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# **EQUIPMENT PURCHASE AGREEMENT**

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between

Energy Parts Solutions, LLC

and

Derwick Associates, S.A.

February\_\_, 2010

## EQUIPMENT PURCHASE AGREEMENT

This Equipment Purchase Agreement (the "Agreement") is made effective as of the \_\_\_ day of February 2010 (the "Effective Date"), between **ENERGY PARTS SOLUTIONS, LLC**, a Missouri company ("Seller"), and **DERWICK ASSOCIATES, S.A.**, a Panamanian company ("Buyer").

### RECITALS

Buyer desires to purchase two (2) new GE Frame 7F 60 Hz gas turbine generator sets and two (2) previously operated and refurbished GE LM6000 60 Hz gas turbine generator sets, as further described in Exhibit A (each gas turbine generator set sometimes referred to as a "Unit" and collectively referred to as the "Equipment").

Seller desires to sell the Equipment to Buyer.

The parties further agree that once they have executed this Agreement that they will immediately commence negotiations and execute one or more agreements whereby Seller and/or one of its affiliates or subsidiaries will install, startup and commission the Equipment in Venezuela all on a fast-track basis.

**FOR AND IN CONSIDERATION** of the mutual covenants herein contained and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged and agreed, the parties agree as follows:

### 1. PURCHASE AND SALE OF EQUIPMENT

Upon the terms and subject to the conditions contained herein, Seller shall sell to Buyer, and Buyer shall purchase from Seller, the Equipment.

### 2. PURCHASE PRICE; PAYMENT TERMS

#### 2.1 Purchase Price

The purchase price for the Units is as follows:

U.S.\$38,500,000 for each of the two (2) GE Frame 7F Units for a total of U.S.\$77,000,000  
U.S.\$17,000,000 for each of the two (2) GE LM6000 Units for a total of U.S.\$34,000,000

The total purchase price for all the Equipment is a total of U.S.\$111,000,000

(the "Purchase Price").

#### 2.2 Payment Terms

2.2.1 On or before two (2) days from the Effective Date the Buyer shall wire to Seller in immediately available funds a non-refundable downpayment of U.S.\$1,700,000 for the GE LM6000 Units.

2.2.2 On or before two (2) days from the Effective Date the Buyer shall wire to Seller in immediately available funds a non-refundable downpayment of U.S.\$38,500,000 for the GE Frame 7F Units.

- 2.2.3 On or before twenty (20) days from the Effective Date the Buyer shall wire to Seller in immediately available funds the final payment of U.S.\$38,500,000 for the GE Frame 7F Units.
- 2.2.4 On or before thirty (30) days from the Effective Date the Buyer shall wire to Seller in immediately available funds U.S.\$25,500,000 for the GE LM6000 Units.
- 2.2.5 On or before Seller's written notice of readiness to ship the GE LM6000 Units the Buyer shall wire to Seller in immediately available funds the final payment of U.S.\$6,800,000 for the GE LM6000 Units.

All funds wired to Seller shall be sent according to the following instructions:

US Bank  
3615 W Broadway Blvd  
Sedalia, MO 65301  
Routing Number: 081000210  
Account Number: 152307883347  
SWIFT Code is: USBKUS44IMT (that is an 'i' and not a '1')

If the downpayment of the Purchase Price for either the GE LM6000 Units or GE Frame 7F Units is not paid to Seller within two (2) days from the Effective Date then Seller may terminate this Agreement in whole or in part without further obligation or liability. In the case where payment is delayed and one or more Units are no longer available for sale then, at the option of Seller, said Unit(s) may be excluded from the sale hereunder and the total Purchase Price for the Equipment will be reduced by the Purchase Price for said Unit(s).

### **3. ASSUMPTION OF LIABILITIES; REMOVAL AND TRANSPORTING OF EQUIPMENT; TITLE AND RISK OF LOSS**

#### **3.1 Assumption of Liabilities**

Upon payment of the full amount of the Purchase Price for a Unit the Buyer shall assume and agree to pay, perform and discharge when due all liabilities arising out of, in connection with, or related to the ownership, storage, removal, operation, use, or maintenance of the Unit relating to periods on or after said date.

#### **3.2 Removal and Transporting of Equipment**

After Seller's receipt of the Purchase Price for a Unit, the Seller agrees to assist Buyer and its representatives in gaining access to the Unit where it is stored or located so that Buyer can remove and transport the Unit. Buyer will at all times while at the storage facility abide by the applicable safety rules and regulations. Buyer will work closely with Seller's and its representative's and agent's personnel to ensure that Buyer's activities shall not interfere with any other activities on-going at the facilities. Buyer shall be responsible for all storage charges for the Unit after the date of Seller's receipt of the Purchase Price for the Unit. In the event Buyer retains Seller to crate, remove and transport the Unit from its present location, then Seller will agree to do so at cost plus 15% and the Parties will execute a separate Purchase Order for said the additional work which will include a mutually agreeable advance of funds so that Seller can mobilize and commence the work.

#### **3.3 Title and Risk of Loss**

Title and risk of loss in and to a Unit shall transfer from Seller to Buyer upon Seller's notice of readiness to ship the Unit from its present location; provided, however, if Buyer engages Seller to handle the storage, crating, removal and transporting of the Unit under a separate agreement or purchase order then risk of loss in and to the Unit shall transfer to Buyer upon discharge of Seller's obligations to transport under said separate agreement or purchase order.

#### **4. WARRANTY**

4.1 Seller hereby represents and warrants to Buyer that:

- (a) Seller shall have full legal and beneficial title to the Equipment, free and clear of any and all security interests, liens, claims, charges or encumbrances of any nature whatsoever, together with full power and lawful authority to deliver the Equipment to Buyer; and Seller shall transfer good and marketable title to the Equipment to Buyer on or before the date the Equipment is ready to be transported from its present location.
- (b) Seller is an entity duly organized, validly existing and in good standing under the laws of the jurisdiction in which it is formed and has the requisite power and authority to own, lease and operate its properties and to carry on its business as now conducted. Seller is duly qualified to transact business and is in good standing in each jurisdiction in which its ownership of the Equipment and commitments made hereunder makes such qualification necessary.
- (c) Seller has the requisite power and authority to execute this Agreement and to consummate the transactions contemplated by this Agreement. The execution and delivery of this Agreement by Seller and the consummation by Seller of the transactions contemplated by this Agreement have been duly authorized by all necessary action on the part of Seller. This Agreement has been duly executed and delivered by Seller and, assuming due execution and delivery by Buyer, constitutes a valid and binding obligation of Seller, enforceable against Seller in accordance with its terms.
- (d) The execution and delivery by Seller of this Agreement and the consummation of the transactions contemplated hereby do not and will not (i) violate any provision of the constituent documents of Seller, (ii) violate any order of any governmental authority to which Seller is bound or subject, (iii) violate any applicable law, or (iv) result in the imposition or creation of any lien upon the Equipment.
- (e) No order or permit issued by, or declaration or filing with, or notification to, or waiver from any governmental authority is required on the part of Seller in connection with the execution and delivery of this Agreement, or the compliance or performance by Seller with any provision contained in this Agreement.
- (f) There is no legal action or order pending or overtly threatened against Seller that seeks to restrain or prohibit or otherwise challenge the consummation, legality or validity of the transactions contemplated hereby.
- (g) Seller is, with respect to the Equipment and this Agreement, in compliance with all applicable laws.
- (h) There are no defects in material and workmanship in a Unit for a period of twelve (12) months from the installation of the Unit at Buyer's or its customer's site or eighteen (18) months from the date of Seller's receipt of the Purchase Price for the Unit, whichever occurs first. In the event of a warranted defect in the Unit occurs during the warranty term and Buyer so notifies Seller within

