



# Steam Turbines



**AnsaldoEnergia**  
A Finmeccanica Company

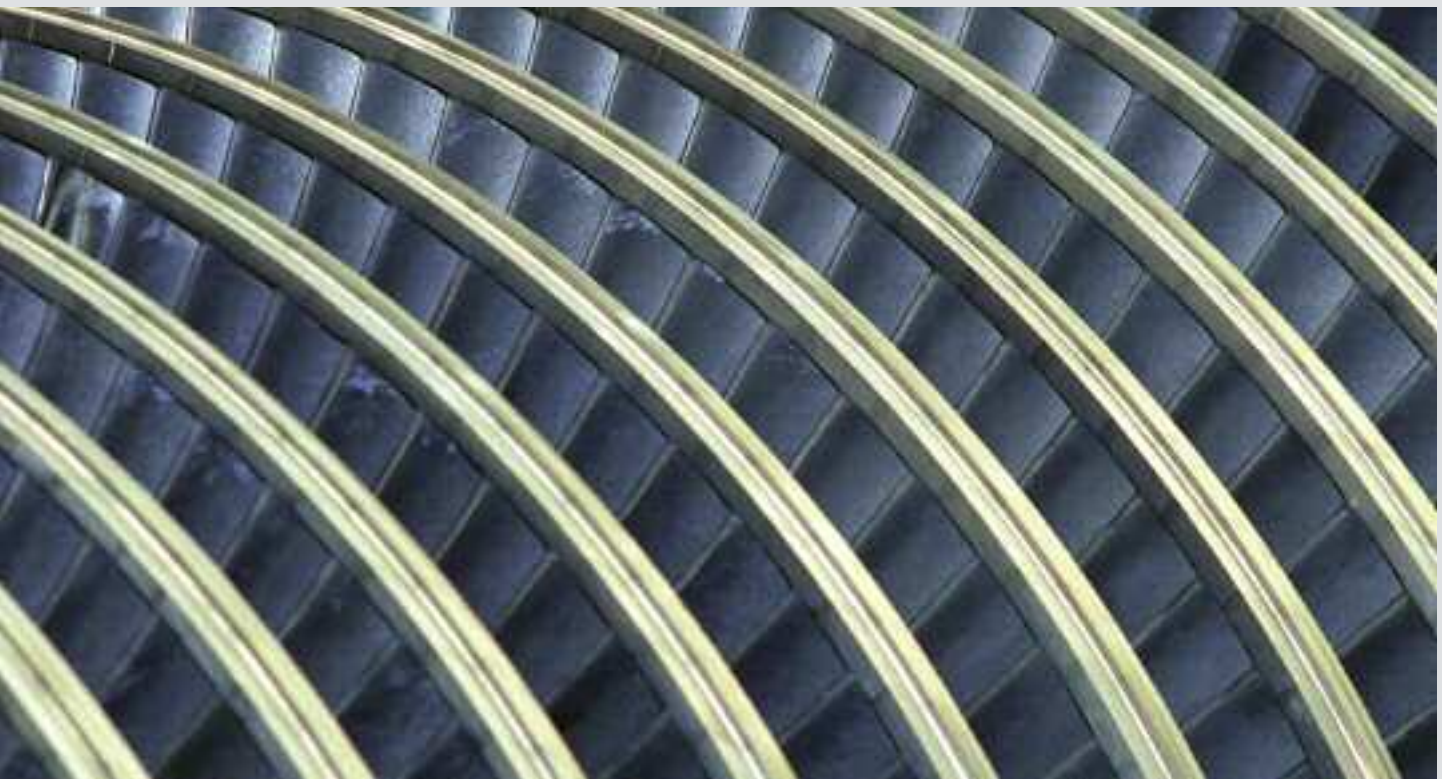


## Steam Turbines

Ansaldo Energia has a comprehensive steam turbine offering covering a wide range of power generation applications:

- Geothermal steam turbines
- Cogeneration steam turbines for process steam, district heating and desalination plant
- Steam turbines for fossil fired cycles
- Steam turbines for combined cycles

Ansaldo Energia has extensive design, manufacturing and installation experience, with more than 300 units rated 100 MW and above in service or on order for power stations.



