

SECTION 18149 - DATA TO BE SUBMITTED WITH BID - STEAM TURBINE

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

A. The Bidder guarantees the characteristics of the turbine generator unit to be at least as stated below when operated under the conditions specified.

1. Guaranteed capability at rated throttle and reheat conditions with _____-inch mercury absolute backpressure, zero percent makeup, full feedwater heating, rated hydrogen pressure and 0.9 power factor: _____ kW.
2. Guaranteed throttle flow at rated throttle and reheat conditions with _____ -inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor _____ lb/hr.
3. Turbine (gross) (net) heat rates at rated throttle and reheat conditions with _____-inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:

<u>Percent of</u> <u>Guaranteed Capability</u>	<u>Turbine (Gross)(Net) Heat</u> <u>Rate, Btu/kWh</u>
100	_____
80	_____
60	_____
40	_____
20	_____

4. Generator capability at 0.9 power factor:

<u>Hydrogen Pressure</u>	<u>Generator Capability,</u>
Full psig	_____
Intermediate psig	_____
Minimum psig	_____

5. Output voltage: _____ volts.
6. Generator efficiency at rated load: _____%.

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7. Temperature rise of the following:
 - a. Generator Stator: _____ °C.
 - b. Generator Rotor: _____ °C.
 - c. Generator Exciter - Stator: _____ °C.
- Rotor: _____ °C.
8. Maximum hydrogen loss at full frame pressure and at rated kVA operation: _____ standard ft³/day.
9. Full frame hydrogen pressure: _____ psig.

1.02 EXPECTED PERFORMANCE DATA:

- A. The Bidder shall submit the following expected performance data by filling in the blanks provided:
 1. Maximum expected throttle flow, capability and heat rate when operating at valves wide open, 5% overpressure, 1000°F High Pressure, 1000°F Hot Reheat, _____-inch mercury absolute backpressure, zero percent makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:
 - a. Throttle flow: _____ lb/hr
 - b. Capability: _____ kW
 - c. (Gross) (Net) heat rate: _____ Btu/kWh
 - d. Reheat steam flow: _____ lb/hr
 - e. Condenser steam flow: _____ lb/hr
 2. Maximum expected throttle flow, capability and heat rate when operating at valves wide open, rated pressure, 1000°F High Pressure, 1000°F Hot Reheat, _____-inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:
 - a. Throttle flow: _____ lb/hr
 - b. Capability: _____ kW
 - c. Reheat steam flow: _____ lb/hr
 - d. Condenser steam flow: _____ lb/hr
 3. Minimum safe continuous load
 - a. at _____ inch Hg absolute: _____ kW
 4. Minimum absolute backpressure
for safe continuous operation of the unit:

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- a. At full load: _____ in. Hg
- b. At minimum continuous load: _____ in. Hg
- 5. Minimum time required for applying full load on the unit:
 - a. After 8-hour shutdown on turning gear _____ minutes
 - b. From cold start _____ minutes
- 6. Maximum allowable exhaust hood temperature:
 - a. During start-up: _____ °F for _____ minutes. _____ °F.
 - b. During continuous operation _____ °F.
- 7. No load throttle flow at rated conditions and _____-inch mercury absolute backpressure: _____ lb/hr
- 8. Generator efficiency with full frame hydrogen pressure:
 - Maximum expected load _____ %
 - Guaranteed load _____ %
 - a. 80% guaranteed load _____ %
 - b. 60% guaranteed load _____ %
 - c. 40% guaranteed load _____ %
 - d. 20% guaranteed load _____ %
- 9. Generator capability with one hydrogen cooler out of service: _____ kVA
- 10. Generator field current at rated load: _____ amps
- 11. Rated load field voltage: _____ volts
- 12. Excitation system ceiling voltage (per unit of rated field voltage) _____ p.u.
- 13. Excitation system voltage response time: _____ volts/sec
- 14. Percent reactances on a base of _____ kVA (to be maximum for generator) and at _____ kV

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- a. Direct axis synchronous at rated current X_d _____
- b. Transient unsaturated at rated current X'_{du} _____
- c. Transient saturated, X'_d _____
- d. Subtransient (at rated voltage) X''_d _____
- e. Zero sequence (at rated current) X_o _____
- f. Negative sequence (at rated voltage) X_2 _____
- g. Synchronous impedance, Z_d _____
- 15. Time constants:
 - a. Open circuit, T'_{do} _____
 - b. Armature, T_a _____
 - c. Transient, T_d _____
 - d. Subtransient, T''_d _____
- 16. Pull-out torque at rated voltage and kVA with infinite bus:
 - a. At 0.85 pf _____ kW
 - b. At 0.90 pf _____ kW
 - c. At 1.0 pf _____ kW
- 17. Winding capacitance, all three phases combined to ground: _____ mfd
- 18. Telephone interference factors, calculated:
 - a. Balanced: _____
 - b. Residual: _____
- 19. Short circuit ratio at rated kVA and maximum frame hydrogen pressure, calculated: _____
- 20. Flywheel effect, WR^2
 - a. For turbine: _____ in lb-ft²

