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SIEMENS DOCUMENT NO. :-				**Page No. :-**	
Issue Number :-				**Date :-**	5JAN2012
SIEMENS Specification No. :-	76/01080160	Issue No. :-		Item No :-	
SIEMENS Purchase Order No. :-	45012197				
Manufacturer's Design Reference No. :-	43889/C1	Manufacturer's Order No. :-			CY.20179

ELECTRICAL DATA

N.B. Electrical Performance Figures are subject to tolerances.
(Reactances ±15%. Time constants and pu. resistances ±30% and Ohmic resistances ±10 %.)

Rated Output		Rating Temp.	PF(cosφ)	Poles	Phases	Voltage	Current	Frequency	Speed
KVA	KW	°C				Volts	Amps	Hz	RPM
10400	8320	15	0.8	4	3	4160	1444	60	1800

Stator Winding Configuration :-	Star	Governing Standard :-	IEC 60034
Ambient Temperature Range :-	-6.5 to 50°C	Max. Operating Altitude :-	<1000m
Total Temperature Rises to Class :-	B	Insulation Class :-	F
Max. Stator Operating Temp.	125°C	Max. Field Operating Temp.	120°C
Short circuit ratio SCR	0.396	Inertia constant H (MJ/MVA) Generator only	0.54
Maximum Voltage Distortion (%)	THD < 5%	Telephone Influence Factor	< 100 Balanced

	Saturated	Unsaturated
Synchronous Reactance (D-Axis) Xd (pu) :-	2.53	2.78
Transient Reactance (D-Axis) X'd (pu) :-	0.261	0.323
Sub-transient Reactance (D-Axis) X"d (pu):-	0.161	0.200
Synchronous Reactance (Q-Axis) Xq (pu):-		1.39
Transient Reactance (Q-Axis) X'q (pu):-		N/A
Sub-transient Reactance (Q-Axis) X"q (pu):-	0.232	0.279
Stator Winding Leakage Reactance X1 (pu):-		0.092
Negative phase sequence reactance X2 (pu):-		0.24
Potier reactance Xpot (pu):-		0.19
Stator winding dc resistance Ra (pu):- 95 C		0.00553
Positive phase sequence resistance R1 (pu):- 95 C		0.00825
Negative phase sequence resistance R2 (pu):- 95 C		0.029
Zero phase sequence reactance X0 (pu):-		0.075
Zero phase sequence resistance R0 (pu):- 95 C		0.00953
OC transient field time constant T'do (s) :-		4.63
SC transient field time constant T'd (s) :-	0.43	0.54
OC sub-transient time constant DA T"do (s) :-		0.062
SC sub-transient time constant DA T"d (s) :-	0.033	0.039
OC sub-transient time constant QA T"qo (s) :-		0.198
SC sub-transient time constant QA T"q (s) :-		0.040
Armature dc time constant Ta (s) :-	0.097	0.138

Negative phase sequence continuous (I_2 withstand) (%)	8	Negative phase sequence heating I_2^2t (s)	20
Machine Cooling Time Constant (secs) for Neg. Seq. Relay T reset	3125	Winding Capacitance per phase (μF)	0.135
Saturation factor S (1.0)	1.10	Saturation factor S (1.2)	1.83
Maximum kVAr available at 0 pf Under-excited (pu)	0.32	Maximum kVAr available at 0 pf Over-excited (pu)	0.78
Maximum Terminal Voltage under Field Forcing (Fault Condition Open Circuit)			5700

IEC tolerance applies	100% Load (pu)	75% Load	50% Load	25% Load
Gen'r. Efficiency at rated PF (pu)	97.90	97.97	97.79	96.65
Gen'r. Total Losses (KW)	178.7	129.5	94.2	72.2
Max Volt Dip % - Load Acceptance	18.5	14.5	9.9	5.0
Max Volt Rise % - Load Shed	23	17	11	5.4
Harmonics	Third	Fifth	Seventh	Eleventh
Maximum phase on Open Cct. (%)	0.25	0.3	1.0	0.06

