Integrated Global Services

Generator
Ansaldo Energia Group

Ansaldo Energia is a leading provider of services and equipment for power plants, offering expertise at all levels of complexity for our own and third party machinery for heavy-duty Steam and Gas turbines, Generators, Nuclear, Micro turbines and Shaft Line. We provide global services including Repairs and Spare Parts, Field Service work including overhauls and upgrades, Plant Support with Remote Monitoring and Diagnostics, with transactional as well as comprehensive Long Term Service Agreements.

We are a global supplier of turn-key power plants, with a broad offering of the most reliable and best performing solutions available today, backed up by a dedicated Research and Development group and a global Service organization that assists customers with continuous product improvements, combined with the traditional reliability and robustness of Ansaldo Energia products.

The result is a unique and balanced value package based on innovation and reliability. Ansaldo Energia’s solutions combine the company’s proven designs, manufacturing capabilities and commissioning skills with its well-known flexibility in matching customer needs with tailored solutions.

At Ansaldo Energia, we recognize that the power market continues to be dynamic and challenging to our Customers. To remain profitable, operators expect global service organizations to offer solutions that improve the efficiency, operational flexibility, emissions, reliability and life-cycle maintenance costs of their power production assets.

Today, 160 years of Ansaldo Energia history are combined with a strategic assemblage of complementary service acquisitions. Not only can our Team provide advanced technology service solutions for your installed Ansaldo equipment, but our uniquely positioned OSP™ (Original Service Provider) technologies enable value-based offerings for any large frame GE, Siemens and Mitsubishi gas turbine, steam turbine or generator. This industry-first combination result? A flexible, multi-platform, full-scope service provider that can deliver competitive and proven answers to improve your equipment’s life cycle maintenance costs.

With major operations in Genoa, Italy; Rheden, Netherlands; Jupiter, Florida, USA; Abu Dhabi, UAE; and field offices throughout Europe, Asia/Pacific, the Middle East, South and Central America, and the US, Ansaldo Energia offers customers localized service and global capacity to bring the highest level of value and capability to your plant.

We look forward to working with you as we create Power Together!
Generator Shaft Line

Ansaldo Energia has focused on turbo-generators since the early 1920s, when we began our first air-cooled turbine generator production. Since then, Ansaldo Energia has continuously enhanced its OEM and non-OEM service portfolio. Today Ansaldo Energia can also offer complete maintenance, restoration and modification services on non-proprietary, third party turbo-generators.

Generator Shaft Line offers complete solutions for turbo and hydro generators over a range of applications, leveraging internal resources, proprietary know-how and technologies, and a global network of external suppliers. Machining repairs, partial or total stator re-winds, magnetic core repair (including partial re-stacking) are some examples of the full range of high-technology services we provide to our Clients.

Ansaldo Energia is able to service a wide range of turbo generator technologies for planned and unplanned service outages, covering the following types:

- Air-cooled turbogenerator
- Indirectly H₂-cooled turbogenerator
- H₂, H₂O cooled turbogenerator
- Hydrogenerator

We Know Our Job

Ansaldo Energia's knowledge and experience derives from:

- A century of experience in the design and manufacture of electrical machines for power production
- About 500 air cooled units in the 10-330 MVA range designed and manufactured since 1950
- More than 200 units in the 40-1220 MVA range cooled by Hydrogen and Hydrogen+Water, designed and manufactured in the last 60 years
- Approximately 40 years of technological agreements with GE and ABB
- More than 500 salient pole generators manufactured since 1950
- A strong product portfolio combining all type of turbogenerators, irrespectively from including all the cooling mediums and Plant types (fossil, gas, geothermal), and hydro units for low-medium-high speed.

The team can provide you the technological know-how of an OEM on every type of technology. Merging a flexible approach, a pro-active structure and highly specialized competencies over different technologies, we build upon our OEM knowledge and leverage our organizational expertise, to achieve the know-how to work both on the OEM fleet and on non-OEM generators.
Ansaldo Energia’s Portfolio Service for Generator Shaft Line

Ansaldo Energia’s Service Organization provides worldwide technical assistance in the fields of maintenance, ad-hoc high technology, and solutions and repairs. We offer a preventive maintenance program, ensuring that customers are in the best position to achieve optimum operation. Diagnostic tools are available to monitor turbo-generator parameters and behavior continuously, in order to detect aging trends and address maintenance activities. Ansaldo Energia’s Service Organization can also provide customers with in-house personnel training, supported by dedicated instructional materials.

Generator Shaft Line offers service in the following areas:
- Solutions/Upgrades
- Repair
- Maintenance
- Diagnostics
- LTSA
- Parts

Shaft Line Solutions
- Generator capacity enhancement (upgrades)
- Maintenance and operation optimizations
- Entire unit replacement
- Generator rehabilitation
- Auxiliaries renovation
- Excitation system improvement (from analog to digital, from rotating to static)

Repair
The majority of repairs and field activities are completed on-site at the customer’s location. Necessary repairs and/or improvements are completed at our Genoa, Italy repair and manufacturing facility.