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- b. For generator and exciter: _____ in lb-ft²
- 21. Saturation factor: _____
- 22. Regulation at: _____ kVA
(to be maximum for generator)
- and 0.9 power factor: _____ %
- 23. Rated armature current: _____ amps
- 24. Field characteristics at 125°C:

	Amperes	Volts
a. Exciter rating:		
b. No load, at rated generator terminal voltage at 20°C		
c. Rated armature current, zero generator-terminal voltage		
d. With machine carrying rated kVA, with rated terminal voltage and 0.9 power factor, at:		
(1) Full frame hydrogen pressure:		
(2) Intermediate hydrogen pressure: _____ psig		
e. Minimum field current required to hold generator in step under steady state loading at guaranteed capability.		
f. Generator load and power factor with machine carrying rated kVA, with rated terminal voltage, full frame hydrogen pressure and with leading power factor (maximum pull out on infinite bus)		
	_____ kW	_____ pf
g. Field conductor material:		
h. Field resistance, ohms at 20°C:		
i. Field temperature coefficient of		

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- resistance, ohms/ohm/°C _____
from 0°C: _____
- j. Field discharge resistor rating
at 20°C, ohms: _____
25. Gas volume within stator housing
with rotor in place: _____ ft³
26. Hydrogen temperature at full rated
kVA, 0.90 power factor, and
95°F inlet cooling water:
- a. Entering Hydrogen Cooler
(hot Hydrogen) _____ °C
- b. Leaving Hydrogen Cooler
(cold Hydrogen) _____ °C

1.03 PHYSICAL DATA:

- A. Bidder shall submit his standard proposition outline drawing of the turbine generator unit which shall show at least the following information:
1. Weights of major components (including heaviest single lift required for placement and/or maintenance).
 2. Dimensions (length, width, height) adequate for layout and preliminary foundation design including turbine room hook height required for service and maintenance.
 3. Number and size of Owner's connections.
 4. Excitation switchgear dimensions, if applicable.
 5. Neutral enclosure dimensions.
 6. Last stage blade length.
 7. Clearance diagram for generator rotor removal, straight and skewed.
 8. Clearance diagram for hydrogen cooler removal.

1.04 MISCELLANEOUS DATA:

- A. Bidder shall submit the following miscellaneous data by filling in the blanks provided:
1. Turning gear data:
 - a. Speed of rotor: _____ rpm
 - b. Motor size: _____ hp

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2. Cooler data with cooling water inlet temperature listed:

a. Cooling water flow expected:

- (1) Lube oil coolers (____°F) _____ gpm
- (2) Electrohydraulic system
coolers (____°F) _____ gpm
- (3) Gland steam condenser
(min ____°F) _____ gpm
- (4) Hydrogen coolers
(____°F) _____ gpm
- (5) Seal oil coolers
(____°F) _____ gpm
- (6) Exciter coolers (____°F) _____ gpm
- (7) Conductor cooling system
coolers (____°F) _____ gpm

b. Cooling water pressure drop
expected:

- (1) Lube oil coolers _____ psi
- (2) Electrohydraulic system
coolers _____ psi
- (3) Gland steam condenser _____ psi
- (4) Hydrogen coolers _____ psi
- (5) Seal oil coolers _____ psi
- (6) Exciter coolers _____ psi
- (7) Conductor cooling system
coolers _____ psi

c. Tube Diameter (I.D.)

- (1) Lube oil coolers _____ in
- (2) Electrohydraulic system
coolers _____ in
- (3) Gland steam condenser _____ in
- (4) Hydrogen coolers _____
- (5) Seal oil coolers _____ in
- (6) Exciter coolers _____ in

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- (7) Conductor cooling system
coolers _____ in
3. Gland steam flow:
a. Maximum _____ lb/hr
b. Minimum _____ lb/hr
Exhaust annulus area: _____ sq ft
4. Lubricating oil circulation rate
through coolers: _____ gpm
5. Total volume of lube oil required: _____ gal
6. Total volume of governor fluid required: _____ gal

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION 18149