

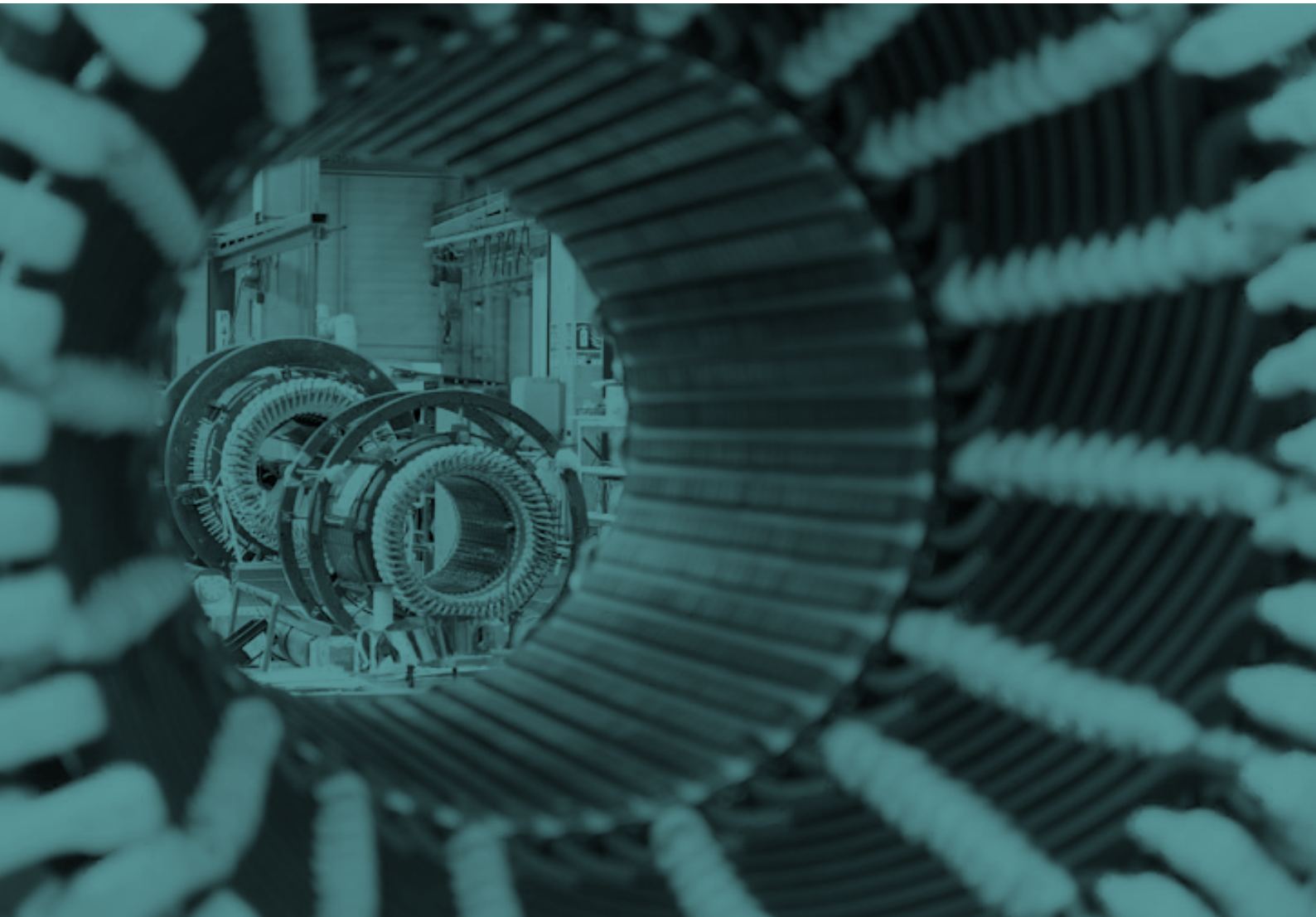


GE VERNOVA

gepowerconversion.com

SERVICES OFFERING FOR ROTATING MACHINES

Nancy site, France





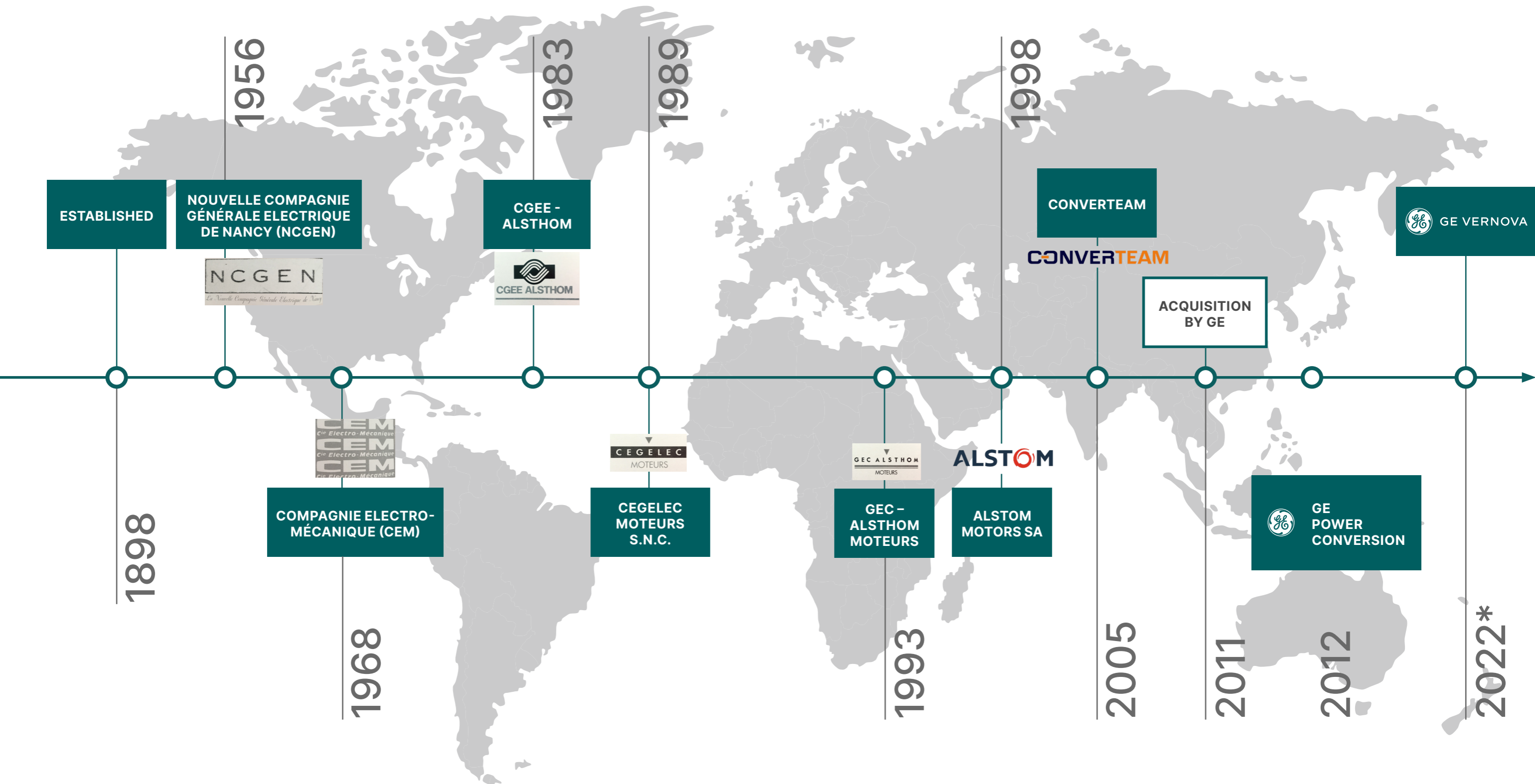
OVERVIEW

With more than 120 years of experience and advanced know-how in the field of induction and synchronous rotating machines, we aspire to offer our customers a high quality after-sales service. Our Services team offers support and expertise in a full range of activities to ensure the sustainability of your facilities:

- Field interventions and commissioning,
- Machine replacement,
- Spare parts,
- Repairs,
- Performance improvement,
- Consulting and Engineering,
- Training,
- Maintenance contracts.

The specificity of our machines requires a special support, adapted to each of them. Therefore, our teams can offer a personalized service that meets the needs of your equipment.

A HUNDRED YEARS OF GLOBAL EXPERIENCE



*2021: GE announced plans to form three public companies. In 2022, the portfolio of energy businesses is launched as GE Vernova.

FIELDS INTERVENTIONS AND COMMISSIONING

Your global and local partner:

Our team of experienced Field Service Engineers travels and operates all around the world.

They are certified:

CERTIFICATIONS & AUTHORISATIONS*

ATEX

BOSIET & HUET

Chemical risks

COFREND

Confined space

Electric (LOTO)

GWO (Global Wind Organization)

Nuclear HN1 SCN1

Work at height

*Possibility to pass certifications and authorizations on request.

They are supported by a dedicated team of experienced engineers ensuring technical support during the most complex operations.