We offer the following on-site capabilities:
- Machining repairs
- Balancing and alignment assessment
- Partial or total stator re-winds, including RR – Resin Rich; VPI – Vacuum Pressure Impregnation; GVPI – Global Vacuum Pressure Impregnation technologies.
- Turbogenerator rotor re-insulation
- Hydrogenerator salient pole replacement
- Magnetic core repair, including partial re-stacking

Machining, such as rotor journals lathing including metal spray to recreate original diameters, slip rings rectifying, and coupling holes honeying, is possible due to fully skilled mechanics/operators and a wide set of portable equipment including:
- Drilling machine
- Lathe
- Vertical Turning Lathe
- Line boring
- Horizontal boring and milling

In addition to the above, a special tool, designed and developed by Ansaldo, permits a fast and reliable dismantling of stator bars insulated as per the Global Vacuum Impregnation Process technology.
Maintenance
Generator Shaft Line provides every type of maintenance: from a short inspection to a major overhaul, covering the machine, its auxiliaries (seal oil system, gas system, demi-water system, braking system on hydro) and the excitation/starting systems, regardless of the technology and the manufacturer.

Pre-outage activities:
- SOW - Scope of Works - Elaboration
- ITP - Inspection and Test Plan - Elaboration
- Planning Elaboration
- Pre-outage meetings
- Method Statement
- Risk assessment
- Tools preparation
- Spares definition

On-site activities:
- On-site mobilization
- Mechanical dismantling
- Fact Finding / NDT - Non Destructive Tests
- NC - Non conformances - report and resolution
- Failure analysis / Troubleshooting
- Remedials implementation
- Generator re-boxing
- Start-up assistance
- On-site demobilization

Post-outage activities:
- Final Report issue
- RCA- Root Cause Analysis - in case of fault
- Data base fertilization
- Engineering feedbacks
- TIL - Technical Information Letter

In case of fault, fast intervention to diagnose the extent of the fault, repair, a troubleshooting analysis and root cause identification are part of the services offered.
Diagnostics
Ansaldo Energia is a leader in developing tools and methods to check the operation of turbo-generators and assess the state of mechanical components. Different checks aimed to minimize maintenance cost and increase availability of the plant, avoiding the risk of unplanned outage, are in Ansaldo Energia’s portfolio:

- Non Destructive Testing
- Life Assessment
- Remote Monitoring

Non Destructive Testing: We continuously develop specifically tailored non destructive testing of steam turbine components. We offer high reliability and repeatability of the tests, as well as reducing the testing time and avoiding long and expensive dismantling of components.

Life Assessment: We provide a number of tests to analyze the expected remaining life of capital and strategic generator components, as well as the characterization of material exposed to high temperature and thermal cycles.

Remote Monitoring: Ansaldo Energia monitors the health of generator cycles 24/7 by the remote acquisition of vital parameters (typically temperature and vibrations). The data acquired and specific feedback is returned to the Operator to provide for planning and predictive intervention and optimize the list of necessary spare parts.

In particular, DIAGEN®, is an integrated diagnostic system designed and developed by Ansaldo Energia that can be installed on existing units regardless of the size, model and OEM.
DIAGEN® allows real-time measurements, evaluation of trends and Fast Fourier Transit (FFT) analysis, all of them able to be remotely connected to our monitoring centers in Genoa, Italy and Florida, US.

DIAGEN® is a modular package that can be installed with the Generator in operation, and is based on the following four modules:

- **CORALB** for the shaft current and voltage monitoring - can be installed in standstill conditions
- **CORTROT** for the air gap flux probe monitoring is installed during a major overhaul
- **SCAPAR** for the stator winding partial discharge monitoring - can be installed in standstill conditions
- **TEMAV** for the stator winding overhangs vibration monitoring and can be installed in a minor overhaul

Several Benefits can be achieved by Customer:

- Easy Data Reading with only one instrument and Assessment (trend)
- Supported by Ansaldo generator specialists
- Predictive diagnostics to reduce fault risks
- Easy implementation to connect already equipped with Ansaldo Energia or other OEM sensors
- Cost saving
  - no specialist travel to Power Plant
  - no generation interruption for measurements
  - reduced risk of outage
  - reduced insurance premiums
Long Term Service Agreements
Generator Shaft Line, as part of the Ansaldo Energia Maintenance strategy, provides long term service agreements that incorporate state-of-the-art technologies, skilled permanent monitoring and swift best-in-class expertise in a customizable format which allows:

- Anticipation of technical issues
- Optimization of scheduled and unscheduled interventions and inspections
- Optimization of spare parts management
- Supply, install and commission upgrades
- Maintenance and operation day-by-day

Parts
As the generator OEM, and based on our extensive experience in the Service and Maintenance of our own fleet, Generator Shaft Line manufactures and continually develops capital parts and all other spares for turbogenerators and hydrogenerators. Leveraging today’s capacities with a history of experience and technological agreements with different manufacturers, Ansaldo Energia is able to supply a wide spectrum of parts for third parties’ machines. As necessary, Generator Shaft Line is able to rapidly implement a Reverse Engineering process, based on a team of well-proven experts in the design of generator parts equipped with up-to-date tools for 3D scanning.