

# Elliott Turbine Generator Sets





Elliott Group has been a leading manufacturer of efficient, reliable steam turbine generators (STGs) for nearly a century. Elliott STGs have proven their value by providing tens of thousands of hours of cost-effective power to a wide variety of industrial, commercial, and institutional users. Customers around the world turn to Elliott for their power needs.



## ■ ELLIOTT GROUP STG MARKETS

Elliott Group designs and configures every steam turbine generator (STG) package to make efficient, productive use of the available energy resources. Whether they are used for a district steam system in a world capital, a palm oil plantation in Malaysia, or a petrochemical company in Mexico, Elliott steam turbines have the flexibility and wide power range to suit virtually any project.

### *Markets*

- ◆ Food Processing
- ◆ Pulp & Paper
- ◆ Sugar Mills
- ◆ Combined Cycle
- ◆ Geothermal
- ◆ Oil & Gas/Petrochemical
- ◆ Palm Oil
- ◆ Waste Heat
- ◆ Biomass
- ◆ District Steam Systems

## ■ ELLIOTT STEAM TURBINE GENERATORS

Elliott STGs provide the features and functionality that ensure accurate operation and control, simple, low-cost maintenance, and years of reliable service.

### *Elliott STG Features*

- ◆ Power range from 50 kW to 50 MW
- ◆ Synchronous or induction generator options
- ◆ Standardized designs up to 3 MW for lower cost and faster delivery
- ◆ Global engineering support from proposal through commissioning

### *Complete Package*

- ◆ Steam turbine
- ◆ Speed-reducing gear
- ◆ Generator
- ◆ Integrated control system
- ◆ Lubricating system
- ◆ Baseplate

### *Services*

- ◆ Installation and commissioning
- ◆ Maintenance and operator training
- ◆ Long-term maintenance programs

