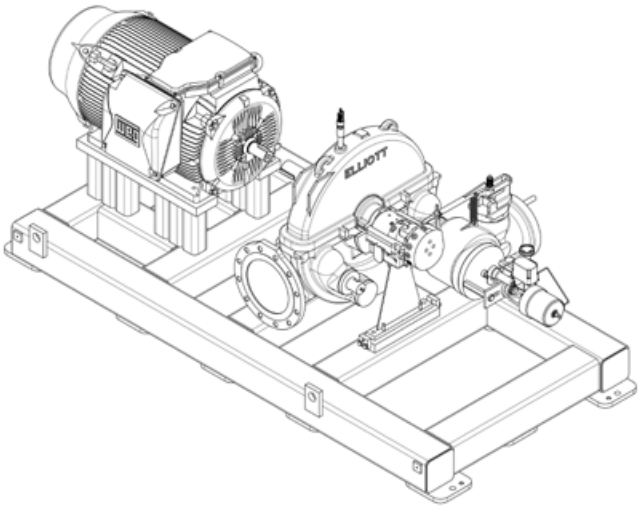
Power Generation – Steam Turbine Generator RFQ Guidelines

Information Required for Quote:

1. Power desired (kWe) or steam flow
2. Inlet/exhaust steam conditions
3. Induction or synchronous generator
4. Location



Additional Preferred Information for Quote:

5. Power factor (synchronous)
6. Generator voltage
7. Generator frequency
8. Generator cooling medium
9. Altitude if over 3,000 ft. (914 meters)
10. Other special requirements

Discerning Questions

- What is the type of application for which the steam used? (Industrial, campus, power generation opportunity, etc.)
- Will the power be used to offset utilities or to export to the grid? If the former, do we need to ensure power is not exported?
- If offsetting utilities, does the location have large inductive motors? If yes, a synchronous generator is better to offset this load.
- Will the generator operate in isolation or in parallel with the grid/other generators? If yes, a synchronous generator is the better choice.
- Will the unit need to operate during loss of grid power? If yes, a synchronous generator is the better choice.
- If the location experiences large power swings, or if the fuel source is “unstable” (i.e., biomass), then a synchronous generator is better.
- Is initial price, power or efficiency the most important factor to optimize?
- For what will the downstream steam be used? If heating, then backpressure control can be a more important factor than power.
- When is the proposal due? Budget or firm? If firm, allow a minimum of two weeks to secure firm vendor pricing.
- If there is an extraction and power below 10MW, can the extraction be uncontrolled or can the steam be taken off of the header? This is a more economical option.

Scope of Supply

The base scope of supply for an Elliott STG includes the turbine, gearbox (if needed), generator, control system, lubrication system (if needed), and base-plate. The control system is shipped loose unless otherwise specified. The lubrication system can be integrated into the baseplate or on its own console. Condensers are not included in Elliott’s scope of supply.

Frame	PYR	AYR	BYR	BYRH & BYRHH	DYR & DYRH DYRM & DYRN	MYR
Initial pressure (psig/bar)	650/45	700/48	700/48	900/62	900/62	900/62
Initial temperature (F/C)	750º/400º	825º/440º	900º/482º	900º/482º	900º/482º	900º/482º
Exhaust pressure (psig/bar)	100/6.9	vac-100/6.9	vac-100/6.9	375/25.9	vac-350/24.1	vac - 250/17.2
Speed (rpm)	5000	7064	6675	7090	5770	8500
Wheel pitch diameter (inch/mm)	12/305	14/360	18/460	18/460	28/710	28/710
Number of stages (impulse type)	1	1	1	1	1	9
Inlet sizes (ANSI, inch)	3"	3"	3", 4"	3", 4", 6"	3", 4", 6", 8",10"	3", 4", 6", 8", 10"
Exhaust size (ANSI, inch)	6"	6"	8"	8"	10",12", 14", 16"	Up to 48"
Range of capacities (hp/kW)	200/150	750/560	to 1400/1044	to 3500/2610	to 5400/4027	to 14,000/10,440
Shipping weight (lb/kg)	550/250	870/400	1275/580	2300/1050	2600/1180	to 17,000 / 7710

Induction vs. Synchronous

Are you considering using an STG for power generation but do not know the most effective configuration? This is a common question and the answer is not quite as simple as it may seem. Many factors such as output rating, speed, and efficiency must be considered. The table below helps to explain the differences between induction and synchronous power generation.

Economic Decisions

There are many incentives available for renewable and clean energy projects, including refunds, discounts, grants, and funding. Two sources for this information are the Environmental Protection Agency (http://www.epa.gov/chp/policies/database.html) and The Database of State Incentives for Renewable Energy (www.dsireusa.org).

CONSIDERATIONS	INDUCTION	SYNCHRONOUS
Output power	1000 kWe and smaller. Available >1000 kWe, but these installations are unusual.	All power ranges.
Price	Less expensive turbine generator package <1000 kWe.	Less expensive turbine generator package >1000 kWe.
Interconnection with the grid	Must be interconnected to the electrical grid.	May be interconnected to the grid, stand-alone, or interconnected with other generators.
Excitation	Induction generators are not self-exciting. Requires excitation from the grid.	Self-exciting.
Speed	Typically 3600 rpm for 60Hz; 3000 rpm for 50Hz. Turbine is directly coupled to the generator.	Typically 1800 rpm for 60Hz; 1500 rpm for 50Hz. Turbine speed is reduced through a gearbox, allowing it to run at higher speeds.
Complexity	Less complex and less expensive control system. No speed reducing gear. No exciter or synchronizer.	More complex and more expensive control system. Speed reducing gear required. Exciter and synchronizer required.
Emergency power	No emergency power capability. Will not operate if the grid is not available.	Emergency power capable and can operate independently from the grid.
Power factor characteristics	Consumes reactive power. May negatively affect the plant power factor.	Creates reactive power. No plant power factor issues; requires power factor control.
Efficiency	Less efficient due to running at low speeds.	More efficient due to capability of running turbine at higher speeds.

ELLIOTT GROUP
EBARA CORPORATION

901 North Fourth Street
Jeannette, PA 15644-1473
Phone: 724-527-2811
Fax: 724-600-8442
Email: info@elliott-turbo.com

www.elliott-turbo.com