Paragraph C1.1(4)

Each GTG set shall be furnished complete with all necessary component parts, accessories, auxiliaries and appurtenances, including but not limited to the following:

(a) Skid mounted assembly consisting of the following:

Dual Gas Turbine engine, reduction gear box, and generator

generator output breaker, governor, exciter and controls. *

Fuel System complete with engine driven pumps.

Lube Oil System complete with engine driven pumps, strainers, filter, instrumentation, etc.

Combustion Air System complete with flexible connections, silencer and bird screen.

Exhaust System complete with discharge expansion connector and silencer.

Starting Air System, to include air start motors, start and stop control solenoid valves, "Y" strainers, and flexible connectors.

All integral piping, valves, instrumentation, wiring of all Control, Auxiliary Power and Alarm Circuit.

NRC Comment

* Inserted Note

Add the components listed since they are part of the GTG as shown in RG 1.9.

MHI Answer

This report is "Qualification plan of GTG", and the Chapter 1.0 shows the general information of GTG system. The detail of specification of GTG system should be defined in FSAR and design specifications of each plant. The generator breaker, however, is an integral part of the building switchgear lineup and will not be included in the type tests for the qualification GTG. The purpose of the type tests as identified in IEEE 387 is to verify the function and reliability of the generator set. The generator breaker will be connected and tested with the GTG for the Site Testing portion of the IEEE387 qualification.

C.1.2 Other Auxiliary Equipment

(1) Separate enclosure in Seismic Category Class I Building for housing each of the GTG units.

(2) Interconnecting piping and wiring between GTG set and remotely located auxiliary equipment.

(3) Fuel oil storage tanks (7 day) and fuel oil transfer pumps.

(4) Hoists required for maintenance.

(5) Furnishing and installation of cables for conveying power from the GTG units to the emergency busses.

(6) Current transformers for generator differential, for mounting and wiring.

(7) Distribution Panel for GTG auxiliaries.

(8) Air ducting for room ventilation.

(9) Remote control and surveillance stations.

(10) All labor, fuel oil, lube oil, test equipment and other supplies required for field testing.

(11) All cables required to interconnect the skid with motor control center, control panels and other remote equipment.

(12) Furnishing and installation of generator overcurrent, differential current, loss of field, reverse power, and bus fault protective relays, 27/59, 81U/O, 46 (I2t), Overspeed, 51G, 24 (volt/Hz)*

NRC Comment

* Inserted Note
check IEEE standard 242 and others for complete generator protection.

Add
(12) Neutral grounding Resistor

MHI Answer

This report is "Qualification plan of GTG", and the Chapter 1.0 shows the general information of GTG system. The detail of specification of GTG system should be defined in FSAR and design specifications of each plant.

C.2.0 Design Requirements-General

NRC Comment

In this section, i.e, Design Requirements you need to address each item in regulatory position C.1. (Design Consideration) given under "C. Regulatory Position," of RG 1.9. It appears that only some parts of Position C.1.4 are addressed in section C.2.0 of the Technical Report.

If you decide you do not want to meet a given regulatory position of the RG 1.9, then you need to provide a justification (bases) why you believe you do not have to meet it or an equivalent way of meeting it. Section C.2.0 needs more work to be compatible with RG 1.9 regulatory Position C.1

MHI Answer

MHI will revise this Technical Report include the conformances to all requirements R.G 1.9.

C.2.1.3 Performance Criteria

The GTG units shall have the capability of performing in accordance with each of the following criteria, singly or in any combination; in the service conditions specified.

(1) Automatically or manually starting, being at set speed and voltage, and achieving a condition of "ready-to-load" within a maximum of 100 seconds after receiving a start signal in single operation.

(2) Compliance with Factory and Field Acceptance Tests discussed in Section C.4.0.

(3) Operating in parallel with the station 6.9 kV +10% auxiliary power system after being manually synchronized and manually loaded.

(4) Operate continuously at rated speed and voltage with no load on the generator terminals for a maximum of 72 hours without loss of performance.