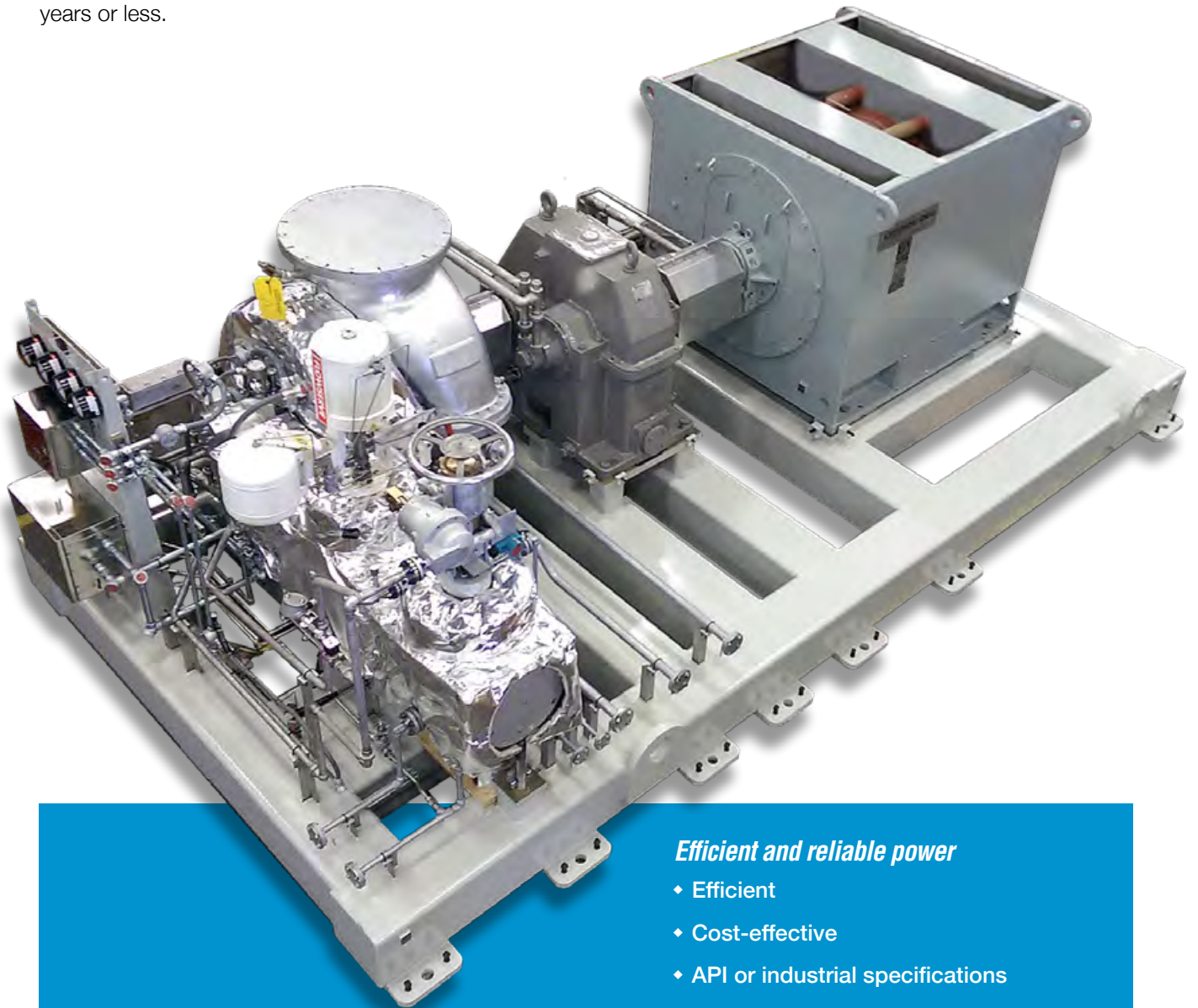


*This biomass project included two STGs. The left STG is induction with a power of .257 MWe. The right STG is synchronous with a power of .260 MWe.*



## ■ WHY ELLIOTT GROUP STGs?

An Elliott STG is an efficient, cost-effective means of producing electric power from the excess thermal energy in a steam system, from a conventionally-fueled source, or from an alternative fuel source such as biomass. Each Elliott STG is configured to a customer's specific requirements and takes the local utility cost model into account. Depending upon applicable electricity rates, an Elliott STG can offer payback on the capital investment in three years or less.



### *Efficient and reliable power*

- ◆ Efficient
- ◆ Cost-effective
- ◆ API or industrial specifications
- ◆ Wide power range
- ◆ Flexible operation
- ◆ Robust and reliable
- ◆ 20+ years service life
- ◆ State-of-the-art components
- ◆ Attractive pay back rates
- ◆ Proposal to commissioning support
- ◆ 35,000+ turbines installed worldwide
- ◆ Global service network



## ■ THE RIGHT MIX

Configuring an STG for cost-effective power generation depends upon determining the right mix of elements, including:

- ◆ A defined steam supply
- ◆ A clear understanding of how the electricity will be used
- ◆ Whether the steam is also needed for other processes



*This 2.6 MWe synchronous generator was used for a CHP project.*

The mix of these elements, and each installation, is always unique. Designing the best STG solution requires an accurate understanding of the application and operating conditions from the start. A clear definition of the right mix allows Elliott's application and product engineers to match the STG to the customer's specific requirements.