DC Resistances (ohm at 20 ^{0}C)			
Stator winding (phase)	Field winding	Exciter armature (phase)	Exciter field winding
0.0071	0.238	0.0146	7.7

EXCITATION				
	Main field		Exciter field	
	current	voltage	current	voltage
Rated load at 0.8 pf over-excited	315	105	6.2	58
Rated kW at 1 pf	196	65	3.9	36
Rated voltage on open circuit	92	31	1.9	17
Rated current on short circuit	232	77	4.6	43
Max. Operating Load / Temp.	315	105	6.2	58
Ceiling Values	696	232	15.1	141

PERMANENT MAGNET GENERATOR (PMG)						
Values at Gen'r. Rated Load		Ceiling Values		Short Circuit	Open Circuit	Frequency
Current (A)	Voltage (V)	Current (A)	Voltage (V)	Current (A)	Voltage (V)	(Hz)
0.9	237	5.8	221	-	239	150

A C AUXILIARIES					
1 phase Voltage	120	3 phase Voltage	480	Frequency (Hz)	60
1 Phase Loads	Rated KW	Rated PF	Absorbed KW	Full Load Amps	Start Current
Anti-Con Heater	1.0	1		8.33	
Exciter A-C Htr	0.125	1		1.04	
3 Phase Loads	Rated KW	Rated PF	Absorbed KW	Full Load Amps	Start Current
Fans 1 & 2	4		3.4		

PROTECTION / INSTRUMENTATION / SYSTEM SETTINGS & DATA							
Winding RTD	Manufacturer		Sensing Devices	Type		Pt 100	
Stator Winding Temperature	Warning (^{0}C)		130	Shutdown (^{0}C)		140	
Air RTD	Manufacturer		Thermocouple Instruments	Type		Pt 100	
Air Inlet Temperature	Warning (^{0}C)		38	Shutdown (^{0}C)		42	
Air Outlet Temperature	Warning (^{0}C)		68	Shutdown (^{0}C)		76	
Air In / Out Differential Temp.	Warning (K)		27	Shutdown (K)		31	
Vibration Probe	Manufacturer		Bently Nevada	Type		Proximity	
DE Bearing Vibration (microns pk-pk)	Warning		70	Shutdown		90	
NDE Bearing Vibr'n (microns pk-pk)	Warning		70	Shutdown		90	
Bearing RTD	Manufacturer		Thermocouple Instruments	Type		Pt 100	
Driven End Bearing Temp. (^{0}C)	Normal	70	Warning	85	Shutdown	90	
Non Driven End B'ring Temp. (^{0}C)	Normal	70	Warning	85	Shutdown	90	
DE Bearing Lub Oil Pressure	Normal	10	Warning	7	Shutdown	15	
NDE Bearing Lub Oil Pressure	Normal	10	Warning	7	Shutdown	15	
DE Bearing Lub Oil Flow (L/min)	Normal	14	Minimum	12	Maximum	16	
NDE Bearing Lub Oil Flow (L/min)	Normal	10	Minimum	8	Maximum	12	

MECHANICAL DATA			
Lub Oil Viscosity to ISO 3448	VG 46	Minimum Oil Inlet Temp. (^{0}C)	10
Heat Input to Oil from DE Bearing	6.3 kW	Heat I/P to Oil from NDE Bearing	3.9 kW
Bearing Type	RENK EMXCA/Q 18-200	Bearing Ingress Protection Rating	IP56
Generator Cooling Method	IC6A1A6	Generator Mounting	IM1001
Total Generator Cooling Air Flow	9.2 m^3/sec	Max. Air Press. Drop Across Genr	
Max. Allowable Ext'l. Press. Drop		Air Filter Efficiency	