### Experience

Application	Units	Power (MW)
Fossil fueled power plants	343	65,522
Nuclear power plants	12	6,180
Combined Cycles power plants	84	6,475
Waste to energy power plants	26	402
Geothermal power plants	130	2,118
Industrial plants (*)	581	5,423
<b>Total</b>	<b>1,176</b>	<b>86,120</b>

(\*) Product Line closed in July 2000.



## Geothermal steam turbines

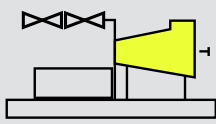
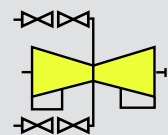
Ansaldo Energia has designed, built and commissioned more than a hundred geothermal units since 1912 throughout the world, in sizes ranging from 250 kW to 60 MW and for all types of steam or water dominated geothermal sources.

This extensive experience (more than 2000 MW installed) has enabled the company to achieve a high level of reliability and efficiency as well as remarkable flexibility in terms of adapting to different steam conditions and plant arrangements.

State-of-the art technology, modular design and cutting edge construction methods are used to pre-engineer different turbine models for different geothermal steam conditions, and power output levels.

### Geothermal steam turbine design features

Feature	Benefits
impulse/reaction construction	better protection against solid particles entering the steam path
new generation airfoil and steam seal	high efficiency
top or lateral exhaust fully integrated with condenser	simple layout
patented design solutions to prevent problems arising from dissolved solids or steam impurities	simplified maintenance

STEAM TURBINE CONFIGURATION						
Application	Model	Speed (hz)	Basic Configuration	Output Range (MW)	Max. Main Steam Data	
					Pressure (bar)	Temperature (C±)
■ Geothermal Power Plants	GT- 40	50 60		30 - 60	20	10± Superheated
■ Geothermal Power Plants	GT- 60	50 60		50 - 80	20	10± Superheated

# Cogeneration steam turbines

These turbines up to 100 MW are employed in both industrial and district heating plants. As it is basically the process which dictates steam parameters and therefore turbine design, each cogeneration steam turbine is a unique product tailored to the client's specific needs. Cogeneration steam turbines have a modular construction, enabling the production of back pressure and condensing turbines with or without controlled extraction.

**Main design features:**


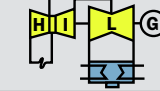
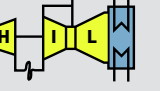
- modular design
- with or without control stage
- single and two cylinder design
- one or two internally controlled process steam extractions
- axial or vertical exhaust
- package unit design

# Steam turbines for fossil fired cycles

Today's big power generation turbines are reheat type with regenerative feedwater cycle and possible district heating plant applications.

Ansaldo Energia is now offering an updated reheat turbine product line, specifically designed to satisfy all possible customer requirements in terms of operating conditions, performance and reliability, including turbines for supercritical and ultrasupercritical applications.



STEAM TURBINE CONFIGURATION						
Application	Speed (hz)	Basic Configuration	Output Range (MW)	Max. Main Steam Data		
				Pressure (bar)	Temperature (C±)	
<input type="checkbox"/> RH Fossil - Power Plants	50 60	TC - DF 	200-1200	300	600/610	
<input type="checkbox"/> RH Fossil - Power Plants	50 60	TC - DF 	150-350	170	540/565	
<input type="checkbox"/> RH Fossil - Power Plants	50 60	TC - SF 	100-250	170	565/565	

The main technical features are based on successful operating experience throughout the world in the full range of applications combined with modular design to improve reliability and performance.

Their advanced design concept and special construction features make Ansaldo steam turbines particularly appropriate for operation in advanced steam conditions (>565°C).

The extensively referenced modular design can be applied without modification.

The only adaptation required for operation in advanced steam conditions is the 10% chromium steel which must be used for HP, IP inner casings, valve bodies and middle rotor sections. One of the most advanced turbine of this type is located at the Avedoere power plant in Denmark.

