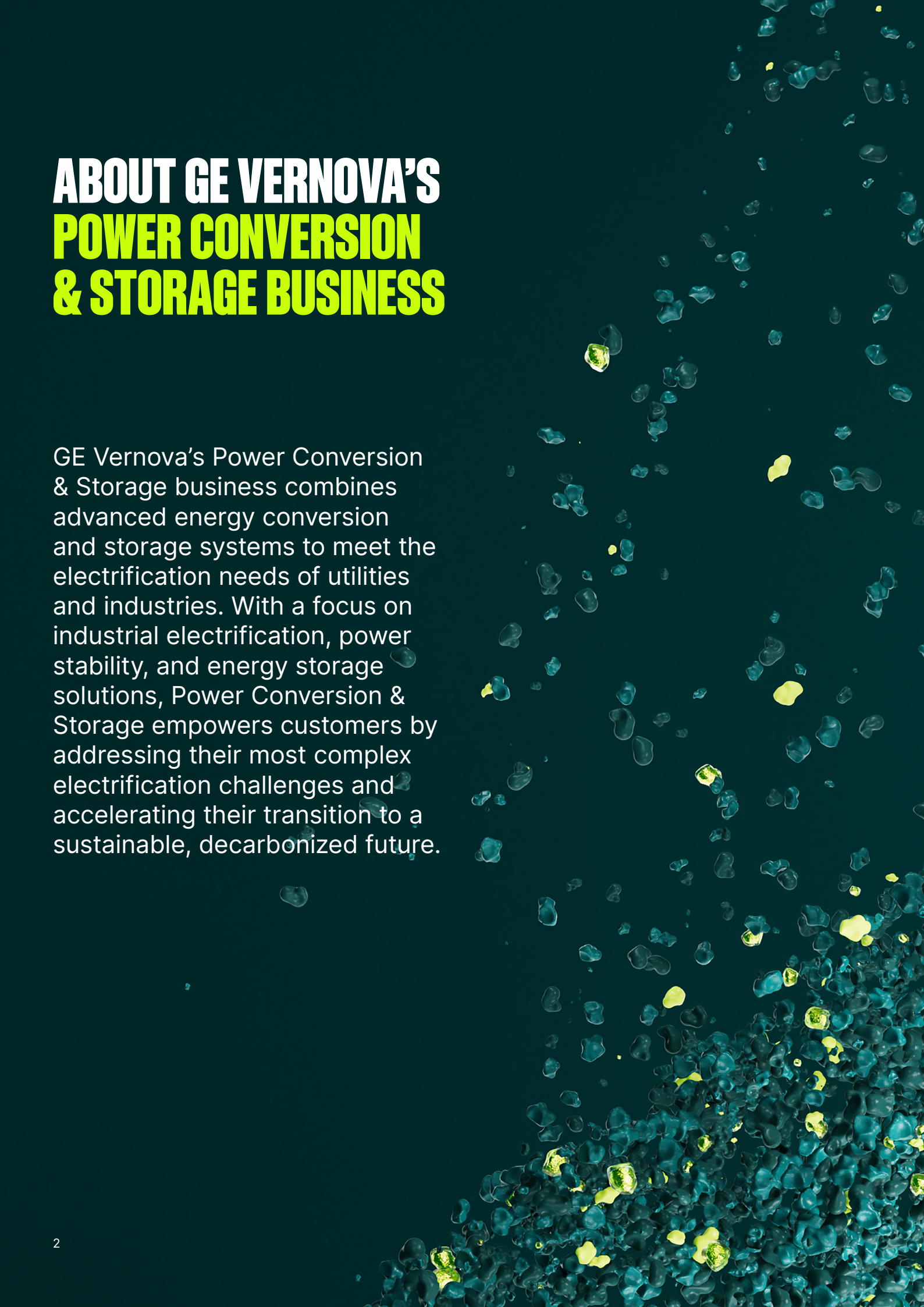
GE VERNOVA

ROTATING MACHINES FACILITY

Nancy, France

ABOUT GE VERNOVA'S POWER CONVERSION & STORAGE BUSINESS

GE Vernova's Power Conversion & Storage business combines advanced energy conversion and storage systems to meet the electrification needs of utilities and industries. With a focus on industrial electrification, power stability, and energy storage solutions, Power Conversion & Storage empowers customers by addressing their most complex electrification challenges and accelerating their transition to a sustainable, decarbonized future.