Our team can intervene on-site as soon as possible, which reduces intervention times and therefore production shutdowns in all their fields of expertise:

- Site survey with complete scan of the installation,
- On-site equipment installation and assembly,
- Settings and commissioning,
- Expertise in real operating conditions,
- Upgrades,
- Normal or exceptional maintenance work,
- Repairs or reconditions on site,
- Electrical, thermal and vibration measurements,
- Dynamic balancing,
- Lineage.

MACHINE REPLACEMENT

We can provide integrated solutions for the replacement of complete machines, while preserving most of the existing customer installation.

Our expertise allows us to provide the right products, helping to ensure optimal performance:

- DC to AC architecture change,
- Upgrading AVR for synchronous machines.

These solutions offer a multitude of concrete and lasting benefits:

- Consumption optimization,
- Carbon footprint reduction,
- Integration of the latest technologies.



SPARE PARTS

We supply complete replacement machines and all types of sub-assemblies and parts for all motors of our manufacture:

- Rotors and stators,
- Exciters,
- Bearings and accessories,
- Instrumentation,
- Cooling systems,
- Purge units,
- Lifting and lubrication groups,
- AVR,
- Etc.



We have the archives of the machines we manufacture. Thanks to the serial number of the machine concerned, we can offer you original spare parts.

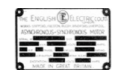
REPAIRS

We repair motors and generators with induction and synchronous technologies, including from other manufacturers. Repairs achieved in our factory or by our teams directly on-site benefit from the added value of the manufacturer:

- **Technical expertise** to identify and recognize the defect for root treatment,
- **Know-how** to apply the right actions and repair protocol,
- **Testing means** to ensure repair success.

Controls at all stages of the work, including at our suppliers and potential subcontractors, help ensure compliance with our procedures and acceptance criteria as well as the high quality of our services, the reliability of the repaired machines and the tranquility of their users.

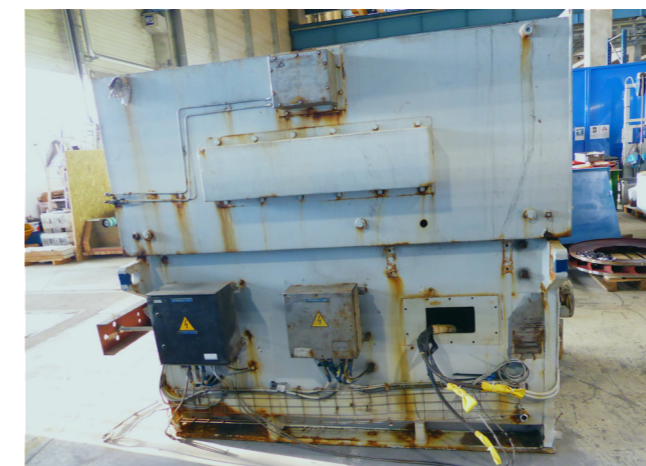
We have, within our factory, a workshop dedicated to the Services activity as well as efficient industrial means that allow us to carry out expertise and validate our work as soon as possible.



Before repair



After repair



PERFORMANCES IMPROVEMENT

Our know-how allows us to offer improvement solutions aimed at reducing equipment obsolescence and improving their performance by taking advantage of the latest control technologies.

- Cooling system,
- Performance improvement,
- Power factor optimization,
- Reliability of sub-assemblies,
- Reduction of partial discharges,
- Remote Machine Monitoring System (VISOR),
- Etc.