(5) Providing a quality of power such that: The maximum voltage dip on load acceptance shall not exceed 25 percent * of rated voltage. The maximum frequency dip on load acceptance shall not exceed 5 percent of rated frequency. The maximum recovery time from 75 percent voltage to 90 percent voltage and from the lowest frequency to frequency at steady state, following the maximum load acceptance voltage and frequency dips, should be respectively three seconds after application of maximum load.

NRC Comment

* Inserted Note
Reference the regulatory position 1.4 of RG 1.9. All values should be compatible with RG 1.9, position 1.4.

The start and load-accepting capabilities of GTG must meet the criteria given in Regulatory Position 1.4. I believe you need to expand this section to be compatible with RG 1.9.

There is no reference to load sequence interval. GTG test will need to include load sequence intervals for step loading increases to demonstrate its starting and load-accepting capabilities.

MHI Answer

MHI will revise this section to reflect the intent of C1.4 of R.G 1.9. The load sequence is shown in Figure A 1.0-5 to A 1.0-8 of current report, and load sequence interval is designed 5 seconds.

C.2.3.1.13 Power Output Leads / Terminal Box

The generator is equipped with six power output leads for bus connection. The leads are terminated to insulated standoffs within the generator load terminal box assembly. The terminal box is sized to allow for cable terminations at each phase and neutral connection. The three phases are labeled "T1", "T2", and "T3". The three neutrals are labeled "T4", * "T5", and "T6".

NRC Comment

* Inserted Note

Add Neutral grounding resistor including disconnecting means and neutral current transformers for the neutral ground relay.

MHI Answer

MHI will revise this section. Current design is that the connection to the neutral grounding resistor and CTs (neutral differential and ground fault) are located in switchgear.

C.2.3.1.14 Generator Assembly Manufacturer's Test

The assembled generator shall be tested at the manufacturer to confirm proper operability and conformance to standards. All tests shall be performed in accordance with accepted standards (IEEE 115 or MIL-STD-705) and shall include, at a minimum, the following:

Air Gap Measurement

Resistance Temperature Device Test

Winding Resistance Test

Space Heater Test

Insulation Resistance & Polarization Index Test

Bearing Insulation Resistance Test

High Potential Test *

Generator Dynamic Balance Test

NRC Comment

* Inserted Note

Specify whether this test is AC or DC voltage test.

Also include Tan delta (PF, Dissipation Factor) test for the generator.

MHI Answer

MHI will revise this section. MHI will specify this test is AC High Potential Test. And the Delta testing is not a requirement for a machine of this voltage and size.

C.2.3.6 Motor Control Center and Auxiliary Power

(1) The motor control center to supply power to motor driven auxiliaries will be provided. This motor control center will receive power from the GTG source under emergency conditions.

(2) Auxiliary power available from plant power distribution system will be:

(a) dc control power	125 volt nominal
	90 volt minimum 140 volt maximum
	2 wire ungrounded system
(b) ac power	460 Volt +10%, with a dip of -25% during motor starting
	ungrounded, 3 phase, 3 wire 60Hz, 115V ±1 0%

NRC Comment

* Inserted Note

Make it more clear what this ungrounded conveys. Are you referring that the ac power from the MCC is ungrounded. Most 460 volt systems in the US are solidly grounded.

MHI Answer

MHI will revise this section in accordance with actual plant design.

C.2.3.8.1 Generator

(1) The protective devices designed to trip the GTG shall be limited to the following:

(a) Overspeed
(b) Generator differential current
(c) High EGT
(d) Failed to start
(e) Overcurrent *
(f) Low pressure lube oil
(g) High temperature lube oil
(h) Anti motoring

These components are installed in the unit switchgear and are provided by others. The above devices will be bypassed during ECCS signal except for mechanical overspeed (1), generator differential current (2) and high EGT (3). The bypassed protective devices shall provide annunciation in any mode of operation.