said period, Seller shall correct such defect by either repair or making available a repaired or replacement Unit, or part thereof, at Seller's place of repair/replacement. Buyer shall be responsible for removing, transporting and installing any defective or repaired/replaced Unit or part thereof. The terms set forth in this Section 4.1(h) sets forth the exclusive remedies for all claims based on failure of or defect in the Equipment provided under this Agreement whether the failure arises before, during or after the warranty period and whether said claim is based on contract, indemnity, warranty, tort (including negligence), strict liability or otherwise. The duties of Seller under this Section 4.1(h) do not extend to any repairs, adjustments, alterations, replacements or maintenance that may be required as a result of normal wear and tear in the operation of the Equipment, normal degradation in the performance of the Equipment, or as a result of (i) improper repair or alteration by Buyer or any other person (other than Seller or its affiliates), (ii) misuse, negligence or damage by Buyer or any other person (other than Seller or its affiliates), (iii) misuse, negligence or damage by Buyer or other persons, (iv) excessive operation at peak capacity, frequent starting, type of fuel, detrimental air inlet conditions, or erosion, corrosion or material deposit of fluids. The warranty and remedies are further conditioned upon (a) the proper storage, installation, operation and maintenance of the equipment and conformance with the operation and instruction manuals provided by the suppliers and manufacturers, (b) repair or modification pursuant to the instructions of the suppliers and manufacturers and as otherwise directed by Seller, and (c) either (y) installation, startup and commissioning of the Equipment will be performed by Seller or one if its affiliates under separate agreement or (z) on-site supervisory services for the installation, startup and commissioning of the Equipment will be performed by Seller or one of its affiliates under separate agreement. **SELLER HEREBY DISCLAIMS ANY OTHER WARRANTY EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE AS TO THE EQUIPMENT.**

4.2 Buyer hereby represents and warrants to Seller that:

- (a) Buyer is an entity duly organized, validly existing and in good standing under the laws of the jurisdiction in which it is formed and has the requisite power and authority to own, lease and operate its properties and to carry on its business as now conducted. Buyer is duly qualified to transact business and is in good standing in each jurisdiction in which its commitments hereunder makes such qualification necessary.
- (b) Buyer has the requisite power and authority to execute this Agreement and to consummate the transactions contemplated by this Agreement. The execution and delivery of this Agreement by Buyer and the consummation by Buyer of the transactions contemplated by this Agreement have been duly authorized by all necessary action on the part of Buyer. This Agreement has been duly executed and delivered by Buyer and, assuming due execution and delivery by Seller, constitutes a valid and binding obligation of Buyer, enforceable against Buyer in accordance with its terms.
- (c) The execution and delivery by Buyer of this Agreement and the consummation of the transactions contemplated hereby do not and will not (i) violate any provision of the constituent documents of Buyer, (ii) violate any order of any governmental authority to which Buyer is bound or subject, or (iii) violate any applicable law.
- (d) No order or permit issued by, or declaration or filing with, or notification to, or waiver from any governmental authority is required on the part of Buyer in connection with the execution and delivery of this Agreement, or the compliance or performance by Buyer with any provision contained in this Agreement.

- (e) There is no legal action or order pending or overtly threatened against Buyer that seeks to restrain or prohibit or otherwise challenge the consummation, legality or validity of the transactions contemplated hereby.
- (f) The execution and delivery by Buyer of this Agreement and the consummation of the transactions contemplated hereby or any subsequent transaction involving the resale of the Equipment do not violate the U.S. Foreign Corrupt Practices Act, and in connection therewith, Buyer agrees not to directly or indirectly receive, authorize, make, or promise to make any offer, payment, or gift of anything of value that would violate the laws of the United States of America or the laws of Venezuela to or for the use or benefit of (a) any official, candidate for political office, or employee of any agency or instrumentality of any government, political party, public international organization, or any other person, or (b) any person, while knowing that all or a portion of such money or thing of value will be directly or indirectly offered, given, or promised to any official, candidate for political office, or employee of any agency or instrumentality of any government, political party, public international organization, or any other person.

## **5. INDEMNIFICATION**

Buyer assumes liability for, and hereby agrees to indemnify, protect, save and keep harmless Seller and its directors, officers, and employees from and against any and all liabilities, obligations, losses, damages, penalties, claims (including, without limitation, claims involving strict or absolute liability in tort), actions, suits, costs, expenses and disbursements, including, without limitation, reasonable attorney's fees and expenses, of any kind or nature, which may be imposed on, incurred by or asserted against Seller arising out of and in connection with (i) Buyer's obligations under this Agreement, (ii) acceptance, ownership, delivery, possession, use, operations, maintenance, repair, function, registration, sales, return, storage, or other disposition of the Equipment or any accident in connection therewith after the transfer of the title of the Equipment to Buyer on the date of Seller's receipt of the Purchase Price (except for defects in the equipment, latent or otherwise), or (iii) the negligence of Buyer, its employees, representative, contractors and agents.

## **6. TAXES**

Buyer shall be responsible for and shall pay when due any and all taxes, duties, fees or other charges (including ad valorem, consumption, excise, franchise, gross receipts, import, license, property, sales, stamp, use or value added taxes) imposed by any governmental authority which relate to the transactions under this Agreement. Upon request, either party agrees to furnish to the other evidence of any applicable tax or duty exemption acceptable to the taxing or customs authorities. In the event Buyer is obligated by law to deduct or otherwise withhold from the amounts due to Seller under this Agreement any taxes, duties or other charges for which it is responsible, then it agrees to pay such additional amounts to Seller to equal the full amount for which Seller is entitled and shall provide Seller with accurate official receipts from the appropriate governmental authority for the deducted or withheld amounts.

## **7. DEFAULT; REMEDIES**

### **7.1 Events of Default**

If any one of more of the following events of default (herein "Event of Default") shall happen, then this Agreement may at the option of the party not in default be terminated:

- (a) If either party shall default in the due and punctual payment of any sum due to the other which default shall not be cured within five (5) business days after written notice of default to the defaulting

party; provided, however, no notice and cure period shall apply with respect to any payments of the Purchase Price under Section 2.2;

(b) If either party shall default in the performance of any of the material provisions contained in the Agreement, which default shall continue for five (5) business days after written notice of default to the defaulting party; or

(c) If any representation or warranty made by either party herein or made in any statement or certificate furnished or required hereunder, or in connection with the execution and delivery of this Agreement, proves untrue in any material respect as of the date of issuance or making hereof.

## **7.2 Remedies**

Upon the occurrence of an Event of Default the non-defaulting party shall have all rights and remedies at law and at equity.

