Outage Profile



HGP
CI
MI

Outage profile based on:
- 6,200 hours per year
- 100 starts per year

Benefits

6FA.01

Better availability

- Four CIs eliminated over one major cycle
- Typical CI is 6 days outage cycle
- 24 days of added availability over 1 major cycle
- 0.8% improvement in availability
- Common parts for customers with 6FA.01 and 6FA.03

Improved emissions

- Expected turndown down to 45%
- NO_x/CO level expected below 15/9 ppm @ 15% O_2

6FA.03

Better availability

- Two CIs eliminated over one major cycle
- Typical CI is 6 days outage cycle
- 12 days of added availability over 1 major cycle
- 0.4% improvement in availability
- Common parts for customers with 6FA.01 and 6FA.03

Scope

EICS can be installed within a standard combustion outage. To maximize the full availability of the EICS, and for a retrofit on a 6FA.01, it is recommended that this conversion be performed at a Hot Gas Path (HGP) or Major Inspection (MI).

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