(2) A GTG breaker trip is initiated by Items (a), (b), (c), (e) **, (f) and (g) with items (f), (g), (h), and (h) bypassed on ECCS signal.

NRC Comment

* Inserted Note
the overcurrent should include both phase and ground.

** Inserted Note
check against RG 1.9 and list of trips given in SRP section 8.3.1. This list does not conform to the SRP

MHI Answer

MHI will revise this section to include ground fault overcurrent and to match the SRP.

C.2.4.3 Alarms

(1) Each alarm shall be locally signalled on an individual window of an annunciator located in the free standing control panel.

(2) The following alarm points shall be furnished.

Engine:

(a) Lubricating oil low pressure

(b) Lubricating oil high temperature

(c) Starting air low pressure

(d) Engine failure to start (after automatic attempt to start)

(e) Overspeed

(f) Low fuel oil day tank level

(g) High fuel oil day tank level

(h) High Fuel Oil Tank level

(i) Low Fuel Oil Tank level

(j) Governor Not Isochronous

Generator:

(a) Generator differential

(b) Overcurrent with voltage restraint, ground fault overcurrent (Inst.), reverse power**

(c) Loss of excitation**

(d) Stator high temperature

(e) Bearing high temperature

(f) Field ground fault

NRC Comment

* Inserted Note

This list appears to be incomplete. Check this list against the IEEE 242 standard on generator protection and list given under item 12 under C.1.2 of the Technical Report.

MHI Answer

MHI will revise this section based on current design.

(3) In addition to the manufacturer's standard tests, the following tests shall be performed on each unit prior to acceptance by the Purchaser.

(a) Reliability

Test results of a factory test consisting of 100 valid start & load tests on a prototype unit to demonstrate the ability of the GTGs to start, attain rated speed and voltage within 100 seconds and load to 50% of the continuous rating shall be submitted. A valid start and load test is defined as a start with loading to at least 50% of the continuous rating within 100 seconds and continued operation until temperature equilibrium is obtained.

At least 90 of the starts shall be performed with the unit at warm standby conditions.

At least 10 of the starts shall be performed with the unit at normal operating temperatures.

Failure of the unit to successfully complete this series of tests will require further testing as well as a review of the System Design Adequacy. The test as described above shall be performed on the first unit of the design.

NRC Comment

* Inserted Note

Revise this writeup to reflect the 150 tests with no failures per your discussion during the public meeting held on August 6, 2009.

MHI Answer

MHI will revise this section to change to 150 tests with no failure.

(b) Starting Test

Starting Test - A test consisting of 15 valid start and load test without failure, to demonstrate the capability to attain rated speed and voltage within 100 seconds and load to 50% of the continuous rating within 30 seconds. This test shall be performed in the same manner as described above. If a unit has been reliability tested, this test is omitted.

NRC Comment

* Inserted Note

Start and Load tests;

This write up is not consistent with RG 1.9 and IEEE 387, Clause 6. The RG 1.9 will take precedent over IEEE 387.

Your Plan should address each of the requirements listed under Clause 6 of the IEEE 387, i.e., 6.1 through 6.7.

Your format should be similar to IEEE 387 so that the reader can easily follow your plan and be able to compare with IEEE 387. Check RG 1.9 where it takes precedent over IEEE 387 for each item listed under Clause 6 in IEEE 387.

MHI Answer

MHI will delete this paragraph, because this starting test is not included in initial type test of IEEE387 or RG 1.9. It should be performed as site test.

C.4.2 Field Tests

NRC Comment

* Inserted Note

What are these tests? Are these supposed to mean "Site Testing" as given in Clause 7 of IEEE 387. If so you need to revise this to conform to IEEE 387 and RG 1.9.

If these tests are not meant to be "Site Testing," then you need to list the site testing requirement so that the COLA applicant can perform these tests as required by RG 1.9 (section 2.2) and IEEE 387.

MHI Answer

MHI will delete this section. The field test will be performed as site test. MHI will revise about description of testing to limit the initial type test in qualification.