## **8. MISCELLANEOUS**

### **8.1 Notices**

Any and all notices given, or required to be given hereunder shall be in writing and shall be deemed to have been adequately given when received by the party to whom such notice is being given. Notices shall be addressed if to Seller to: ENERGY PARTS SOLUTIONS, LLC, Attn: Jeff Canon, 2031 ProEnergy Blvd., Sedalia, MO 65301 USA; and if to Buyer to: DERWICK ASSOCIATES, S.A., Attn: Alejandro Betancourt Lopez, MMG Tower, Piso 16, Calle 53, Urbanizacion Marbella, Ciudad de Panama, Republica de Panama, Presente, or such other address as the respective parties hereto shall from time to time designate in writing to the other party.

### **8.2 Captions**

Caption and section headings set forth are for convenience of reference only and shall not in any manner be deemed to limit or restrict the context of the section to which they relate.

### **8.3 Applicable Law**

This Agreement is entered into and shall be governed by and interpreted in accordance with the laws of the State of Missouri notwithstanding its conflict of law provisions.

### **8.4 Entire Agreement**

This Agreement supersedes all prior understandings, representations, negotiations, and correspondence between the parties and constitutes the entire Agreement between the parties with respect to the transaction contemplated and shall not in any manner be supplemented, amended or modified by any course of dealing, course of performance or usage of trade or by any other means except by a written instrument executed on behalf of the parties by their duly authorized officers.

### **8.5 Confidentiality**

Seller and Buyer agree to treat this Agreement and the terms hereof as confidential and not to, without the prior written consent of the other party hereto, disclose the terms hereof to any other person except (i) to its counsel and accountants or other agents or professional advisors in connection with or relating to

the transactions contemplated by this Agreement, (ii) to any court, governmental agency or instrumentality or other supervising body requesting such disclosure, (iii) to any person as may be required by any government regulation or order (including any regulation, request or order of a bank regulatory agency or authority), law, statute, regulations, decrees, subpoenas or court orders, (iv) its directors, officers, employees, affiliates, successors and assigns, (v) to any banks or other financial institutions in any debt financing by or for the benefit of Buyer or (vi) in connection with any enforcement of the terms of this Agreement. Seller and Buyer shall cause its officers, directors, agents, and employees to comply with the foregoing paragraph.

#### **8.6 Further Assurances**

Seller and Buyer agree that each of them will, and will cause their respective representatives and affiliates, to execute and deliver such further instruments of conveyance and transfer and take such other action as may reasonably be requested by any party hereto to carry out the purposes and intents hereof.

#### **8.7 Casualty Loss**

If, subsequent to the date of this Agreement and prior to the date of Seller's receipt of the Purchase Price, any portion of the Equipment is destroyed by fire or other casualty, is taken in condemnation or under the right of eminent domain, or proceedings for such purposes are pending or threatened (collectively, "Casualty Loss"), Seller shall have the option to either (a) sell the Equipment notwithstanding any such Casualty Loss, and the Purchase Price shall be equitably adjusted per the mutual agreement of the parties or (b) terminate this Agreement without further obligation of either party except that the Buyer shall be entitled to the return of the full amount of any amount of the Purchase Price paid to Seller. In the event of subpart (a) above Seller shall (i) on the date of Seller's receipt of the Purchase Price, pay to Buyer all sums paid to Seller by third parties by reason of the Casualty Loss of such Equipment, (ii) assign, transfer and set over unto Buyer all of the right, title and interest of Seller in and to any unpaid awards or other payments from third parties arising therefrom, and (iii) not voluntarily compromise, settle or adjust any material amounts payable by reason of any Casualty Loss of any portion of the Equipment without first obtaining the written consent of Buyer.

#### **8.8 Expenses**

Except as otherwise set forth in this Agreement, Seller and Buyer shall each bear its own expenses (including, without limitation, attorney's fees) incurred in connection with the negotiation and execution of this Agreement and each other agreement, document and instrument contemplated by this Agreement and the consummation of the transactions contemplated hereby and thereby.

#### **8.9 Submission to Jurisdiction**

The parties agree to unconditionally and irrevocably submit to the exclusive jurisdiction of the federal or state courts sitting in Missouri, and any appellate court from any thereof, for the resolution of claim or dispute relating to or arising under this Agreement.

#### **8.10 Excusable Delay**

Neither Seller nor Buyer shall be responsible to the other for any delay ("Excusable Delay") in the performance of its duties under this Agreement (other than payment obligations) due solely to any cause beyond its reasonable control and not occasioned by its intentional act, fault or negligence including, but not limited to acts of God, strikes, lockout or other industrial disturbances, acts of public enemies, orders of any kind of the government of the United States or any state or local government or any of their departments, agencies or officials, or any civil or military authority, insurrections, riots, earthquake, fire

storm, restraint of government and people, civil disturbances, or explosions. Either Seller or Buyer shall promptly notify the other when it anticipates that an Excusable Delay has occurred or is likely to be incurred and in each case specify to the extent practicable the estimated extent of such delay. Except for an Excusable Delay, time shall be of the essence in the parties fulfilling their obligations under this Agreement.

#### **8.11 Severability**

If any provision of this Agreement is invalid or unenforceable, the balance of this Agreement shall remain in effect.

#### **8.12 Limitation of Liability**

NOTWITHSTANDING ANYTHING TO THE CONTRARY IN THIS AGREEMENT OR OTHERWISE, NO PARTY HERETO (OR ITS SUBSIDIARIES, AFFILIATES OR ASSIGNS) SHALL, UNDER ANY CIRCUMSTANCE, BE LIABLE TO ANY OTHER PARTY (OR ITS SUBSIDIARIES, AFFILIATES OR ASSIGNS) FOR ANY CONSEQUENTIAL, EXEMPLARY, SPECIAL, INCIDENTAL OR PUNITIVE DAMAGES CLAIMED BY SUCH OTHER PARTY UNDER THE TERMS OF OR DUE TO ANY BREACH OF THIS AGREEMENT, INCLUDING, BUT NOT LIMITED TO, LOSS OF REVENUE OR INCOME, COST OF CAPITAL, OR LOSS OF BUSINESS REPUTATION OR OPPORTUNITY.

**8.13 Binding Effect; Assignment** This Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and permitted assigns. No assignment of this Agreement or of any rights or obligations hereunder may be made by Seller or Buyer (by operation of law or otherwise) without the prior written consent of the other parties hereto and any attempted assignment without the required consents shall be void.

#### **8.14 Counterparts**

This Agreement may be executed in any number of counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

**IN WITNESS WHEREOF**, the parties have caused this Agreement to be executed effective as of the day and year first above written by their duly authorized officers or representatives.