TORSIONAL DATA			
Inertia of Generator / Exciter Rotor	316 kgm^2	Equivalent Shaft Stiffness	14.5 MNm/rad
First Critical Speed	1350 rpm	Second Critical Speed	4400 rpm
Base Torque (1pu)	44.5 kNm	Full Load Torque	44.5 kNm
Short Circuit Torque - Air Gap	541 kNm	Worst Mal-Synch Torque - Air Gap	1158 kNm
10^0 Mal-Synch Torque - Air Gap	53 kNm	20^0 Mal-Synch Torque - Air Gap	109 kNm
Short Circuit Torque - Shaft		Worst Mal-Synch Torque - Shaft	

WEIGHTS AND LOADS			
Rotor Weight (Kg) (+/-5%)	See drg 5661689	Stator Weight (Kg) (+/-5%)	See drg 5661689
Exciter Weight (Kg) (+/-5%)	See drg 5661689	Field + PMG Weight (Kg) (+/-5%)	See drg 5661689
Cooler Weight (Kg) (+/-5%)	See drg 5661689	Total Gen'r. Weight (Kg) (+/-5%)	See drg 5661689
Static Load on Stator Feet (per side)	See drg 5661689	Short Cct. Load on Stator Feet (per side)	See drg 5661689
Normal Running Load on Stator Feet (per side)	See drg 5661689	Maximum Faulty Synch. Load on Stator Feet (per side)	± 926 kN *
* N.B. Not a condition the generator is designed to withstand.			

LINING OUT AND FIXING DETAILS			
Position of Rotor Centre of Gravity from shaft end (mm)	2386	Est'd Rotor Expansion - Vertical (mm)	0.3006
Estimated Rotor Expansion - To the Right Looking on NDE (mm)	0.04	Rotor Centre - Coupling Flange at Full Load (mm)	0.743
Coupling Face - Bearing Centre Line (mm)	0.205	Centre Line of Rotor to Mounting Feet (mm)	0.537
Recommended Fixing Bolts (type / diameter (mm))	M30	Holding Down Tightening Torques (Nm)	1290
Recommended Bolts - length (mm)		Recommended Packing Shims	5mm

NOISE DATA											
Noise Spectrum (in dB) at 1m	Hz	31	63	125	250	500	1K	2K	4K	8K	dB(A)
Around Machine SPrL			82	79	76	78	76	75	70	56	82
At Air Inlet SPrL			64	67	78	76	80	82	80	73	87
At Air Outlet SPrL			67	69	80	73	72	79	80	75	85

GENERATOR CURVES	
The following curves / diagrams are required for each generator :-	
Description	Document Number
Generator Output Capability (Input KW & Output KVA v Ambient Temp. ^{0}C)	43889/C1/GT
Generator Power Chart	43889/C1/PC
Current versus Time Curve for Phase to Earth Fault	43889/C1/SCD
Current versus Time Curve for Phase to Phase Fault	43889/C1/SCD
Current versus Time Curve for Three Phase Faults	43889/C1/SCD
Zero Power Factor Saturation Curve	43889/C1/SAT
No Load Saturation Curve	43889/C1/SAT
Generator 'V' Curves (pu KVA v Field Amps at Fixed Levels of Excitation)	48894/C1/VC
Overload / Short Circuit Capability Curve (Current v Time)	STD
Excitation System (including AVR) Block Diagram / Model	PMG & Exciter Data Sheet

AVR			
Manufacturer		Type	
Voltage Setting Range (+/- %)		Steady State Voltage Regulation (from no load to full load at 0.8pf) (+/-%)	
Frequency Operating Range (Hz)		Auxiliary Supply Voltage	

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SIEMENS

PURCHASE SPECIFICATION
106116

SPECIFICATION No.	76/01080160		Page 1 of 13
TITLE	CACA Generator for Bluewater ATP		
AUTHOR Electrical Engineering	DATE 09/02/2011	REVISION	C

Item No.	Revision number to be inserted in column adjacent to revised text. See last page for revision history	Rev

The following requirements are applicable to all items on this purchase specification unless specifically stated otherwise. Any deviation from or conflict between the specification and referenced documents shall be clearly stated in writing and clarification shall be requested from SIEMENS.

