Transformer Health Assessment Report

TR-003: Gamma Distribution Unit

⚠️ CRITICAL ALERT

Parameter	Value
Status	🔴 CRITICAL
Health Score	35/100
Risk Level	HIGH
Scenario	Core Ground Fault

Transformer Information

Attribute	Details
Transformer ID	TR-003
Name	Gamma Distribution Unit
Location	Central Distribution Hub
Rating	100 MVA
Voltage	245/66 kV
Age	12 years
Last Maintenance	2025-09-10
Next Scheduled	**EMERGENCY**

Current Operating Parameters

Temperature Readings - ⚠️ ELEVATED

- **Top Oil Temperature:** 85°C (Normal: <65°C) ❌ HIGH
- **Winding Temperature:** 105°C (Normal: <90°C) ❌ CRITICAL

- **Current Load:** 65% of rated capacity

Oil Quality Parameters

Parameter	Value	Limit	Status
Moisture Content	28 ppm	<25 ppm	⚠️ Elevated
Tan Delta	1.52%	<1.0%	❌ High
Breakdown Voltage	38 kV	>50 kV	❌ Low

Dissolved Gas Analysis (DGA) - ⚠️ FAULT GASES DETECTED

Gas	Concentration	Limit	Status
Hydrogen (H_2)	**1250 ppm**	<100 ppm	❌ CRITICAL
Methane (CH_4)	**380 ppm**	<50 ppm	❌ HIGH
Acetylene (C_2H_2)	8 ppm	<3 ppm	❌ Elevated
Carbon Monoxide (CO)	420 ppm	<300 ppm	❌ High
Carbon Dioxide (CO_2)	1850 ppm	<2500 ppm	⚠️ Elevated

Fault Diagnosis

Primary Fault Type: Core Ground Fault with Thermal Degradation

Analysis: The extremely high hydrogen concentration (1250 ppm) combined with elevated methane indicates a severe thermal fault condition. The Rogers Ratio analysis points to a core grounding issue causing circulating currents between core laminations.

Root Cause Assessment:
1. Core bolt insulation degradation
2. Circulating currents causing localized heating
3. Progressive thermal damage to adjacent insulation

Risk Factors

Risk	Severity	Probability
Core ground fault	Critical	Confirmed
Very high H_2 generation	Critical	Active
Thermal hot spots	High	Detected

Risk	Severity	Probability
Catastrophic failure	High	Possible

IMMEDIATE ACTIONS REQUIRED

1. **IMMEDIATE:** Reduce load to 50% of rated capacity
2. **Within 24 hours:** Notify grid operations for contingency planning
3. **Within 7 days:** Schedule emergency outage for internal inspection
4. **Prepare:** Core ground resistance testing equipment
5. **Standby:** Replacement transformer or load redistribution plan

Recommended Repair Scope

- Complete internal inspection
- Core bolt insulation assessment and replacement
- Oil filtration and degassing
- Post-repair electrical testing
- Enhanced monitoring after return to service

Report Generated: January 12, 2026
Assessment Engineer: Predictive Analytics System
Classification: CRITICAL - IMMEDIATE ACTION REQUIRED

⚠️ **FAILURE RISK: If not addressed within 7 days, risk of catastrophic failure increases significantly.**