Seller:

Buyer:

**ENERGY PARTS SOLUTIONS, LLC**

**DERWICK ASSOCIATES, S.A.**

By: \_\_\_\_\_

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

## **Exhibit A**

### **Equipment Description**

#### **1. TWO (2) GENERAL ELECTRIC 7F GTG PACKAGES EACH CONSISTING OF:**

##### **Gas Turbine**

Base-mounted gas turbine including:

- Modulating IGV (inlet guide vanes)

##### **Combustion System**

- Dry Low NOx combustion system
- Combustion system features
  - Thermal barrier coated liners
  - Nimonic transition pieces
  - Reuter Stokes SiC flame detectors
  - Compressor inlet heating
    - Stainless steel water injection piping (GT unit)
- Water injection for NOx control
  - Liquid fuel
  - Off base water injection skid with:
    - Enclosure
    - Space heater
    - Water injection pump with variable frequency drive
    - Water filter

##### **Fuel Systems**

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##### **Gas Fuel System**

- Natural gas only
- Stainless steel gas piping
- Natural Gas Flow measurement System Orifice Plate
- Calibration of Natural Gas Flow Measurement System - Orifice

- Single gas strainer
- Gas fuel valves on accessory base
- Gas fuel temperature < 365°F (185°C)
- Gas fuel conditioning equipment
- Fuel gas scrubber, cyclone type
- Duplex absolute separator filter
  - Fuel gas chromatograph system
  - One (1) system provides signals for up to four (4) gas turbines

#### **Liquid Fuel System**

- Stainless steel fuel oil piping
- Duplex, low pressure fuel filters, on-base
- Main liquid fuel filter differential pressure transducer, 96LF
- Liquid fuel/atomizing air module
- Single, motor driven, atomizing air compressor
- Motor driven, 1x100% capacity, main liquid fuel pump
- Main liquid fuel pump inlet pressure transducer, 96LP
- Liquid fuel recirculation system during gas fuel operation
  - On-base piping in turbine compartment and LF/AA module
  - Requires fuel forwarding pump in operation if not supplied with gas turbine scope
- Distillate fuel forwarding system configured to supply one (1) gas turbine
  - Inlet/discharge valves for skid isolation
  - Duplex fuel oil strainer with differential pressure switch and gauge
  - AC motor driven distillate fuel pump with pressure switch
  - One (1) back-up ac motor driven distillate fuel pump per forwarding skid
- Motor starters not provided in the gas turbine scope of supply
- Pressure regulating valve
- Separate distillate fuel heater skid (up to 20°F rise) with thermal relief valve (one (1) heater skid per turbine)
  - Inlet/discharge valves for skid isolation
  - SCR control panel mounted on skid unless area is rated Class 1, Group D, Div 2 or IEC

Zone 2. When skid is rated as a hazardous area, the control panel must be installed in a climate controlled, non-hazardous area. This installation is not included in the gas turbine scope of supply.

- Carbon steel fuel oil piping
- Electrical conduit & junction boxes
- Instrumentation and gauges (dual metric/English)
- Weatherproof acoustic enclosure(s) with:
  - fire detectors
  - vent fan and lighting
- No enclosure for the fuel forwarding skid
- Hazardous area rating (Class 1, Group D, Div 2 or IEC Zone 2)
- Distillate fuel management spool piece
  - Inlet/discharge valves for skid isolation
  - Combined pressure regulating/stop valve
  - Flow meter with:
    - local and remote flow and totalizer readout
    - $\pm 0.5\%$  system accuracy for the design fuel
  - Carbon steel fuel oil piping

### **Lubricating and Hydraulic Systems**

#### **Pumps**

- AC motor driven dual lube oil pumps
- AC motor driven dual hydraulic pumps
  - Used for jacking oil also
- DC motor driven, emergency lube oil pump
- AC/DC motor driven auxiliary generator seal oil pump

#### **Filters and Coolers**

- Dual lube oil system filters
- Dual hydraulic oil filters
- Dual lube oil coolers
  - Plate/frame type with stainless steel plates

- ASME code stamp
  - Lube oil coolers
  - Lube oil filters

#### **Lube Oil Piping**

- 304L stainless steel lube oil feed pipe
- Carbon steel lube oil drain pipe
- Lube system valve stainless steel trim
- Automatic GMAW or GTAW root pass weld, lube oil feed and drain piping

#### **Mist Elimination**

- Lube vent demister

#### **Oil Reservoir**

- With heater for -20°F (-29°C) ambient temperature
- With provisions for lube oil conditioner

#### **Instrumentation**

- Delta pressure switches for alarm for lubrication and hydraulic oil filters
- Lubrication oil tank level transmitter

#### **Inlet System**

- Refer to GEK 111330a "Operation and Maintenance Recommendations for Gas Turbine Inlet Air Filter Compartments" provided in chapter 22 of this Appendix, for operation and maintenance information for the GT inlet system.
- Inlet system arrangement
  - Up and forward inlet system arrangement
- Inlet compartment
  - Self-cleaning inlet filter
  - Compressor bleed air supply for filter cleaning
  - Severe duty filter media (high humidity/corrosive environments)
  - 50 micron moisture separator
  - Coalescing filters
  - Inlet compartment local differential pressure indicator (gage) across each stage of filtration and overall filter compartment system

- Inlet compartment differential pressure alarm
- Three thermocouples for inlet air temperature measurement
- Inlet filter compartment support steel (Seismic Zone 4,  $\leq$  120 mph wind speed loads per UBC 1997)
- Evaporative cooler, 85% effective
  - Stainless steel piping
  - Redundant pumps (lead/lag)
  - Stainless steel pump casing material
- Caged ladder access to inlet filter compartment
- Left hand access to inlet filter compartment
- Electric hoist with 500 lb lift capacity
- Inlet filter compartment interior lighting
- Air processing unit (APU) for filter cleaning
  - With 304 stainless steel piping and dual filters
  - APU heat tracing kit if required due to site minimum ambient temperature rating
- Inlet compressor bleed heating
  - DLN premix turndown inlet bleed heat control
  - Compressor pressure ratio operating limit bleed heat control
  - Bleed heat manifold located in inlet duct
  - Inlet bleed heat control valve(s)
- Inlet ducting
  - Inlet duct section arrangement per proposal mechanical outline
  - Inlet silencing
  - Inlet 90 degree elbow
  - Inlet transition piece
  - Inlet expansion joint
  - Inlet ducting support steel (Seismic Zone 4,  $\leq$  120 mph wind speed loads per UBC 1997) (Refer to proposal drawing for scope)
  - Outdoor unit
  - Compressor inlet humidity sensor

- Triple redundant sensors
- Compressor inlet temperature thermocouple
- Inlet viewing window in plenum area
- Inlet system atmospheric protection
  - Zinc rich paint inside and outside of inlet filter compartment
  - Two-part epoxy overcoat inside and outside inlet filter compartment
  - Zinc rich paint with two-part epoxy overcoat on evaporative cooler unwetted section
  - Zinc rich paint inside and outside of inlet ducting with two-part epoxy overcoat on all inside surfaces exposed to airflow as well as all outside surfaces
  - Galvanized, galvannealed or carbon steel with zinc-rich primer for all interior surfaces not exposed to airflow
  - Corrosion-resistant inlet silencing perforated sheet
  - Galvanized inlet support steel

### **Exhaust System**

#### **Arrangement**

- Exhaust diffuser with an axial exit
- Exhaust expansion joint
- Exhaust system materials and atmospheric protection
  - Carbon steel exhaust system shell and stiffeners
  - 409 stainless steel internal lagging
  - Inorganic zinc primer

#### **Couplings**

- Rigid load coupling
- Load coupling guard

### **Gas Turbine Packaging**

- Lagging and enclosures
  - On-base accessory compartment lagging
  - Off-base acoustic enclosure for turbine only
  - Off-base load coupling compartment enclosure