Compliance with this specification and specifications referenced within this document shall be considered as a minimum requirement and does not relieve the Supplier from the responsibility to provide a safe product suitable for the application.

Manufacturer's Part Numbers listed in this document are for reference only. It is supplier's responsibility to provide a product in compliance with this specification.

MANUFACTURER/SUPPLIER

Converteam
3993 West Sam Houston Parkway North
Suite 300
Houston, Texas 77043
713-895-0068

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1 **1.0 SCOPE OF SUPPLY**

This specification covers the minimum requirement for the design, manufacture and supply of a totally enclosed air to air cooled (CACA) generator. The generator will be driven by a Siemens SGT300 gas turbine. The generator voltage and frequency is to be 4.16KV 60 Hz. The combined main and neutral box is to be constructed to IP56. Auxiliary function boxes are to be approved for Zone 1 areas. Two Bently Nevada Type 3300 Proximeter Sensors to be provided for each bearing (X – Y configuration). The Cooler tubes will be Marine Type Aluminum, suitable for salt laden environment, and equipped with 2 x 67% fans complete with a differential pressure switch and emergency stop buttons. C

1.1 MATERIAL REQUIREMENTS:

Vendor shall provide material testing reports (MTR) for all generator materials, all pipe and fittings materials and all structural steel materials purchased. Pipe, fittings, flanges, vessel materials and structural steel shall preferably be of U.K. or U.S. manufacture, however Canadian, Japanese or EU manufacturers are acceptable without Siemens approval. Steel from any other source must be specifically approved by Siemens.

1.2 SPECIAL REQUIREMENTS:

Compliance with all relevant UK offshore Statutory Legislation, Compliance with all relevant EC Directives, and shall be such that the entire Gas Turbine Package can be CE marked in accordance with European legislation. EU ATEX Directive 94/9/EC and 1992/92/EC must be adhered to such that the entire Gas Turbine Package is suitable for the automatic operation and protection of rotating machinery in a Category 3 (Zone2) hazardous area.

2.0 APPLICABLE STANDARDS

The equipment shall be designed to be in compliance with latest edition of the following standards:

2.1 Industry Standards

- IEC 60034 : Rotating electrical machines
- ABS6 : Rules for Building and Classing Mobile Offshore Drilling Units Section 4/3C2 & 4/3D1.11
- USCG/CFR 46 part 111 : Rotating Electrical Equipment
- IEC 61892 : Mobile & Fixed Offshore Units – Electrical Installations
- All Relevant EC directives
- Machinery Directive 98/37/EC (with amendment 98/97EEC)
- Directive 2000/14/EEC Noise Emissions
- Pressure Equipment Directive (97/23/EEC)
- Low Voltage Directive (LVD) 73/23/EEC (with Amendment 91/31/EEC & 93/68/EEC)
- EMC Directive 89/336/EEC (with Amendment 91/31/EEC & 93/68/EEC)
- Radio and telecommunication Terminal Equipment Directive 1999/5/EC
- Equipment and Protective Systems for use in Potentially Explosive Atmospheres (ATEX) Directive 94/9/EC
- API 546 Brushless Synchronous Machines

2.2 SIEMENS Standards

- Siemens standard Specification 64/01007957
- Vendors Quality Requirements Plan (VQRP) HI8016RW-01 Rev 3 C

2.3 Contract Specific Documents

- ATP-Cheviot-Project Document Submittal Requirements HI8016-H16-002

2.4 ATP – Bluewater Specification

- Specification for AC Generators 1212503-TS-EE-SP-0102 Rev C
- Generator Data Sheet (API 546) for G8001A/B 1212503-TS-EE-G8001-4012 Rev 0
- Specifications for Turbine Generators 1212503-TS-FE-SP-0031 Rev 0
- General Specifications for Equipment Suppliers 1212503-TS-FE-SP-0001 Rev B
- Design and Fabrication of skids for Equipment 1212503-TS-SE-SP-0905 Rev E
- Specifications for Low Voltage Motors 1212503-TS-EE-SP-0104 Rev A