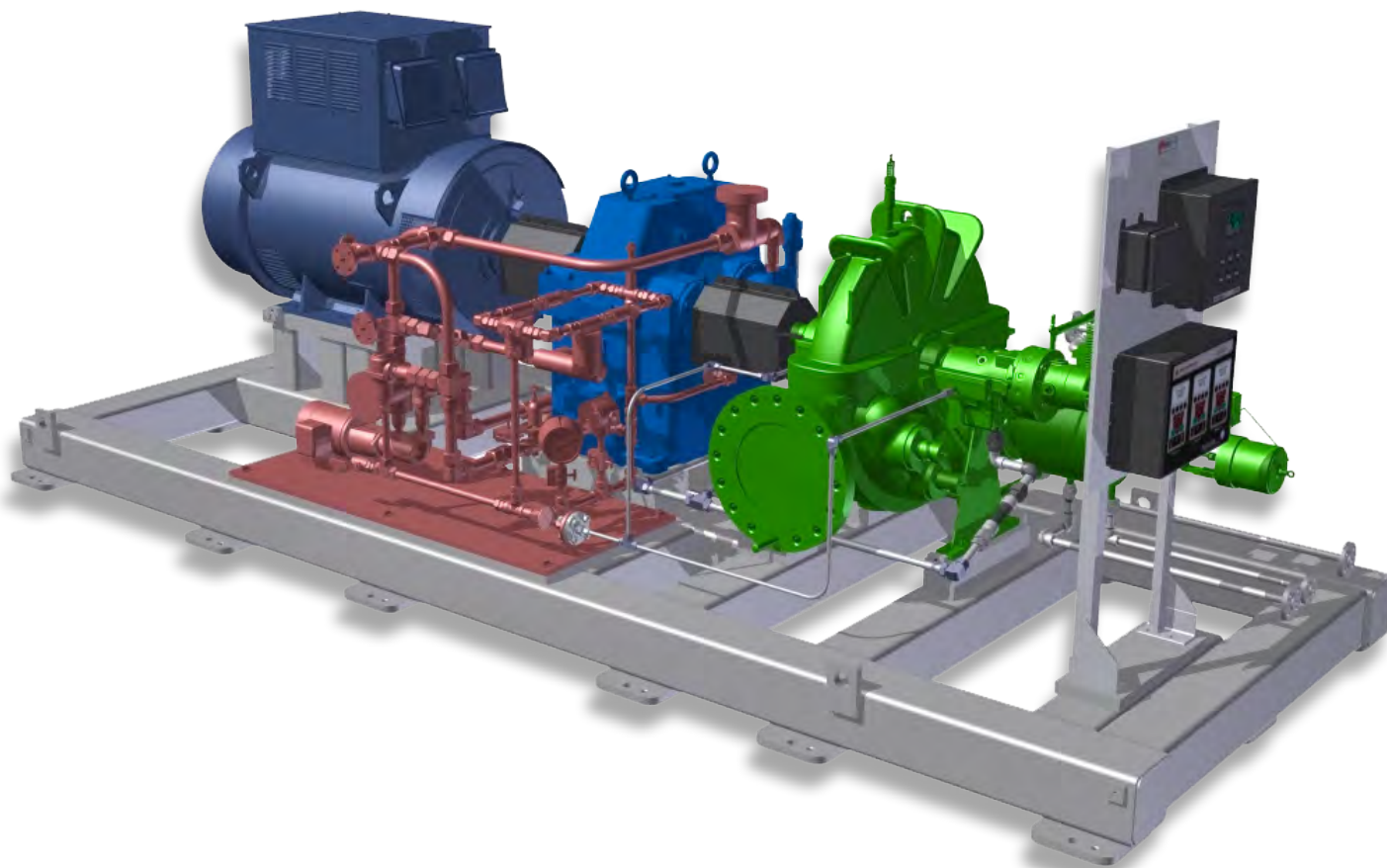
Elliott STGs operate in power applications such as combined heat and power (CHP), waste-to-energy, and waste heat recovery. The alternating seasonal steam demand for heating and air conditioning at institutions such as universities, medical centers, correctional institutions, and corporate campuses makes these facilities well-suited to an STG. However, the varying steam loads dictate a different system approach than do the relatively unchanging process requirements of an industrial plant.

The prevalence of steam in industrial processes makes these plants excellent candidates for electrical co-generation. Steam availability often exceeds process requirements, and without an STG, the extra energy is frequently vented and lost. An Elliott STG cost-effectively converts this excess thermal energy into electricity. Industries that produce significant combustible waste, such as lumber, sugar, and food processing, can use this material to fuel a boiler and produce low-cost steam. In these situations, an Elliott STG can pay for itself in a few years.



## ■ POWER TO MATCH YOUR NEEDS

Elliott works closely with every customer to select the right steam turbine generator for each unique project. Tens of thousands of flexible, reliable, Elliott steam turbines are driving generators, pumps, compressors, fans, blowers, and other equipment across a wide range of applications and power requirements.