- Acoustic barrier wall around exhaust diffuser
- External junction boxes
  - Epoxy-coated carbon steel junction boxes, rated NEMA 4 or glanded IP56, dependent on whether wiring is compliant with NEC or IEC standards
  - Cast aluminum may be substituted as needed for flame-proof enclosure requirements, as determined by the hazardous area map for the project
- Compartment ventilation, pressurization and heating
  - Dual turbine compartment vent fans
  - Dual accessory compartment vent fans
  - Dual load compartment vent fans
  - Dual vent fans for liquid fuel and atomizing air skid
  - Compartment freeze protection heating
  - Heated turbine and accessory compartments for humidity control
- Plant arrangement
  - Turbine designed for installation outdoors
  - Right hand accessory module
  - Multi shaft STAG
  - Mounting pads only; exterior unit walkways are not part of the power train scope of supply
  - Interior turbine compartment grating
- Base painting
  - Standard primer only
- Interconnecting Lube Oil Feed and Drain piping between accessory compartment and liquid fuel/atomizing air skid
- UBC 1997 Seismic Zone 4 loads (except for inlet and exhaust)
- UBC 1997 Seismic Zone 4 loads for inlet and exhaust
- Hazardous area classification
  - NEC Class1, Group D, Division 2
    - Turbine compartment
    - Natural gas fuel compartment
    - Liquid fuel/atomizing air module

- Special features
  - Blank set of nameplates for on-site engraving by others
  - Dual (metric-English) indicators and gauges

#### **Fire Protection System**

- Fire detection system - heat detectors
  - Turbine compartment
  - Accessory compartment
  - Number 2 bearing tunnel
  - Generator collector compartment
  - Liquid fuel and atomizing air skid
- Smoke detection system
  - Control cab/PEECC
- Compartment warning signs
- Compartment exterior alarms
- CO2 supply system
  - One low pressure CO2 tank per unit
  - Tank suitable for 0-120°F (-18 to 49°C)
  - Tank also suitable for temperatures below 0°F (-18°C)
  - Tank to be located in a shelter (not part of the power train scope of supply), for ambient temperature above 120°F (49°C)
- Fire protection piping
  - Purchaser's connections on right side of unit only
  - Turbine compartment
  - Accessory compartment
  - Number 2 bearing tunnel
  - Liquid fuel and atomizing air skid
  - FM-200 fire protection piping for the PEECC
- Hazardous atmosphere sensors in compartments
  - CHx sensors - natural gas compartment

- Triple modular redundant sensors in the gas compartment
- CHx sensors- turbine compartment
- Triple modular redundant sensors in the turbine vent duct
- H2 sensors - generator collector compartment
- Triple modular redundant sensors in the collector compartment
- H2 sensors - generator terminal enclosure
- Hazardous atmosphere detector readout
  - CHx
  - H2

#### **Cleaning Systems**

- On base piping for on and offline compressor water wash system
- Water wash skid
  - Water storage tank and freeze protection
  - Stainless steel tank
  - Capability to heat water to 180°F (82°C)
  - Single skid for the site
  - One (1) skid can be connected to up to four (4) units, washing one (1) unit at a time (on-base storage tank sized for one [1] off-line wash)

#### **Cooling Water System**

- Cooling system temperature regulating valve
- System suitable for:
  - Water/propylene glycol coolant mix

#### **Starting Systems**

- Generator start with load commutated inverter
- Static start isolation transformer
  - Oil filled
  - Outdoor installation
  - Bottom entry cable connection, HV and LV
  - Isolation transformer fed from auxiliary bus

- Redundant Ethernet link to turbine control panel
- Shared static start across power blocks using cross ties
  - Two (2) static starts for three (3) gas turbines
- Change-over function in LCI controls
- LCI output isolation switch (89MD)
- LCI cross-connect tie switch (89TS)
- AC line reactor
- Single dc link reactor
- Water-to-water heat exchanger, shipped loose
- Rotor turning systems
  - Turning gear and motor for rotor cool down
  - Rotor indexing (borescope inspection)

#### **Miscellaneous Systems**

##### **Special Systems**

- Exhaust frame blowers on turbine compartment roof
  - Bearing area blowers also included

#### **Generator**

##### **General Information**

- Hydrogen cooled generator with conventionally cooled armature
- Outdoor installation
- 60 Hz generator frequency
- Generator voltage 18.0 kV
- 0.85 power factor (lagging)
- Capability to 0.95 power factor (leading)
- Class "F" armature and rotor insulation
- Class "B" temperature rise, armature and rotor winding
- Generator bearings
  - End shield bearing support
  - Elliptical journal bearings

- Roll out bearing capability without removing rotor
- Insulated collector end bearing
- Online bearing insulation check
- Offline bearing insulation check with isolated rotor
- Monitoring Devices
  - Two (2) velocity vibration probes at turbine end, one (1) at collector end
  - Provisions for key phasor-generator
  - Permanently mounted flux probe mounted in stator wedge (Monitoring system not included)
  - Proximity vibration probes
    - Two (2) probes per bearing at 45° angle
- Generator Field
  - Direct cooled field
  - Two-pole field
  - Finger type amortisseurs

#### **Generator Gas Coolers**

- Coolers shipped installed
- Generator gas cooler configuration
  - Five (5) horizontally mounted simplex coolers
  - Coolers located in generator base
- Cooler piping connections on left side as viewed from collector end
  - ASME code stamp
  - Single wall cooler tubes
  - Victaulic cooler couplings
  - Plate fins
  - Cooling water manifold and isolation valves
  - Companion flanges for cooler connection
- Generator gas cooling system characteristics
  - Coolant temperature - 20°F approach

- Generator capacity with one section out of service 80% with Class 'F' rise
- TEMA class C coolers
- Maximum cooler pressure capability - 125 psi
- Coolant 55% water and 45% propylene glycol by volume
- Fouling factor 0.0010
- Generator gas cooler construction materials
  - 90-10 copper-nickel or copper tubes as appropriate
  - Carbon steel tube sheets
  - Carbon steel waterbox and coupling flanges with epoxy coating
  - Aluminum cooler tube fins

#### **Generator Lube Oil Systems and Equipment**

- Bearing lube oil system
  - Generator lube oil system integral with turbine
  - Sight flow indicator
- Bearing lift oil system
  - Stainless steel lift oil piping and tubing
  - Lift oil supplied from turbine oil system
- Lube oil system piping materials
  - Stainless steel lube oil feed pipe
  - Carbon steel lube oil drain pipe
  - Welded oil piping

#### **Generator Grounding Equipment**

- Neutral grounding equipment
  - Neutral ground transformer and secondary resistor
  - Mounted in terminal enclosure
  - Motor operated neutral disconnect switch

#### **Generator Temperature Devices**

- Stator winding temperature devices
  - 100 ohm platinum RTDs (resistance temperature detector)

- Dual element RTDs
- Grounded RTDs
- Nine (9) stator slot RTDs
- Gas path temperature devices
  - 100 ohm platinum gas path RTDs
  - Dual element temperature sensors
  - Four (4) cold gas
  - Two (2) hot gas
  - GTG-2 (common cold gas)
- Bearing temperature devices
  - Chromel alumel (type K) thermocouples
  - Dual element temperature sensors
  - Two (2) bearing metal temperature sensors per bearing
- Collector temperature devices
  - 100 ohm platinum RTDs
  - Single element temperature sensors
  - Collector air inlet temperature sensor
  - Collector air outlet temperature sensor
- Lube oil system temperature devices
  - Chromel alumel (type K) thermocouples
  - Dual element temperature sensors
  - One (1) bearing drain temperature sensor per drain