3.0 ENVIRONMENT

- Location : The North Sea
- Ingress Protection : IP56
- Ambient Temperature : -6.5°C min 50°C max
- Relative Humidity : Up to 100%
- Altitude: : 0 to 1000 m

- Seismic Zone : Generator shall be designed for seismic loads as determined in UBC 1997 for a non-building structure, seismic zone 4, essential facilities, location at ≤ 2km from source, on worst soil profile.
- Environment : Offshore

4.0 UTILITIES & APPROVALS

4.1 Electrical

- Hazardous Area Class. : Ex n, Zone 2, IIB T3
- Generator Ratings @ 0.8 PF : 10400 KVA @ 15°C

4.2 Instrument Air Supply

- N/A

4.3 Approvals

- American Bureau of Shipping

4.4 Cooling Water Supply

- N/A

5.0 DESIGN REQUIREMENTS

- Design shall be based on a minimum working life for the equipment of 20 years. The package shall be fully assembled, tested and ready to use upon delivery.
- The supplier is responsible for the process, mechanical, electrical, instrumentation and controls design of the assembly per the requirement of this specification and its referenced documents.
- Generator Power Curve shall exceed the turbine power curve shown below while maintaining its Class B temperature rise and power factor.

AMBIENT TEMP Deg C	-6.5	10	15	20	25	30	35	40	45	50
TURBINE OUTPUT MW	8.67	7.92	7.72	7.44	7.18	6.94	6.72	6.51	6.33	6.11

5.1 Mechanical

- Speed : 1800 rpm for 60Hz applications
- Number of poles : 4
- Drive Shaft : Siemens drawing - TBD

- Guaranteed Noise Level:

  For this project: sound attenuation to be 82 dB(A) average overall at 1 meter in accordance with ISO 1680 – Survey method

- Rotor Balancing:
  The rotor and its sub-assemblies shall (where practical) be individually dynamically balanced and the finished assembled rotor dynamically balanced in each plane to a maximum permissible residual unbalance of 3175 W / N gram-mm with a total out of balance permissible of Umax=6350 W / N gram-mm, Where W= Weight of rotor assembly (Kg) and N= Generator speed (rpm). In U.S. Customary units: Umax = 4 W/N where W is weight of rotor assembly (lb.) and N= generator speed (rpm)

- Rotor Overspeed : The rotor shall be capable of withstanding an overspeed of 20% of the nominal operating generator speed for 2 minutes.

- Vibration Levels

Generator Speed	**Peak to Peak Amplitude** (unfiltered)	**R.M.S. Velocity**
rpm	mm	mm/s
1800	0.037mm	2.3mm

- Direction of Rotation (Looking at Driven end):
  - SGT-300 : Clockwise.

- Bearings : Bearings shall be sleeve type bearings. Bearings shall be protected from damage/deterioration due to circulating current.

- Lubrication : Lubricating oil shall be ISO VG 46 and shall comply with Company Fluid Specification Report 65/0027. Lubricating oil shall be supplied at the following conditions:
  - Normal Operating Pressure : 30 psi
  - Shut Down Pressure : 20 psi
  - Normal Operating Temperature : 55°C to 70°C
  - Warning Temperature : 76°C
  - Shut Down Condition Temperature : 84°C
  - Start Permissive Temperature : 10°C

- Emergency Shut-Down:
  The sleeve bearings used on this generator are not self lubricating. In the event of an Emergency Shutdown the machine should be capable if running down using only the turbine mechanical gearbox driven pump.

- Intermittent Loads : The generator shall be capable of handling intermittent loads e.g. motor starting conditions, block load changes, etc and other loads as described in this specification and referenced standards.

- Temperature Detection : The generator shall be fitted with the following:

Type	No. Of	No. of Wires
Windings	6 RTD's (2 per phase)	4
Bearings	2 duplex RTD's (1 per bearing)	4
Air Flow	3 duplex RTD's (1 hot 2 cold)	4

RTD's shall be 100 ohm platinum type.