TURBINE DESIGN	AVAILABLE CONFIGURATIONS	POWER RANGE	INLET LIMITS		EXHAUST PRESSURE
			PRESSURE	TEMP	
Single-valve, Single-stage (SVSS)	Backpressure or Condensing	50 kW - 3.0 MW	900 psig (63.3 kg/cm <sup>2</sup> )	900 ° F (482° C)	Vac to 375 psig (25 barg)
Single-valve, Multi-stage (SVMS)	Backpressure or Condensing Uncontrolled Extraction	2.0 MW - 12 MW	900 psig (63.3 kg/cm <sup>2</sup> )	900 ° F (482° C)	Vac to 250 psig (17.2 barg)
Multi-valve, Multi-stage (MVMS)	Backpressure or Condensing Controlled/ Uncontrolled Extraction Induction	18 MW - 50 MW	2000 psig (140.8 kg/cm <sup>2</sup> )	1005° F (541° C)	Vac to 600 psig (41.4 barg)

■ OTHER RESOURCES:



Scan this QR code to access the Elliott resources listed below.

***Boiler/STG Sizing Chart***

Boilers and STGs are typically used in conjunction. This chart provides approximate power output at various boiler pressures and flows.

***STG Calculator***

This calculator provides rough approximations of power and/or steam flow at a given set of user-supplied conditions.

***Case Studies***

These case studies explain several of Elliott's past projects that can serve as models for similar markets and operating scenarios.



STG SIZING CHART										
Power in kWe	0	2500	5000	7500	10000	20000	30000	40000	50000	
SVSS	■									
SVMS		■								
MVMS						■				

## ■ IT ALL STARTS WITH THE RIGHT STEAM TURBINE

With output to 12 MW, highly reliable, single-valve, single- or multi-stage Elliott YR steam turbines are well suited for geared, synchronous, or direct-driven induction generator applications. More than 35,000 proven, dependable, YR turbines are in operation today in installations around the world.

Elliott's larger, multi-valve, multi-stage (MVMS) steam turbines are known for their robust design and reliability, and are suitable for demanding and complex applications up to 50 MW. These large, highly-engineered turbines can include multiple extractions, both controlled and uncontrolled, as well as steam induction.

## ■ THE COMPLETE SYSTEM

In some power applications, the generator is directly driven by the turbine. Other applications require a speed-reducing gearbox between the turbine and the generator. The gear enables the turbine to operate at a higher, more efficient speed, while the generator operates at its required speed of 1500 rpm (50 Hertz) or 1800 rpm (60 Hertz). Generators are available in a wide array of powers, voltages, and enclosure types. They are rated for indoor or outdoor use and for different hazardous area conditions.

Lubrication is essential for longevity of the turbine, gearbox, and, often, the generator. The lubrication system can be integrated into the speed-reducing gearbox or provided as a stand-alone system for added capacity in more demanding applications.

A state-of-the-art digital control system integrates all of the components of the STG. Through its programming and user interface, the control system provides protection and supervision of the STG, and optimizes operation of the turbine and generator. Control options make remote interface with existing plant control systems possible, or remote control from a central control room



### **SVSS - Single-valve/Single-stage**

A steam turbine with one set of rotating blades on a single rotor, and one internal governor valve which throttles steam flow at the turbine inlet.



### **SVMS - Single-valve/Multi-stage**

A steam turbine with multiple sets of rotating blades on a single rotor, and one internal governor valve which throttles steam flow at the turbine inlet.



### **MVMS - Multi-valve/Multi-stage**

A steam turbine with multiple sets of rotating blades on a single rotor, and multiple governor valves which throttle the steam flow at the turbine inlet .



## FULLY INTEGRATED CONTROL SYSTEM

Elliott Group offers sophisticated, flexible, and easy-to-use STG control systems. Operators can manage their systems in several modes such as island, black start, tandem, parallel generation, or grid interfaced. These systems can be configured with a wide range of PLC controllers to facilitate communication with your existing plant systems.

- ◆ Touch-screen interface (HMI) for easy, accurate display and control
- ◆ PLC-based controller for safe and reliable operation of the equipment
- ◆ Auto and manual synchronizing with synch check protection relay
- ◆ Independent overspeed trip protection
- ◆ Multifunction generator protection relay
- ◆ Excitation control (automatic voltage regulator)
- ◆ Network communication and remote access capabilities
- ◆ Custom, tailored instrumentation
- ◆ Display available in multiple languages



## COMPLETELY INTEGRATED GENERATOR PACKAGES

An Elliott steam turbine generator is a completely integrated package designed for trouble-free installation, start-up, and operation. Installation and maintenance costs are minimized through:

- ◆ Proven robust turbine, generator, and component designs
- ◆ A baseplate designed with a minimum footprint
- ◆ Electrical connections in junction boxes at the edge of the baseplate
- ◆ Flexibility in piping terminations to best meet needs

These convenient features ensure years of reliable operation.