#### **Packaging, Enclosures, and Compartments**

- Paint and preservation
  - Epoxy based primer
- High voltage bushings
  - High voltage bushings shipped installed
  - Six (6) ambient air cooled, high voltage bushings
- Generator Terminal Enclosure

- Terminal enclosure shipped separate
- Top mounted
- Neutral terminals integral with line-side terminal enclosure
- Line-side terminal enclosure
  - Terminal enclosure shipped separate
- Generator Terminal Configuration
  - Phase sequence R-C-L when looking at enclosure terminals
  - Outgoing power connection on right side when viewed from collector end
- Collector compartment/enclosure
  - Collector compartment/enclosure shipped separate
  - Collector/brush holding rigging
- Generator Terminal Accessories
  - LineCTs
  - Lightning arresters
  - Voltage transformers
  - Neutral CTs
- Compartment lighting
  - AC lighting
  - Collector compartment
- Foundation hardware
  - Generator alignment fixators
  - Generator alignment key(s) - collector end
  - Generator alignment key(s) - turbine end

#### **Hydrogen Systems and Accessories**

- 
- Hydrogen gas manifolds
    - Auto purge gas purge control manifold
    - Hydrogen/CO2 control valve assembly
    - H2/CO2 bulk feed connections
    - H2 Bottle manifold not provided

- CO2 bottle manifold not provided
- Hydrogen detection system
  - H2 detection sensor(s)
    - Collector compartment
    - Terminal enclosure
- Seal oil system
  - Control unit mounted in collector compartment
  - Stainless steel seal oil feed pipe
  - Carbon steel seal oil drain pipe

#### **Electrical Equipment**

- Motors
  - TEFC motors
  - Coated with antifungal material for protection in tropical areas
  - Energy saver motors
  - Extra severe duty motors
  - Cast iron motor housings
- Heaters
  - Generator stator heaters
  - Generator collector heaters

#### **Generator Excitation Systems, Static Components**

- Bus fed static excitation with warm backup bridge

#### **Excitation Module Features**

- Control/monitor/display through turbine control panel
  - Voltage matching in turbine control system
  - Power factor controller in turbine control system
  - Var controller in turbine control system
  - Selection of automatic or manual regulator
  - Raise-lower of the active regulator setpoint
  - Enter setpoint command

- Display field amps
  - Display field volts
  - Display transfer volts
  - Redundant Ethernet link to turbine control panel
  - Built-in diagnostic display panel
    - Automatic voltage regulator (AVR)
    - Manual voltage regulator (FVR)
    - Automatic and manual bi-directional tracking
    - Reactive current compensation (RCC)
    - Temperature compensation for UEL and OEL
    - Volts per hertz limiter (V/Hz LIM)
    - Volts per hertz protection (24EX) (Backup to 24G)
    - Over excitation limiter (OEL)
    - Offline/online over excitation protection (76EX)
    - Loss of excitation protection (40EX)
    - Bridge ac phase unbalance protection (47EX)
    - Under excitation limiter (UEL)
    - Generator overvoltage protection (59EX)
    - Generator field ground detector trip (64FT)
    - Field over-temperature alarm
    - Field ground detector alarm (64FA)
    - Exciter phase voltage imbalance (47EX)
    - Bridge over-temperature (26EX)
  - Local operator interface, panel mounted
- 
- Dual source internal bulk power supply
  - Millivolt shunt for field
  - Surge protection
    - VT disconnect and CT shorting switches
    - Two phase current sensing

- Three phase voltage sensing
- Single pole dc field contactor/bridge
- Thyristor bridge circuit filtering
- Shaft voltage suppressor circuit (mounted in panel)
- Power system stabilizer

#### **Performance**

- 2.0 response ratio and 160% VFFL (100°C) ceiling @  $V_t = 1.0\text{pu}$

#### **Excitation Location**

- Installed in LCI/EX compartment

#### **PPT Features**

- Freestanding oil-filled PPT for outdoor installation
- PPT fed from auxiliary bus

#### **LCI Features**

- LCI located in LCI/EX compartment
- LCI output isolation switch (89MD)
  - Located in LCI compartment
- LCI cross-connect tie switch (89TS)
  - Located in LCI compartment
- LCI disconnect switch (89SS)
  - Located in generator terminal enclosure
- LCI fuse
  - Located in compartment with LCI

#### **Generator Current Transformers and Voltage Transformers**

- Current Transformers (CTs)
  - Line-side CTs with relaying class C800 and metering class 0.3B-1.8 (ANSI C57.13)
  - Neutral-side CTs with relaying class C800 and metering class 0.3B-1.8 (ANSI C57.13)
  - Line side CTs
    - CT 13, 14, 15 (miscellaneous functions)

- CT 19A, C (excitation)
- CT 21, 22, 23 (generator differential relay)
- Neutral CTs
  - CT1,CT2,CT3
  - CT4,CT5,CT6
  - CT7,CT8,CT9
  - CT10,CT11,CT12
- CT calibration curves, provided after equipment ships
  - For line-side CTs
  - For neutral-side CTs
- Voltage transformers (VTs)
  - Fixed
  - VT2, generator line side
  - VT4, generator line side

### **Gas Turbine-Generator Controls and Electric Auxiliaries**

#### **Control Cab/Packaged Electric and Electronic Control Compartment (PEECC)**

- Weatherproof, climate controlled, base mounted enclosure
- Redundant HVAC system
- Mounted on pedestals

#### **Gas Turbine Control System Panel Features**

- Triple Module Redundant (TMR) SPEEDTRONIC<sup>™</sup> Mark VIe with non-remote I/O
  - Redundant unit data highway (UDH)
- Auto/manual synchronizing module with synchronizing check function
- Generator stator overtemperature alarm (49)
- Load limiter
- Purge cycle
- Island mode operation for DLN units
- Automatic transfer from gas to liquid fuel
- Customer alarm/trip contact for CRT display

- Additional customer input contacts (digital), as available
- Additional customer output contacts (digital), as available
- Provision for analog inputs from customer, as available
- Provision for analog outputs to customer, as available
- Maximum of 12 RTDs inputs for customer use
- Power source selector
- Totalizing fuel flows
- Vibration alarm readout and trip
- Electrical overspeed protection
- Constant settable droop
- Power factor calculation and display
- Power factor control
- VAR control
- VARS shedding
- Tie-line VAR control
- Manual set point preselected load
- External load setpoint, 4-20 mA control
- Airflow calculation and readout
- Inhibit/initiate auto synchronization from remote location
- Time synch
  - Time input signal, for devices on the power train network, is not part of the power train scope of supply

#### **Local Operator Station**

- Commercial grade personal computer
- Operator interface 19" rack
- PC table
- Color monitor
  - Rack mounted
  - 17 in. LCD monitor or equivalent

- Keyboard with built-in cursor positioning device
- Printer
  - Color ink jet printer
- Display in English language
- Unit Ethernet equipment

### **Generator Protection Panel**

#### **Generator Protection Panel Hardware**

- Mounted in PEECC
- GE Multilin G60 Generator Management Relay
- GE Multilin T60 Transformer Management Relay
- GE Multilin C60 Breaker Management Relay
- Generator Digital Multimeter
- Lockout relays
- Test switches (per one-line)
- Generator breaker trip switch (52G/CS) and lamps
- Gas auxiliary monitoring panel (GAMP)
  - Humidity sensor readout
  - Hazardous atmosphere detector readout
  - Bentley Nevada 3500 vibration monitor