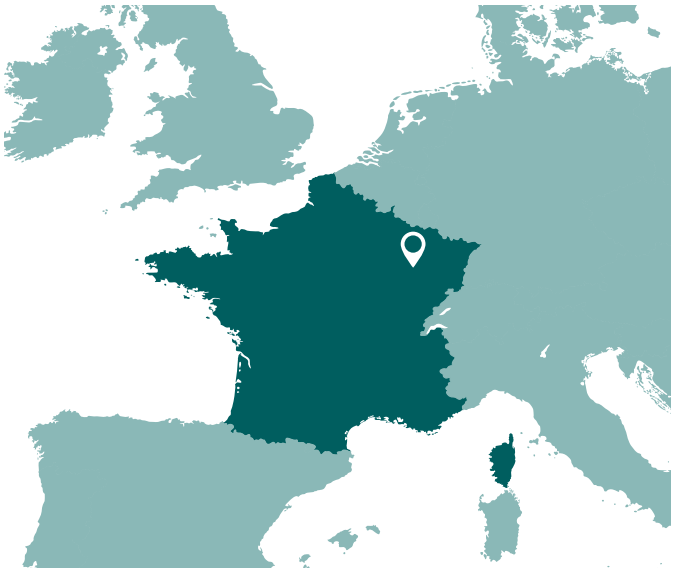
SITE OVERVIEW

Power Conversion & Storage, Nancy

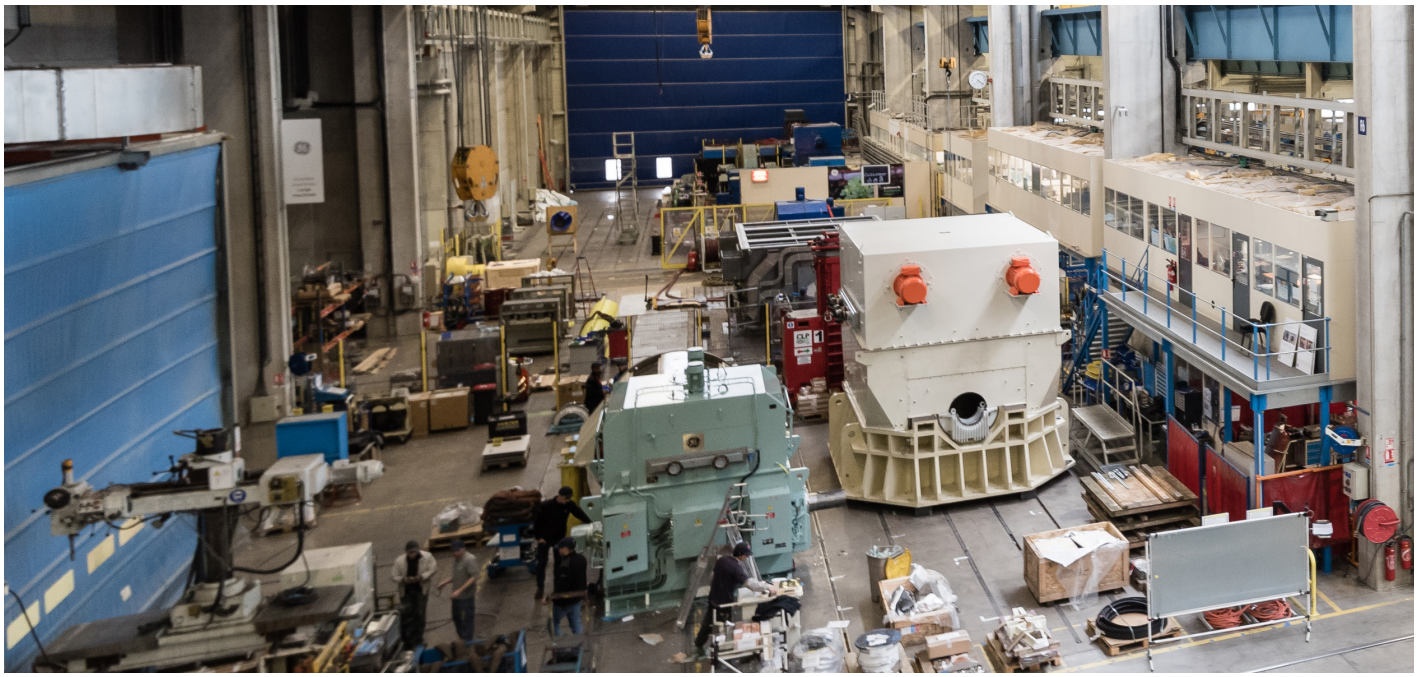
Manufacturing of Rotating Machines

Research & Development	Strong activity on IP and patenting, with 68 patents active in 2023, mainly on High-Speed and Renewable technologies
End-markets	Oil & Gas Marine Industry Power & Water Renewables Metals