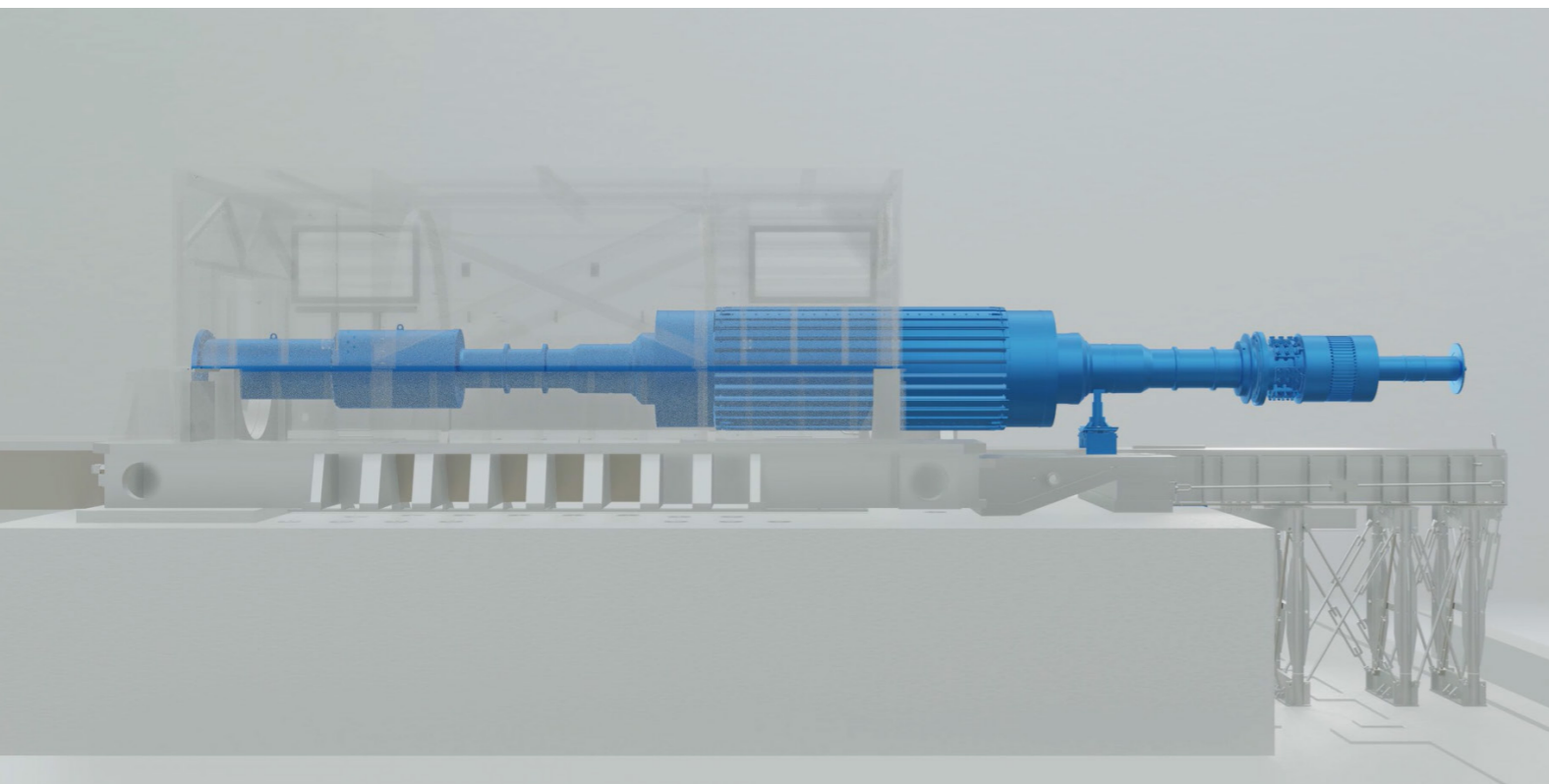
ADVICE AND ENGINEERING

- Design and production of custom tools: rotor extraction, bearing replacement, etc.,
- Rotor dynamic analysis: torsional analysis, clean modes, etc.,
- Structural noise analysis,
- Reverse engineering.

TRAINING

We provide training for customers that helps to perfect the knowledge of engineers responsible for the operation and maintenance of rotating machines. Practical training is an essential complement to acquire the fundamental concepts necessary for proper operation and preventive maintenance of rotating machines in operation.

- At the Nancy factory: We welcome customers to our factory where they benefit from the experience of our after-sales team and the skills of our Engineering and Production departments.
- On customer site: Training can be done in addition to the commissioning of the machines.



MAINTENANCE CONTRACTS

Regular maintenance of the equipment makes it possible to minimize costly and unplanned interventions.

To ensure the sustainability of the installations and meet the requirements of our customers, we offer a wide range of maintenance services:

- Predictive maintenance,
- Preventive maintenance (annual, quarterly, or five-year visits),
- Hotline and response times,
- Corrective maintenance,
- Supply and management of spare parts,
- Audit, consulting and expertise.

TIMSA

Since 2017, we have developed TIMSA (Test and Inspection for Motor Status Assessment), an advanced stator inspection program consisting of a series of tests that anticipate premature wear and reduce the risk of failure.

The TIMSA allows to give an overall precision on the state of health of the stator.

The tests carried out during the TIMSA program make it possible to optimize the maintenance of motors and generators by facilitating decision-making through a thorough analysis of the results.

The various tests and controls carried out during the TIMSA program are as follows:

TIMSA 1:

- Internal Visual Inspection or borescope,
- Recording and analysis of operating data,
- Insulation Resistance test (IR),
- Polarization Index (PI),
- Dielectric Discharge (DD),
- RLC Measurement,
- Step Voltage (SV),
- Surge test.