#### **Generator Management Relay (G60)**

- Generator overexcitation (24)
  - Phase undervoltage (27P)
  - Reverse power/anti-motoring (32)
  - Loss of excitation (40)
- 
- Current unbalance/negative phase sequence (46)
  - Phase time overcurrent (51PV)
  - Neutral ground overvoltage (stator ground) (59N)
  - Phase overvoltage (59P)
  - Stator ground protection, (third harmonic) (27TN)

- Site data required for setting
- Generator over frequency (81O)
- Generator under frequency (81U)
- Phase Distance (21)
- Out of Step (78)
- Stator differential (87S)
- Voltage transformer fuse failure (VTFF)

#### **Breaker Management Relay (C60)**

- Inadvertent energization (50/27)
- Breaker failure with timer (50/62BF)
- Breaker failure (50BF)
- Bus ground detection (59BN)
- Voltage transformer fuse failure (VTFF)

#### **Transformer Management Relay (T60)**

- With three (3) restraints
- Unit differential (87U)
- Transformer neutral overcurrent (51TN)
- Latch output contact for transformer fault pressure (63PTX)

#### **Digital Generator Protection System (DGP)**

Note: Refer to OEM one-line diagram for complete discrete relay scope

- Generator protection lock-out relay (86G1A)
  - Generator protection lock-out relay (86G2A)
  - Inadvertent energization lock-out relay (86IE)
  - Breaker failure lock-out relay (86BF)
- 
- Unit differential lock-out relay (86U)
  - Transformer differential lock-out Relay (86T)
  - Breaker Cross tripping dual breaker trip coils (94GB-1,2)
  - Breaker status auxiliary relay (52GX-1)

### **Features Integrated Into Gas Turbine Control System**

- Gas turbine control system with speed matching, synchronization and check
- Manual synchronization displayed on gas turbine control system operator interface
- Auto/manual synchronizing module with generator voltage matching displayed on gas turbine control system operator interface
- Load control in gas turbine control system
- Temperature indication for generator RTDs

### **Generator Protection Panel Metering**

- Generator digital multimeter (Nexus)
  - Generator volts
  - Generator Amps: Phase 1,2,3 and Neutral
  - Generator Watts
  - Generator VARs
  - Generator frequency
  - Generator VA
  - Generator power factor
  - MWH - Generator Watt-Hours
  - MVAH - Generator VA-Hours
  - Generator VAR-Hours

### **Generator Protection Panel Outputs**

- Nexus meter with KYZ pulse output module (field configurable)
- Generator watt/VAR transducer 4-20 mA output for input to TCP (96GG-1)
- Generator TCP/droop control transducer 4-20 mA output (96GW-1)

### **Generator Protection**

- Generator electrical protection equipment
  - Shaft voltage monitor in turbine controls

### **Batteries and Accessories**

- Lead acid battery
- Two (2) single-phase battery chargers, each sized 100% capacity

### **Motor Control Center**

- MCC mounted in control compartment
- Tin-plated copper bus-work

### **Remote Control and Monitoring Systems**

- HMI Ethernet communications link using GSM protocol
- Site Ethernet equipment in central control room
- Ethernet cables internal to components and compartments, as well as Ethernet switches
- Remote HMI, multi-unit control
  - Two (2) per site
- Commercial grade personal computer
- Color monitor
  - Table top
  - 20 in. LCD monitor
- Trackball cursor control
- Mouse cursor control
- Table top keyboard
- Printer
  - Black and white laser network printer
  - Color laser jet network printer

### **Rotor, Bearing and Performance Monitoring Systems**

- Performance monitoring systems
  - Air flow measurement sensors wired to gas turbine control system
  - Gas turbine performance monitoring calculations in operator interface
- Vibration sensors
  - Velocity vibration sensors
  - Proximity vibration sensors
  - Transducer for atomizing air compressor
- GE proximity vibration sensor monitoring
  - In the SPEEDTRONIC<sup>TM</sup> Mark VIe panel

- HMI display
- Bentley Nevada 3500 proximity vibration sensor monitor
  - Signals provided from turbine control panel
  - Mounted with auxiliary panel
- Bearing thermocouples
  - Bearing drain thermocouples
  - Bearing metal thermocouples Borescope access holes Bentley Nevada System 1 TGVAS
- Software for gas turbine/generator(s) Universal On Site Monitoring System (uOSM)
  - Rack Mounted
  - Shares HMI monitor, keyboard and positioning device
  - ADH equipment for turbine control system
  - Requires two dedicated analog phone lines, which are not part of the power train scope of supply

#### **Motor Features**

- TEFC motors less than or equal to 200 hp
- Coated with antifungal material for protection in tropical areas
- High ambient motor insulation
- Energy saver motors
- Extra severe duty motors
- Cast iron motor housings
- All redundant motors to be lead/lag
- Motor heaters connected to AC power, for all motors greater than 1 hp
- WP motors >200 hp
- NEMA Class F insulation, Class B temperature rise

## **2. TWO (2) GENERAL ELECTRIC LM6000 GTG PACKAGES EACH CONSISTING OF:**

### **Gas Turbine**

General Electric gas turbine model LM6000 is a two-shaft/two-spool engine consisting of a five-stage low pressure compressor, a fourteen-stage high pressure compressor, a two-stage high pressure turbine, and a five-stage low pressure turbine. The engine is equipped with a stainless steel mesh screen in the inlet air stream for "last chance" protection against foreign object damage. The engine is shock mounted and shipped in position, with the exception of the coupling spacer, which is removed and shipped in a separate container.

### **Generator**

Air cooled, 2-pole generator operating at 13.8 kV, 60 Hz. Generator is capable of handling power requirements throughout a wide ambient temperature range. A cooling water loop and its associated fans and pumps are not required. The generator includes a brushless excitation system with permanent magnet generator. Neutral and line side cubicles are included.

### **Unit Enclosure**

The basic equipment package is supplied with weatherproof acoustic enclosures with sound attenuation to an average of 85 dB(A) at 3 ft 3 in (1 m) from the face of the equipment at 4 ft 11 in (1.5 m) above ground. The enclosures are completely assembled and mounted over the equipment prior to testing and shipment. The turbine and generator compartment is fully ventilated with belt driven fans. Explosion-proof lighting is provided in both compartments.

### **Gas Turbine / Generator Baseplate**

The basic equipment package is supplied with the support structures for the gas turbine generator set consisting of a two-piece skid assembly, which is sectioned between the gas turbine and the generator. The full depth, bolted section is designed to provide the full structural properties of the wide flange I-beams. Full depth crossmembers are utilized to provide for a rigid design that is suitable for installation in earthquake areas (U.S. Seismic Zone 4) as well as providing a convenient structure for transportation. The baseplate support system is enhanced by the installation of a heavy-duty, welded superstructure, which utilizes structural tubing for wall columns and roof beams.

### **Air Inlet System**

The basic equipment package is supplied with a modular, multi-stage filtration system consisting of inlet screens, a prefilter and a final barrier filter. All air for ventilation systems is filtered to the same level as turbine combustion air. An evaporative cooling system is included in the basic equipment package scope. Filtered air is silenced before entering the turbine plenum. This design results in a compact arrangement and eliminates the need for Buyer supplied inlet ducting when the standard design is utilized. Internal lighting of the filter house is provided to facilitate inspection and service. Package is also supplied with platforms and ladders to service the inlet filter. These items are packaged separately for shipment. Ladders, platforms and stairways to service other portions of the gas turbine generator enclosure are not included. Special or customized filter arrangements can be supplied, and they are quoted on an individual basis.