The plant is natural gas, biomass and oil fired.

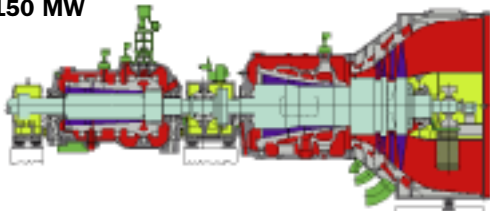
Power output is 534 MW in the high power condensing mode, with nominal inlet temperature increased to 580°C for live steam (at 300 bar) and 600°C for reheat steam. Plant efficiency levels stand at about 47%.



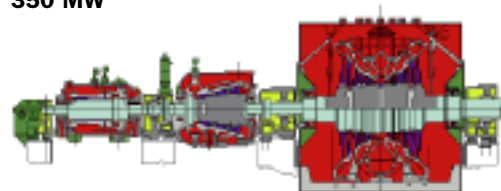
Feature	Benefits
Full 3-D design reaction blading	High efficiency
Rotating blades with integral shroud and free-standing last stage blades	
Single bearing concept	High operating flexibility
Double shell design	
Shrink rings for HP inner casing	
LP casing independent from bearing housing	Low thermal stresses
Welded rotor design	
	Material optimised for operating temperature
Safety and control systems are electric / electronic components	Minimum number of mechanical hydraulic components

## TURBINE CROSS SECTIONS

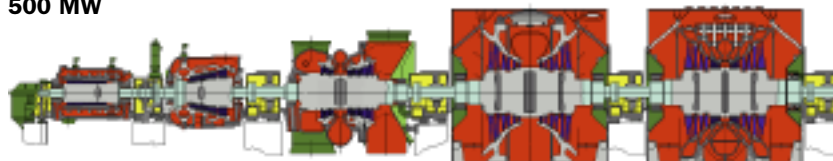
150 MW



350 MW



500 MW



# Steam turbines for combined cycles

Steam turbines for combined cycles must be easy to adapt to different gas turbine configurations (number and models) and the steam conditions delivered by various heat recovery steam generator systems. Ansaldo Energia steam turbines are optimised to meet the full range of customer requirements and all specific site conditions.

The combined cycle steam turbine product line incorporates all the main features currently being implemented on conventional medium and large size units plus additional features required by specific applications including:



Feature	Benefits
Full arc admission	Improved efficiency and operation
Special rotor geometry	Fast load changes associated with gas turbine operation
Axial or side exhaust arrangement	

Steam turbines for single shaft arrangements (gas turbine, generator, steam turbine on a single shaft line) are also available to optimize installation compactness and therefore reducing associated costs.

STEAM TURBINE CONFIGURATION						
Application	Speed (hz)	Basic Configuration	Output Range (MW)	Max. Main Steam Pressure (bar)	Max. Main Steam Temperature (C±)	
■ RH Combined Cycle Power Plants	50 60	TC - DF	150-300	170	565/565	
■ RH Combined Cycle Power Plants	50 60	TC - SF	100-200	170	565/565	
■ RH Combined Cycle Power Plants	50 60	SC - SF	40-100	125	540/540	
■ SH Combined Cycle Power Plants	50 60	TC - DF	100-250	125	540	
■ SH Combined Cycle Power Plants	50 60	SC - SF	40-150	125	540	



## Quality system

The Quality System cover all aspects of steam turbine quality including:

- design
- inspection
- planning
- installation
- manufacture
- servicing
- testing

The Quality System is certified as complying with ISO 9001 by a recognised certification society.



**Ansaldo Energia has 150 years experience in the electrical and mechanical engineering business. It is a global player in the power generation sector with an installed capacity of 160,000 MW.**

**Ansaldo Energia offers the full range of manufacturing, engineering, contracting and service activities, as well as a flexible approach to power projects.**

**Steam fossil fired, gas turbine and combined cycle, hydroelectric, geothermal and nuclear power plants, supplied turnkey, in separate lots or by components.**



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