TIMSA 2:

- TIMSA level 1,
- Partial Discharge measurement (PD)*,
- Dissipation factor measurement ($\tan \delta$)*.

*Tests excluded on machines <4kV



LOGISTICS SERVICES

Storage

The capacity of our workshop allows us to provide our customers a storage solution for their equipment. This solution offers the possibility of directly performing the maintenance of the machines on our site, by our experienced engineers.

Transport and handing

We can offer transport support for the import or export of your equipment through our transport providers qualified in this field.



NANCY FACTORY CAPACITIES

LIFTING EQUIPMENTS	
Overhead cranes	
Maximum hook height (m)	16
Maximum load (t)	200
ROTOR MACHINING TOOLS	
Parallel tower	
Number of units	2
Maximum diameter (m)	2,35
Maximum length (m)	7
Maximum load (t)	25
Revolutions/minute (rpm)	0,8 à 1100
Vertical tower	
Number of units	1
Maximum height (m)	2,25
Maximum diameter (m)	7
BALANCING	
Rotor Balancer (SCHENK)	
Description	Characteristics
Number of units	1
Maximum diameter (m)	2,5
Maximum rotor length (m)	4,5
Maximum bearing spacing (m)	4
Maximum load (t)	13
Maximum revolutions/minute (rpm)	4320
Rotor balancer (TREBEL)	
Number of units	1
Maximum diameter (m)	3,3
Maximum rotor length (m)	6
Maximum bearing spacing (m)	4,5
Maximum load (t)	23
Maximum revolutions/minute (rpm)	1500
High speed balancing bench	
Number of units	1
Maximum revolutions/minute (rpm)	25 000
Maximum rotor length (m)	5
Maximum load (t)	up to 56.5 tons depending on the size of the bearings.
IMPREGNATION	
Autoclave tank	
Number of units	4
Process used	VPI (Vacuum Pressure Impregnation)
Resins used	Poly ester type,Epoxy ,3418 (low partial discharges), solvent-free and VOC-free
Maximum diameter (m)	4
Maximum load (t)	90
TEST PLATFORM	
Types of tests	Motor and generator testing Horizontal and vertical machine tests
Number of test areas	9
Test line capabilities	2 lines for synchronous machines up to 60 MW 1 line 1 MW 1 line 2 MW 1 line 5 MW 2 lines 18 MW
Maximum test voltage (V)	14 000
Test speed (rpm)	from 0 to 15 000
Test frequency (Hz)	to 250
Power type	DOL (Direct Online) VSD (Variable Speed Drive)
Machine cooling	water cooling (raw water flow) 4 MW plant to deliver 80m3/ hour max
Oil lubrication system for machine bearings	ISOVG32 et ISOVG46

TESTS AND CERTIFICATIONS

Do you need...

- To test your high power machine at full load?
- A full combined test with the entire system (transformer + drive + motor)?
- That the tests are compliant with IEC, IEEE, NEMA, API standards?

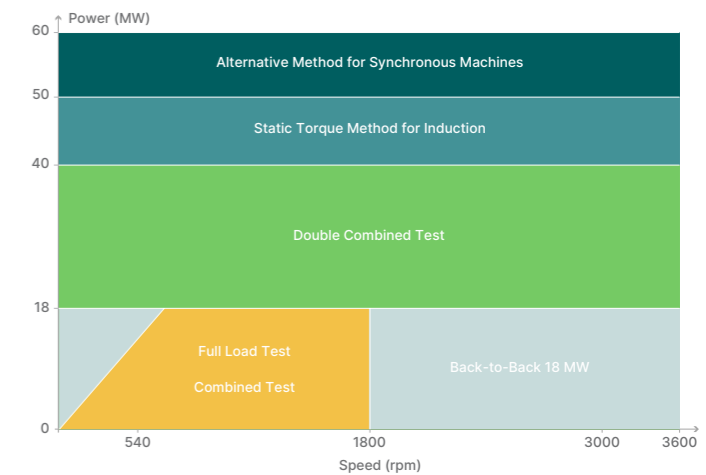


Our solution

The first and one of a kind 18 MW test line

- Full load capability up to 18 MW,
- Frequency from 5 up to 300 Hz,
- 40 MW loading induction machine,
- Alternative method on induction forced cooled motors up to 50 MW,
- **Full load combined test up to 40 MW** (transformer + drive + motor in back-to-back configuration).

Test bench capability curve





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About Power Conversion, a GE Vernova business

GE Vernova's Power Conversion business provides energy conversion technologies, systems, and services across the power and energy intensive industries, driving the electric transformation of the world's energy and industrial infrastructure.