Induction generator packages for grid-dependent applications generally do not require reduction gears or external lubrication systems, and are lower in cost as a result. Elliott can also provide auxiliary systems such as electrical switch gears and surface condensers.



## ■ GLOBAL SERVICE AND SUPPORT

Elliott Group offers comprehensive service, support, and training for all types of turbomachinery regardless of the original manufacturer. Our experienced engineers, metallurgists, technicians, welders, and mechanics have the expertise and experience to keep equipment performance high and maintenance costs low. We support our customers through a global network of service centers that are registered to ISO 9001 or have structured quality management systems.

- ◆ Installation
- ◆ Maintenance
- ◆ Repairs
- ◆ Overhauls
- ◆ Rerates
- ◆ Modifications
- ◆ Training
- ◆ Parts

These services are offered 24 hours a day, 7 days a week.

Supported by our service centers throughout the world, Elliott's field service teams are recognized for their hands-on experience with comprehensive overhauls, project management, resource planning, subcontractor control, installation and commissioning, and on-site repairs. Elliott Technical Services provides practical, timely, and cost-effective solutions for complex turbomachinery problems. Rerates and modifications by Elliott Engineered Solutions enhance operating efficiency and extend the life of rotating equipment from any manufacturer.

Elliott is accredited by the American Society of Mechanical Engineers (ASME), holding both U and R boiler and pressure vessel certifications. Nondestructive Examination (NDE) and welder qualifications are important parts of our quality control system. Elliott qualifies its NDE personnel in accordance with American Society of Nondestructive Testing (ASNT) Recommended Practice SNT-TC-1A or country-specific equivalent based on ISO 9712. Elliott qualifies its welders in accordance with ASME Boiler and Pressure Vessel Code Section IX. Project-specific compliance with other industry standards includes: ANSI, API, CRN, CSA and CE/PED.





## ■ PARTIAL REPRESENTATION OF ELLIOTT STEAM TURBINE GENERATOR INSTALLATIONS



For more than 100 years Elliott Group has supplied STG units to companies throughout the world. For applications like biomass, CHP, and district energy, Elliott STGs offer unparalleled reliability and efficiency.



Elliott Group is a global leader in the design, manufacture, and service of technically advanced centrifugal compressors, steam turbines, power recovery expanders, cryogenic pumps and expanders, and axial compressors used in the petrochemical, refining, oil & gas, liquefied gas, and process industries, as well as in power applications.

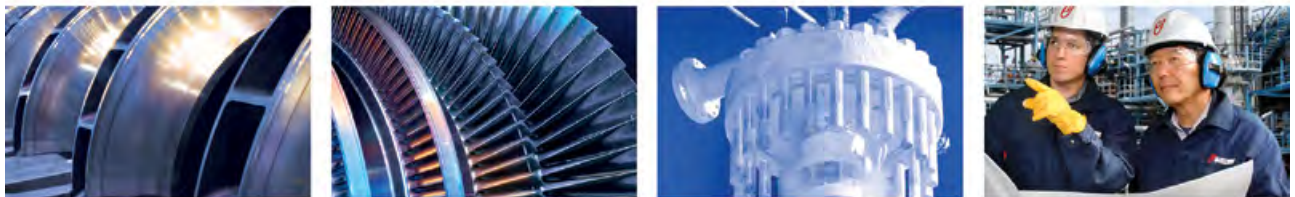
Elliott Group is a wholly owned subsidiary of Ebara Corporation, a major industrial conglomerate headquartered in Tokyo, Japan.



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T H E W O R L D T U R N S T O E L L I O T T



C O M P R E S S O R S ■ T U R B I N E S ■ C R Y O D Y N A M I C S ■ G L O B A L S E R V I C E