### **Turbine Exhaust**

The basic equipment package is supplied with a circular, axial exhaust outlet with connection flange to facilitate in-line mounting of an HRSG or simple cycle exhaust stack.

### **Fuel System**

The basic equipment package is supplied with a natural gas fuel system using an electronically controlled fuel-metering valve. All necessary shutoff valves, piping and instruments between the auxiliary skid connection and the turbine are included. For full-load operation, the gaseous fuel must be supplied to the baseplate at 675 psig $\pm$ 20 (4,658  $\pm$ 138 kPag). All necessary shutoff valves, piping and instruments between the baseplate connection and the turbine are included. Gas fuel must meet General Electric specification MID-TD-0000-1.

### **Lube Oil Systems**

The basic equipment package is supplied with two separate lube oil systems: one for the gas turbine (synthetic oil) and one for the generator (mineral oil). The oil reservoirs and piping are all stainless steel, and the lube oil system valves have stainless steel trim. Each lube oil system has duplex filters, duplex shell and tube coolers, and thermostatically-controlled electric heaters. The coolers, oil reservoir, and

filters for each system are mounted on an auxiliary equipment module located next to the gas turbine baseplate. The auxiliary equipment module provides simplified piping connections and reduces Buyer's installation time and costs. Buyer must supply cooling water to the shell and tube coolers. Turbine lube oil must meet General Electric specification MIDTD-0000-6.

#### **Electro-Hydraulic Start System**

The basic equipment package is supplied with an electric motor driven hydraulic pump assembly, filters, cooler and controls, mounted on the auxiliary equipment module. A hydraulic motor is also mounted on the gas turbine accessory gearbox. Hydraulic hoses are furnished to connect the auxiliary equipment module and the main baseplate.

#### **Fire Protection System**

The basic equipment package is supplied with a factory installed fire protection system complete with optical flame detection, hydrocarbon sensing and thermal detectors, piping and nozzles in both generator and engine compartments. The fire protection system includes cylinders containing CO2 mounted on a separate skid. A 24 V DC battery and charger to power the fire protection system is also included. All alarms and shutdowns are annunciated at the turbine control panel (TCP). An alarm sounds at the turbine if the gas detectors detect high gas levels, or if the system is preparing to release the CO2. When the system is activated, the package shuts down, and the primary CO2 cylinders are discharged into the turbine and generator compartments via multiple nozzles, and the ventilation dampers automatically close. After a time delay and if required, the reserve supply of CO2 is discharged.

#### **Digital Control System**

The basic equipment package is supplied with a free-standing control panel suitable for mounting in an indoor, non-hazardous area. The control system features an integrated Woodward MicroNet Plus turbine control system, vibration monitor, digital meter, digital generator protective relay module and an HMI (human machine interface) display of key discrete and analog data. The operator selects HMI displays with convenient touch screen control. Alarm and shutdown events are displayed on the HMI automatically. An Ethernet TCP/IP EGD or RS485 Modbus Port is provided to transmit unit conditions (status, pressures, temperature, etc.) to the Buyer's distributed control system. Power for the control panel is provided by a dedicated 24V DC battery system with dual 100% capacity chargers, which are shipped separately for installation by others.

#### **Generator Protective Relays**

The basic equipment package is supplied with a microprocessor-based generator protective relay module, mounted in the TCP. The protective relay system includes functions necessary for protection of the generator.

#### **Soak Wash System**

The basic equipment package is supplied with a turbine cleaning system, which allows cleaning the compressor section of the turbine during full power operation. The same system reservoir and piping are utilized for off-line soak washing. Auxiliary skid connections are provided for Buyer supplied purified water at a maximum of 50 psig (345 kPag) and air at 100 – 120 psig (689 – 827 kPag). Buyer is required to provide purified water meeting General Electric specification MID-TD-0000-4, detergent meeting General Electric specification MID-TD-0000-5, and air filtered to ISA S7.3 standards.

### **3. EXCLUSIONS**

Listed below are the limits/exclusions to the Seller's scope of supply. All piping, wiring, cables, ducts, etc. connecting to these points is furnished by Buyer (or others).

Equipment System	Limits of Seller Scope
All piping, including Fuel Gas, Fuel Oil, Steam, Cooling Water, Heating Water, Demineralized Water, Lube Oil, Compressed Air, Instrument Air, Hydraulic Start Oil	Flanged or threaded connection on baseplate
Inlet Air-to-Filter	Atmosphere (non-standard duct by others)
Turbine Package Ventilation/Cooling Air	Atmosphere (non-standard duct by others)
Turbine Exhaust	Exhaust flange on main baseplate
Instruments on baseplate	Terminal box on baseplate
Instrument wiring in Turbine Control Panel	Wiring Terminal block in Turbine Control Panel
High Voltage Connections	Bus bar in lineside cubicle
Generator Ground Connections	Neutral cubicle
Electric Motors	Terminal box on individual motor
Ladders and Platforms for Air Filter	Ladders and Platforms for Inlet Air Filter maintenance only
24 V DC Batteries and Chargers for Control System and Fire and Gas Systems	Battery terminals to baseplate (if supplied loose)

**Further Exclusions to Seller's Scope of Equipment**

- Civil engineering design of any kind
- Building and civil works
- Site facilities
- Drains and/or vent piping from the gas turbine package to a remote point
- Fuel storage, treatment and forwarding system
- Site grounding
- Lightning protection
- Power system studies
- Sensing and metering voltage transformers
- Machine power transformers, and associated protection

- Grid failure detection equipment
- Off-loading, transportation and storage
- Off-skid cabling, and design of off-skid cable routing
- Balance of plant and energy optimization controls
- Anchor bolts, embedments, and grouting
- Distributed plant control
- Buyer's remote control
- Field supervision
- High voltage transformer(s), cables, and associated equipment
- Interconnecting piping, conduit, and wiring between equipment modules
- Plant utilities, including compressed air supply and off-skid piping
- Battery containment
- Lube oil measurement other than that defined in the scope of supply
- Additional lube oil breather ducting other than that defined in the scope of supply
- Fuel transfer pump
- Off-skid fuel block and vent valves
- Fuel supply pipework beyond the scope of supply
- Generator controls other than that defined in the scope of supply
- Load sharing control
- Balance of plant controls
- Field Performance Testing
- Site Labor
- Ladders, Stairs, and Platforms for equipment beyond the gas turbine
- Absorption chiller and chilled water supply system
- Boiler feed pump and auto level control assembly
- Bus bars and bus duct beyond generator lineside and neutral enclosures
- Cooling tower and circulating water system
- Deaeration and chemical injection equipment
- Desuperheater equipment

- Filter house support structure, other than standard
- Gas compression, filtration, and separation or regulation equipment
- Heat recovery boiler and blow down controls
- Power plant calibration tools and ordinary hand tools
- Spare parts
- Steam filtration and purification equipment
- Steam turbine condenser and condensate pumping equipment
- Water injection pressurization equipment
- Water treatment and purification equipment