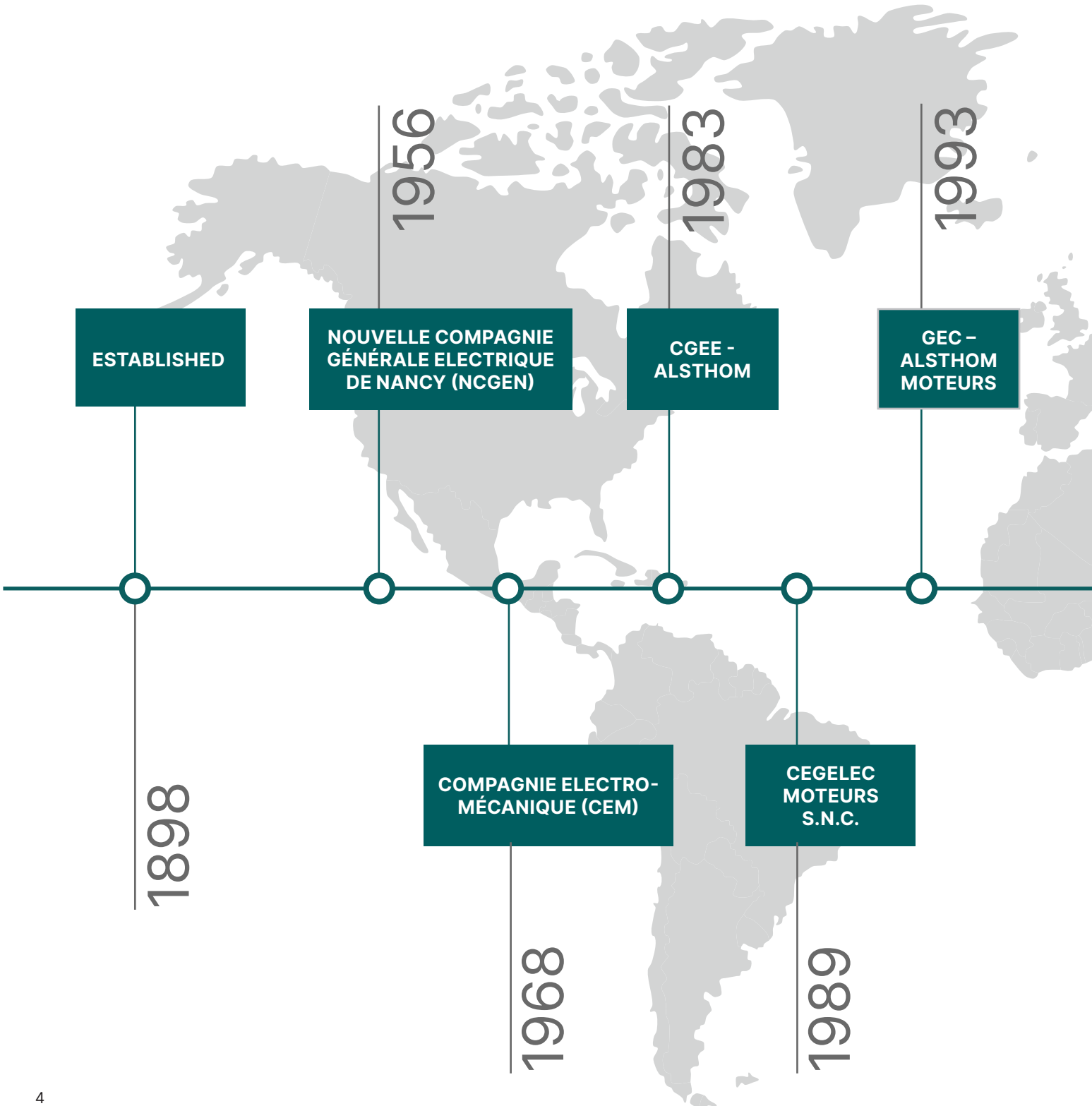
- ✓ **Center of Excellence** for large induction and synchronous electrical machines
- ✓ **Established 1898** (new factory in 2002)