Vibration Detection : Bently Nevada 3300 X – Y vibration sensors to be provided for each bearing.

- Auxiliary Terminations :

  - The exciter field and three phase PMG connections shall terminate in a exciter field/PMG junction
  - All RTD's shall terminate in a RTD junction box.
  - All Vibration Detectors (UD) shall terminate in a Vibration Detectors junction box All Space Heaters shall terminate in a Space Heater junction box.
  - All junction boxes are to be suitable for Zone 1, Gas Group IIB, T3

- Siemens Tag Identification numbers shall be included on the terminal box as follows:
  - UD51X1, UD51Y1 : Drive end Bearings
  - UD52X1, UD52Y1 : Non-Drive end Bearings
  - RTD 23 : Drive end Bearings
  - RTD 24 : Non-Drive end Bearings
  - RTD 25 : Phase U Windings
  - RTD 26 : Phase W Windings
  - RTD 27 : Phase V Windings
  - RTD 28 : Phase U Windings

- RTD 29 : Phase W Windings
- RTD 30 : Phase V Windings
- RTD 39 : Non Drive end cold air circuit
- RTD 40 : Hot air circuit
- RTD 44 : Drive end cold air circuit

- Earthing and Bonding : All non-current carrying conductors shall be adequately bonded and earthed. Earthing pads shall be provided on the bearing/stator support legs.

- Labels : Adequate labels (both warning and identification) shall be provided and securely fastened in suitable and easily visible locations. Warning labels shall be identified in English. C

- Lateral Critical Analysis : Vendor is to provide the data required to perform this analysis.

- Cooling : IC6A1A6 Top mounted air to air heat exchanger having Aluminum tubes and two off Zone 1, 480V, 3 phase, 60Hz motor driven fans, each capable of providing cooling air for 67% of the generator rating. C

  The cooler shall be equipped with a Zone 1 differential pressure switch to detect fan failure.

  The fans shall have red mushroom headed emergency stop push buttons located close to each motor unit. Fans to come equipped with vibration switches. Pushbutton stations and vibration switches to be Zone 1.

5.2 Electrical

- Voltage : 4.16 KV
- Voltage Tolerance : As per IEC60034.
- Frequency : 60 Hz
- Frequency Tolerance : As per IEC60034
- Power Factor : 0.8 lagging
- Stator Winding Insulation Class : 'F' or better
- Rotor Winding Insulation Class : 'F' or better
- Exciter Winding Insulation Class : 'F' or better
- Winding Pitch : Vendor to provide the winding pitch.
- Design Total Temperature Rise : Class B total temperatures

- Parallel Running : Equipment shall be suitable for running singly on its own or in parallel with machines of similar or different ratings.
- Excitation Boost Requirements : Maintenance of excitation under generator three-phase short circuit is required so that the sustained three phase short circuit current is 3 times normal full load current at 40°C rating, for 10 seconds.
- Phase Rotation : UVW
- Neutral Grounding : The neutral of the generator will be grounded by the following means:
  - A high resistance ground method limiting fault current to 20 amps.
- Medium Voltage(MV) Mains and Neutral Termination Box to be suitable for Zone 2, Gas Group IIB, T3.
  The Line Side will contain the outgoing power cable terminations, U, V, and W. Terminations to consist of rigidly mounted tin plated bus bars suitable for terminating three cables per phase with stress.
  The neutral side will contain rigidly mounted neutral bus bars.
  Mounted on the bus bars will be (3) metering current transformers 1800A/1A/1A, 0.5FS10 10VA; (3) protection current transformers 1800A/1A/1A 5P20 10VA. Behind the above current transformers a neutral will be created by shorting the phases together. All current transformers (total of 6 inside the box) secondaries are to be wired to shorting terminal blocks located in a separate junction box. Three (3) loose differential CT's of the same ratio and relay rating of the protection current transformers are to be provided for mounting elsewhere. — C

  To Be Quoted as an Option:

  Provide capability to terminate Five (5) 3-core cables 240 mm2 power cables in the mains and neutral terminal box. — C

- Condensation
  The generator insulation and design shall be resistant to the effects of condensation, mold & mildew. 120V heaters shall be provided and be cabled out to a separate stainless steel IP56 junction box. The heaters to be suitable for Zone 1 areas.