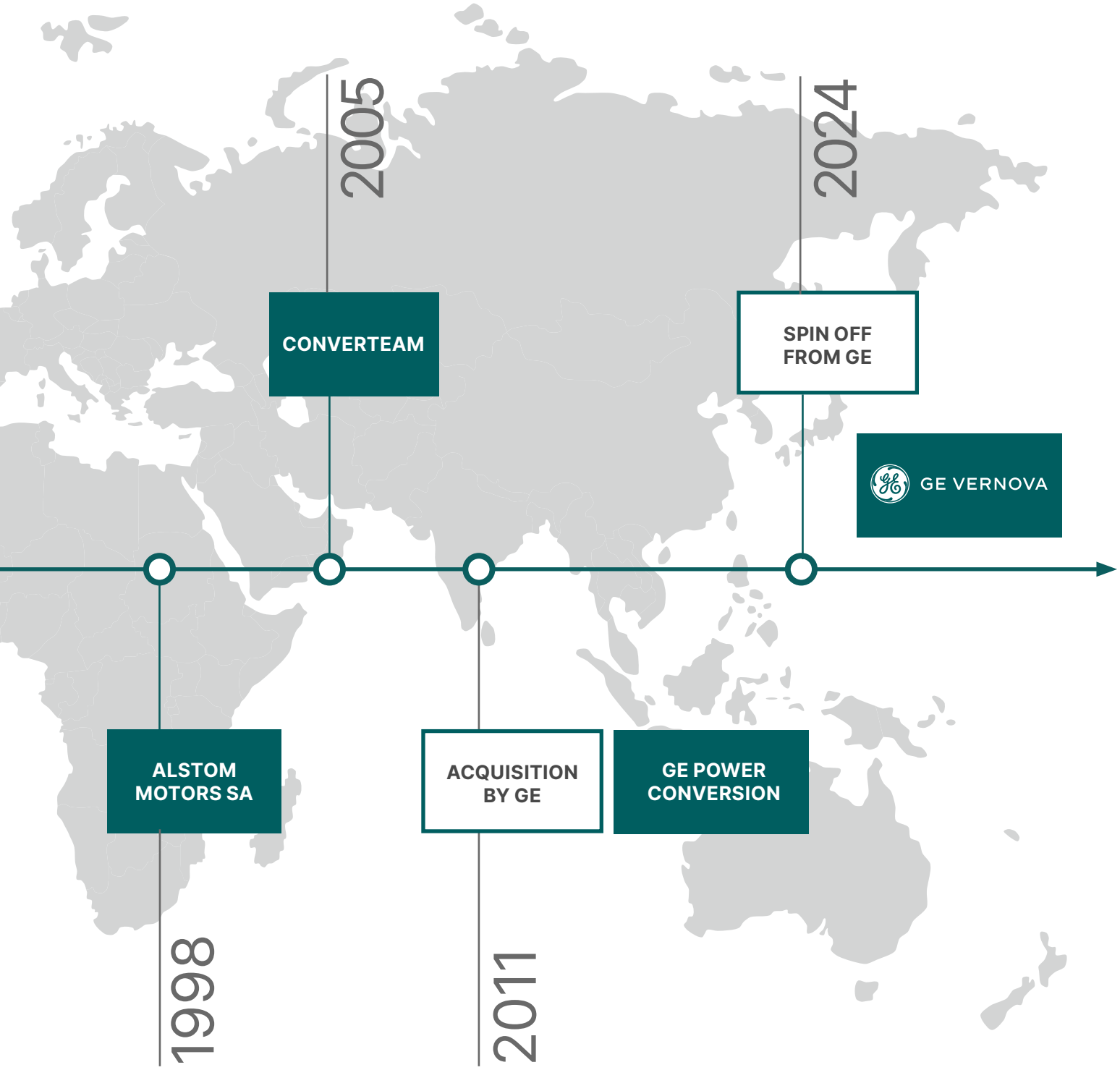


- ✓ Located in **central Europe**
- ✓ **Direct links to extensive transportation** network including waterways and by road
- ✓ **Fast access** from Paris (~1h30 TGV train)



MORE THAN 125 YEARS OF GLOBAL EXPERIENCE

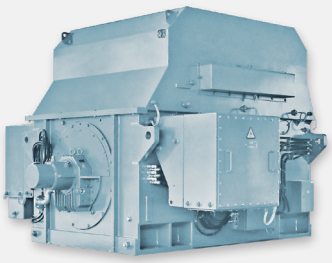



1998
ALSTOM MOTORS SA
2005
CONVERTEAM
2011
ACQUISITION BY GE
GE POWER CONVERSION
2024
SPIN OFF FROM GE
GE VERNOVA

THE SITE

- **Unique test capabilities**: Up to 18 MW with full VSDS combined or back-to-back testing
- **Advanced technology**: High speed motors from 2 MW/20,000 rpm, to 100 MW/4,000 rpm
- **Comprehensive range**: Full medium voltage motor range with high efficiency and power dense induction machines. Large high voltage synchronous motors for all general industry and oil & gas applications. Large slow and medium speed motors, PTO-PTI, and pods including ice class for marine applications
- **Heritage**: Over 100 years experience in the design and manufacture of rotating machines

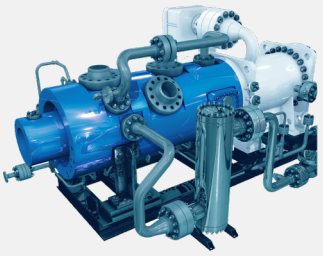
PORTFOLIO



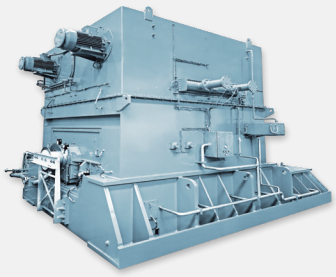
Induction motors
Up to 40 MW

Low speed motors
induction and synchronous, up to 40 MW

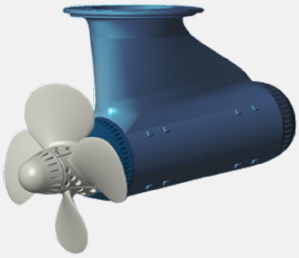
High speed synchronous motors
Up to 100 MW/1,800 rpm



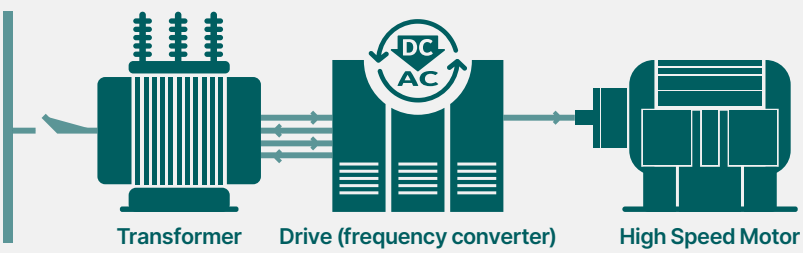
High speed induction motors
Stand-alone or integrated, up to 20 MW/18,000 rpm