6.0 TESTING AND INSPECTION

Testing and Inspection is to be per API 546 Sections 4.1, 4.2 and 4.3. Testing required by these Sections which are additional to the tests listed below are to be quoted as an option. These optional tests would be performed on the first generator only.

The following tests shall be carried out on each generator unless otherwise stated writing by purchaser. Testing will be carried out to establish machine parameters per IEC 60034-2 Methods for determining losses and efficiency of rotating electrical machinery from tests and IEC 60034-4 - Methods for determining synchronous machine quantities from test.

Access to the vendor's production facility to be provided to Siemens for inspection, to witness assembly and for, testing of the generators covered by this contract. Notice to be given to Siemens two weeks prior to testing of the generators.

Customer inspection of the first generator's stator before VPI is required.

A water immersion test per NEMA MG1 part 20 is to be performed and customer witnessed. C

STATIC TESTS

- Cold winding resistance: Measure the winding resistances to determine proper connections and to see if the values correspond with design data.
- Insulation resistance: Check the integrity of winding insulation by using a "Megger" instrument and applying a D.C. voltage between the conductors and earth. The values obtained can also be used for comparison with future readings.
- Bearing insulation: Establish that there is no path for circulating currents, the insulation between each bearing shell and the baseplate is checked by using a "Megger" instrument.
- Diode checks: Check for current polarity of the diodes and that each diode is healthy, the forward and reverse resistances are measured using a hand-held "Fluke" meter.
- Auxiliaries and Fittings: Check the function and installation of auxiliaries and fittings.
- High Voltage Test Check the integrity of winding insulation by using a "Megger" instrument and applying a A.C. voltage

between the conductors and earth. The values obtained can also be used for comparison with future readings

MECHANICAL RUNNING TESTS:

- Vibration levels when Unexcited & excited: The balance of the rotor shall be checked by monitoring the vibration levels at normal speed and and normal temperature. The test is repeated with the machine excited to give rated volts in order to show that vibration levels are not significantly affected by excitation.
- Rotor Overspeed: The mechanical integrity of the machine shall be checked by rotating the rotor at the overspeed indicated in Section 5 of IEC60034-1 for 2 minutes.
- Vibration check after overspeed: The vibration levels after rotor overspeed test shall be checked and there shall be no significant change in the readings.
- Oil quantity and pressure: Monitor using flow meters and pressure quages.
- Noise Test: To determine noise level. The noise test will be carried out in line with ISO 1680/2

ELECTRICAL RUNNING TESTS

- Phase rotation check: Phase rotation shall be checked to ensure it is correct to the general arrangement drawing.
- Open Circuit Saturation: The generator is driven by a D.C. motor and excited in steps up to 130% of rated voltage to produce a saturation curve for the machine which is checked against expected values. Record exciter field amps and volts and also the generator terminal voltage at each step.
- Short Circuit Capability: Generator is driven by a D.C. motor to its rated RPM. The generator terminals are shorted together and power is then applied to the voltage regulator.

	Short Circuit ampacity is measured and timed to confirm specified magnitude and duration of the fault current.
• Temperature rise at zero Power factor. ZPF heat run	To check the temperature rises of all windings, measured with factory instruments and equipment And inbuild instrumentation. Bearing temperature Will be measured as this is the only test that allows Bearing temperatures to stabilize.
• ZPF points	To determine ZPF curve. Generator is driven by a DC motor and run over excited at ZPF and rated Current, with voltage 90%, 100% and 110% of Rated voltage.
• Shaft voltage check	To determine the shaft voltage by measuring across The bearing insulation while the machine is running.
• Sudden three phase short Circuit at 25%, 50% and 75% of rated volts	To determine the transient and sub-transient reactances and time constants from recorded test results.
• Open circuit transient time constant	To determine the combined exciter and generator open circuit transient time constant. The generator is driven by a DC motor at rated speed and is excited to rated volts. A sudden short circuit is applied to the exciter field winding and oscillographs are taken of armature voltage and rotor voltage against time.
• Waveform analysis of line And phase voltage on open Circuit.	To determine the total harmonic distortion (THD).