Two pole turbo motors
Up to 100 MW



Podded propulsion motors
SEAJET* pods



Steam turbine replacement solutions
for compression process optimization

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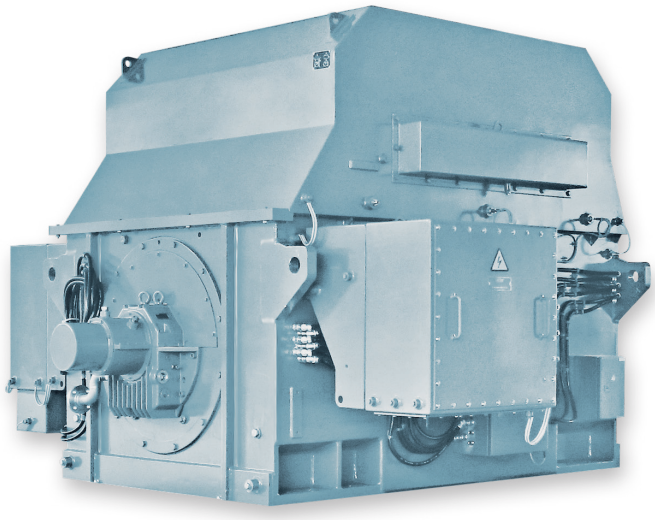
INDUCTION MOTORS

Up to 40 MW



Compact but mighty

GE Vernova's induction machines provide the highest power density in their class. What's more, the innovative compact frame upgrade to our well-established legacy motor line doesn't compromise on efficiency or reliability.

When space matters most

With a lower frame size than conventional induction motors, this new and compact design translates to space savings and lower weight. This is essential especially for onshore and offshore applications where space is at a premium and when platforms require reduced weight motors.

Helping to maximize customer outcomes

- Reduce operating expenses with longer durability and lower vibration.
- Cut capital expenditure with lighter machines that require fewer foundations and associated costs.
- Lower energy consumption from machines that are also safer.

	RATINGS
Frame Size	560 to 2,000
Poles	2 to 30+
Frequency	50 Hz , 60 Hz, or VFD
Cooling	TEAAC, TEWAC, WPII, TEPV
Power	Up to 40 MW
Client Network Voltage	690 to 15,000 V

Driven machines: Reciprocating compressors, centrifugal compressors, pumps, blowers, fans, extruders

Key features & benefits

- World-class compact design
- High efficiency
- Low noise
- Reduced weight
- Proven design with innovative components
- State-of-the-art manufacturing equipment
- Test facility up to 40 MW (upon request)
- ATEX/IEC/IECEX protection

LOW SPEED MOTORS

Induction and synchronous, up to 40 MW

Extensive experience in marine and oil & gas applications

GE Vernova's large low speed motors offer lower weight and inertia advantages.

Requiring little maintenance, induction motors can be used in almost all applications requiring high reliability and robust performance.

Marine induction motors are available as vertically-mounted and horizontally-mounted to meet all applications requirements.

PTO/PTI induction generators are available using the same technical platform.

	RATINGS
Frame Size	Up to 2,000
Poles	8 to 36
Frequency	50 or 60 Hz, or VFD
Cooling	TEWAC, TEAAC, TEPV
Power	Up to 40 MW
Rotor Type	Laminated squirrel cage induction, cylindrical or salient poles synchronous

Driven machines: Reciprocating compressors, fans, extruders, propulsion, marine

Key features & benefits

- Smooth start-up capability: Low starting current machines available
- Improved performance/reduced operating expense: Power factor correction capabilities
- Reduced maintenance requirements: Integrated brushless excitation system
- High reliability: Robust brushless components
- High efficiency: Enhanced design
- Improved electrical system reliability: Reduced torque pulsations for non-steady loads

HIGH SPEED SYNCHRONOUS MOTORS

Up to 100 MW/1,800 rpm

GE Vernova offers a full range of horizontal and vertical synchronous motors, ranging from direct-drive high torque density motors to turbo-type motors for compressor applications.

Synchronous motors are utilized for many applications across a broad range of industries.

Because of the high efficiency and controllable power factor of the design, utility costs (and CO_2 emissions) are minimal.

We can rapidly adapt our standard product platforms to cater for many applications or any purposed starting methods including fixed and variable speed drive.

	RATINGS
Frame Size	900 - 1,600
Poles	4 / 6
Frequency	50 or 60 Hz, or VFD
Cooling	TEWAC, TEAAC, TEPV
Power	Up to 100 MW
Rotor Type	Salient pole rotors (laminated and solid pole dependent upon starting requirements or duty cycle)

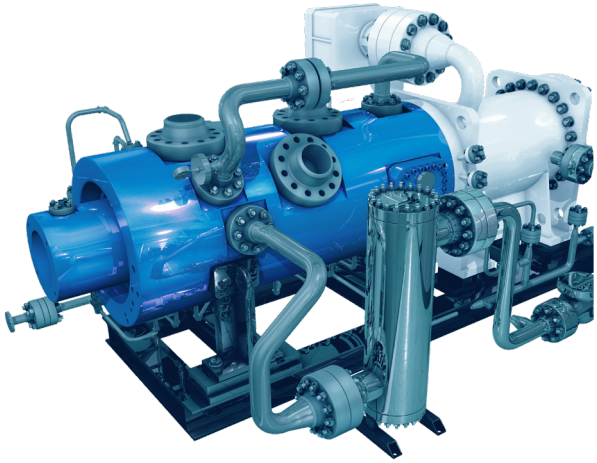
Driven machines: Compressors, centrifugal compressors, pumps, blowers, fans, extruders

Key features & benefits

- Easy access for routine maintenance
- High quality design: All rotors are carefully balanced to comply with standards requirements
- High efficiency: Increased operating cost savings
- Low starting current: Provides better overall starting capability, which reduces the starting equipment cost
- Leading power factor: Reduced utility penalties associated with lagging power factor
- Improved electrical system reliability

HIGH SPEED INDUCTION MOTORS

Stand-alone or integrated, up to 20 MW/18,000 rpm



Compact & simple

- Compact machine with easy installation.
- Leaner, low-maintenance motor that delivers extended maintenance periods and longer periods of uninterrupted operation. Delivering 5+ years of operation.

Increased system efficiency

- Increased operational flexibility and efficiency
- Up to 98.1% operational efficency
- Opex savings when combined with VSI drive (~+1.25%* increased overall system efficiency... lower power consumption)

	RATINGS
Frame Size	450 to 800
Poles	2
Speed	6,000 to 18,000 rpm
Cooling	TEWAC, TEAAC, TEPV
Power	Up to 20 MW
Rotor Type	Laminated squirrel cage induction

Key features & benefits

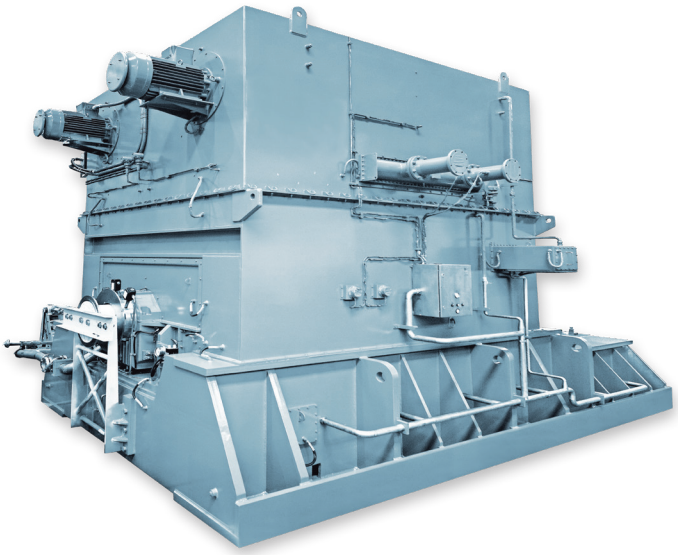
- Lower opex
- Easy installation
- Easy maintenance
- More efficient speed ranges
- Lower capex
- A smaller motor requiring smaller foundations
- Greater availability
- Ideal for the typical five year run time of large liquefaction units
- ATEX/IEC/IECEX protection

Driven machines: Centrifugal compressors, fans

* Estimate from comparison between global system efficiency of N/A project – induction vs synchronous

TWO POLE TURBO MOTORS

Up to 100 MW



Delivering greater reliability and efficiency

GE Vernova has been setting the standard in manufacturing rotating machines for over 125 years, delivering innovative power solutions to the world. Motors are designed and manufactured to operate efficiently and reliably in challenging applications and severe environments where reliability and ease of maintenance is critical.

Our 2-pole turbo motors offer high flexibility and high reliability for centrifugal compressor drive. Induction motors with a simpler rotor (parts reduced x 10), can help increase the MTBF period and allows better optimization of the compressor due to the extended speed range.

	RATINGS
Frame Size	900 to 2,000
Poles	2
Speed	3,000 to 7,500 rpm
Cooling	TEWAC, TEAAC, TEPV
Power	Up to 100 MW
Rotor Type	Laminated squirrel cage induction (Synchronous Laminated Pole available)

Key features & benefits

- Reduced opex
- Easy installation
- Easy maintenance
- High efficiency
- Reduced capex
- Reduced footprint
- High availability

Driven machines: Centrifugal compressors

PODDED PROPULSION MOTORS

SEAJET* pods

For marine applications

The SEAJET* pods are podded propulsion units. The electric motor is housed in the hull mounted pod and directly connected to the propellor. This allows to liberate cargo space and improve maneuverability/efficiency.

SEAJET* is developed to enhance maintainability and availability and to meet marine rules and IEC standards. It includes induction motor technology that has demonstrated its robustness through a wide range of experience in naval, merchant and offshore applications.

Our induction motor is compact and features a bilateral cooling system.The ability of the MV7000 PWM drive to operate at very low frequency allows the motor's pole number to be optimized and a low resistance squirrel cage to be included to increase efficiency and power factor. Reduced unsymmetrical magnetic attraction and shaft deflection make air gap integrity safer than synchronous technology.