7.0 PAINTING

Painting shall be per Suppliers standard offshore high build finish. Top coat color shall be RAL 9002.

8.0 TAGGING

SIEMENS purchase Specification No. (76/01080160/1) as well as supplier's unique serial number shall be clearly & permanently marked on the equipment.

Equipment

- Unit 1 – TBD
- Unit 2 – TBD

9.0 DOCUMENTATION

The supplier shall provide documentation for the assembly per Supplier Documentation Requirement List (SDRL) 76/01080160-SDRL. Submittal to conform to HI8016-H16-002 'ATP Cheviot – Project Document Submittal Requirements'.

The following standard drawings/documents shall be provided for all contracts for each generator ordered, example: 2 generators ordered: 2 individual generator test results.

- Certified General Arrangement Drawing
  Drawing shall provide following details at minimum: dimensions for all connections and extremities, weights (overall and items removed during maintenance), loads at footprint (Static, Normal Operation, and Short Circuit), footprint, ventilation outlet, cabling, control terminal arrangement, locations of mains and neutral terminations, and location of all auxiliary terminal boxes/rails, bearing lube oil supply and drain connections, center of gravity, the magnetic center, the shaft position indicator plate, drive shaft, and lift provisions.
- Rotor Particular Drawing : Shaft dimensional drawing showing inertia and stiffness of all rotating components to facilitate torsional analysis.
- Generator Electrical Schematic/Termination Diagram
  : Drawing shall identify all electrical, central and instrumentation devices together with their wiring, identification references and termination details.
- Terminal box arrangement drawing
- Quality plan
- Short circuit data
- Production schedule
- Generator Curves
- Operating and Maintenance Manual:
  Manual shall include all documents listed in specification plus the following at a minimum: guidelines for operation and maintenance, maintenance schedule, maintenance tools required, spare parts list,

The documents shall be provided within 6 weeks of receiving purchase order unless otherwise stated in writing from purchaser. All drawings to be provided in AutoCAD dwg or dxf digital files, pdf and 3 hard copies. Other documents are to be provided in pdf digital format.

10.0 PREPARATION FOR SHIPMENT

- All internal and external surfaces of the assembly/part shall be completely dried after testing or assembly and protected against corrosion using suitable inhibitor for the type

equipment service. The protection shall be suitable for shipping and storing for up to 12 months in conditions of 100% relative humidity and temperature of -4°F(-20°C) to 122°F(50°C). Prevention commencement date shall be clearly labeled on the outside of the package.

- All openings shall be plugged or blinded for protection against ingress of foreign matter.

11.0 WARRANTY

- Equipment covered by this specification shall be covered by the warranty conditions in the purchase order

12.0 SPARES AND TOOLS

The vendor shall provide priced recommended spares lists to cover for 3 years operations. The vendor shall identify prior to order any special tooling required for installation, commissioning or maintenance activities. This shall be accompanied by priced quotations for these items.

END OF SPECIFICATION

SIEMENS

PURCHASE SPECIFICATION REGISTRATION SHEET

SPECIFICATION No. 76/01080160

REV	ORIGINATOR	CHECKED BY	QC CHECKED	AUTHORISED BY	DATE	ECN No.	ALTERATION HISTORY
A	N.Richardson	S Ricco-Anderson	J Moir	H. Syed	07/22/2011	6018	Specification issued
B	N. Richardson	S. Riccio-Anderson		H. Syed	07/25/2011	6136	Rev per Procurement
C	N. Richardson	M. Houltby		H. Syed	09/02/2011	6252	Ct requriments, Al cooling tubes

Note: Sign below your name