	RATINGS
Speed	100 - 200 rpm
Frequency	VFD
Cooling	TEWAC
Power	Up to 25 MW
Rotor Type	Laminated squirrel cage induction or salient pole synchronous

Technical capabilities

- Output power from 1.8 to 25 MW
- High thrust capability at high transit speed vessels
- High bollard capability for DP application
- Developed for maximum availability
- Reduced noise and vibration for comfort
- Ice class capability
- Digital twin solution

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STEAM/GAS TURBINE REPLACEMENT SOLUTIONS

with electric motors and drive systems for decarbonization, GHG emission reduction and increased efficiency

Replacing turbines with electric systems can help save costs and improve performance

Energy companies are tightening their grip on costs, and evaluating new ways to improve efficiency. In the oil and gas industry - refineries, petrochemical and LNG plants - rotating machines process trains (such as compressors, blowers or pumps) are an important area for achieving potential process optimization. Previously, these process trains could be driven by steam or gas turbines. Today electrification represents most likely the best solution by replacing old turbines with electric systems without compromising on reliability.

Enhanced efficiency and increased plant performance

Our Variable Speed Drive Systems (VSDS) feature a unique combination of Voltage Source Inverter (VSI) and a high-speed motor to help increase reliability and availability of VSD systems. Thanks to the compactness of its high-speed motors, Power Conversion solution offers a smaller footprint and preserves the plant layout in constrained environments, allowing a smooth plant integration.

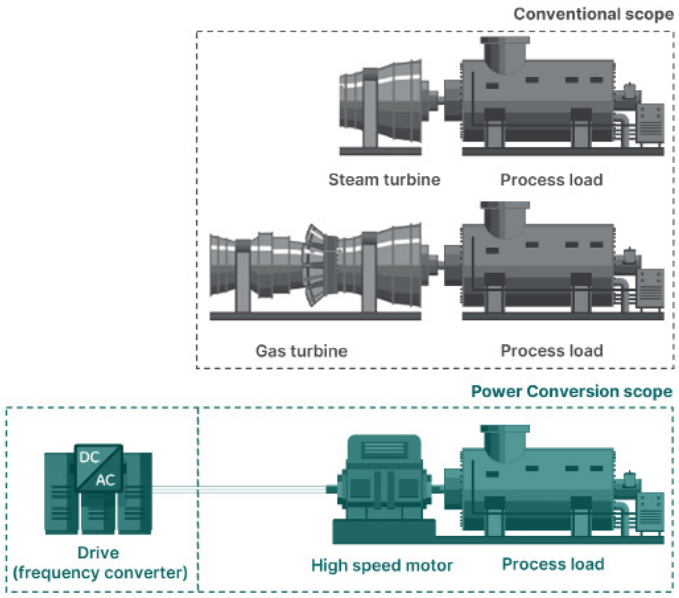
High speed induction motor

Features

- Variable frequency standalone motor directly coupled to a compressor without gearbox
- 2 pole, up to 18,000 rpm
- Water to air cooled motor or TEPV motor
- Magnetic or sleeve bearings
- Copper cage
- Certified Exp according to ATEX
- Shaftless rotor (patented)

Benefits

- No critical speed: reduced vibrations
- Laminated rotor reduces eddy currents
- IEC 60034 & IEC 60079 compliant
- Proven track records: 250+ high speed motors installed globally



Variable frequency drive (VSI)

Features

- 1 to 100 MW, up to 13.8 kV
- Standard drive with high performance control
- Power factor > 0.95

Benefits

- No torque pulsation on the shaft line
- No harmonics filter needed
- Reduced noise and vibrations on the motor, allowing extended life cycle and reduced maintenance

250+
High-speed motors installed worldwide

3.3+ GW
Cumulated power

SERVICES

Caring for your needs

With a global network of experts, we at Power Conversion & Storage are uniquely positioned to provide the knowledge, experience, and skills to meet all your industrial service requirements. Our aim is to help protect your assets, optimize productivity, and improve operation and maintenance (O&M) costs. Our comprehensive approach is designed to meet your equipment health needs.

We have, within our factory, a workshop dedicated to the Services activities as well as high-performance industrial resources that allow us to carry out expertise and validate our work as soon as possible – data analysis to optimize maintenance, expert onsite or remote support, emergency response, and more.

Meeting the needs of your O&M model life cycle, our team from Nancy provides customized services in a wide range of activities:

- Field interventions and commissioning
- Machine replacement
- Spare parts
- Repairs
- Performance improvement
- Consulting and Engineering
- Training
- Maintenance contracts
- TIMSA (Test and Inspection for Motor Status Assessment)

TEST CAPABILITIES AND CERTIFICATION

Mechanical, electrical and thermal design

DO YOU NEED...

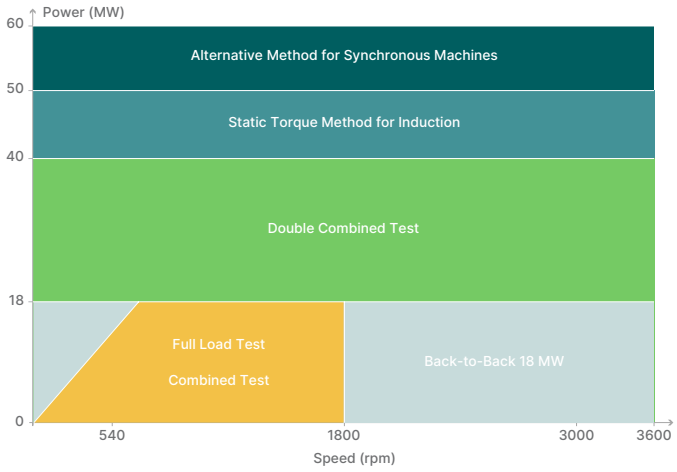
- To test your high power machine at full load?
- A full combined test with the entire system (transformer + drive + motor)?
- The tests as per IEC, IEEE, NEMA, API standards?

Our solution

The first and one of a kind 18 MW test line

- Full load capability up to 18 MW
- Frequency from 5 Hz 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



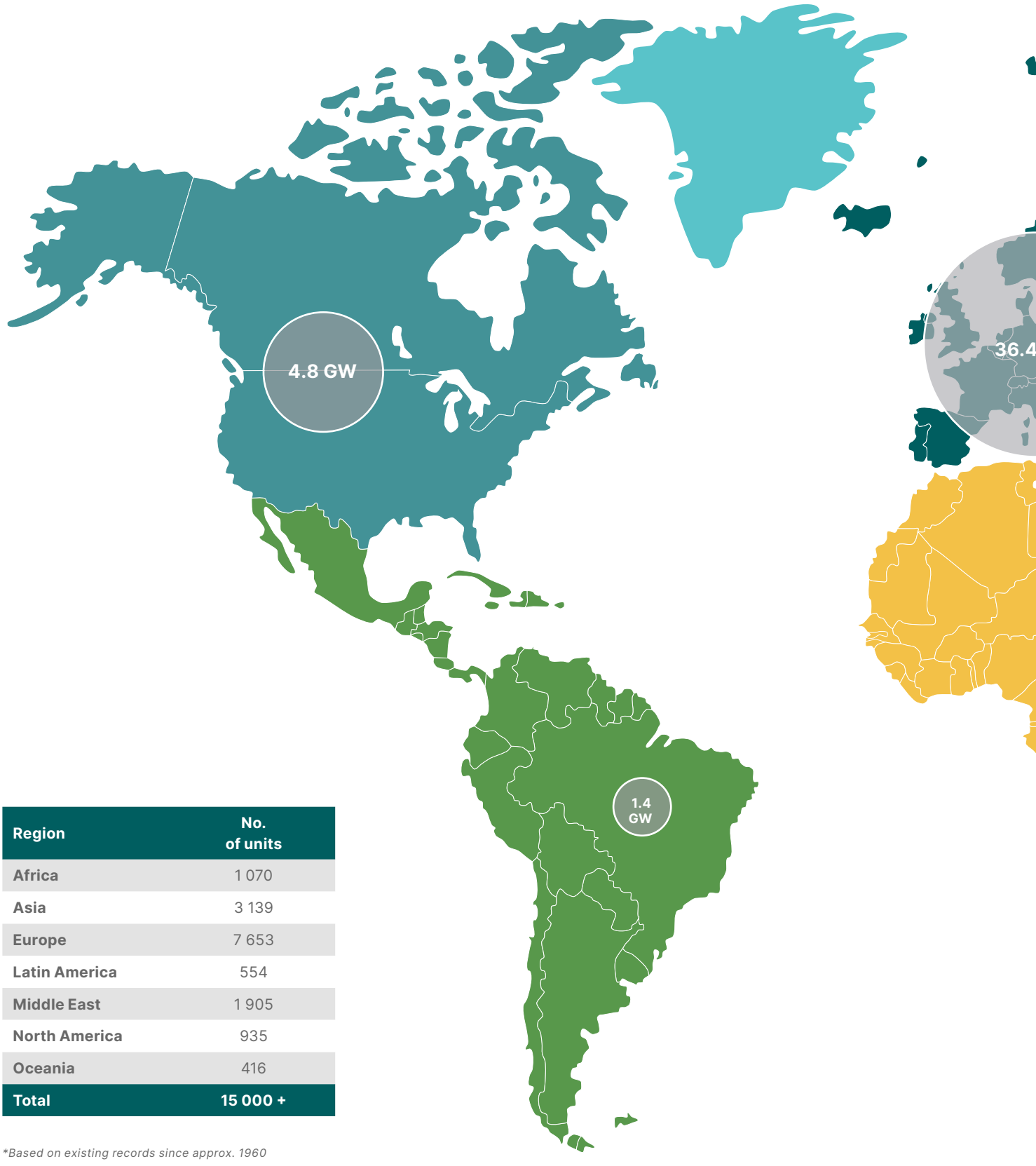
Certifications

We are able to provide certification according to the following standards:

- EN-IEC60079 Ex p,Exe
- IEC60034
- API541/546
- ATEX
- IECEx
- Marine class rules
- Ice class
- UL
- Country-specific certifications, like CSA-QPS for North America, CCCEx for China, KOSHA for Korea, INMETRO for Brazil, RETIE for Columbia

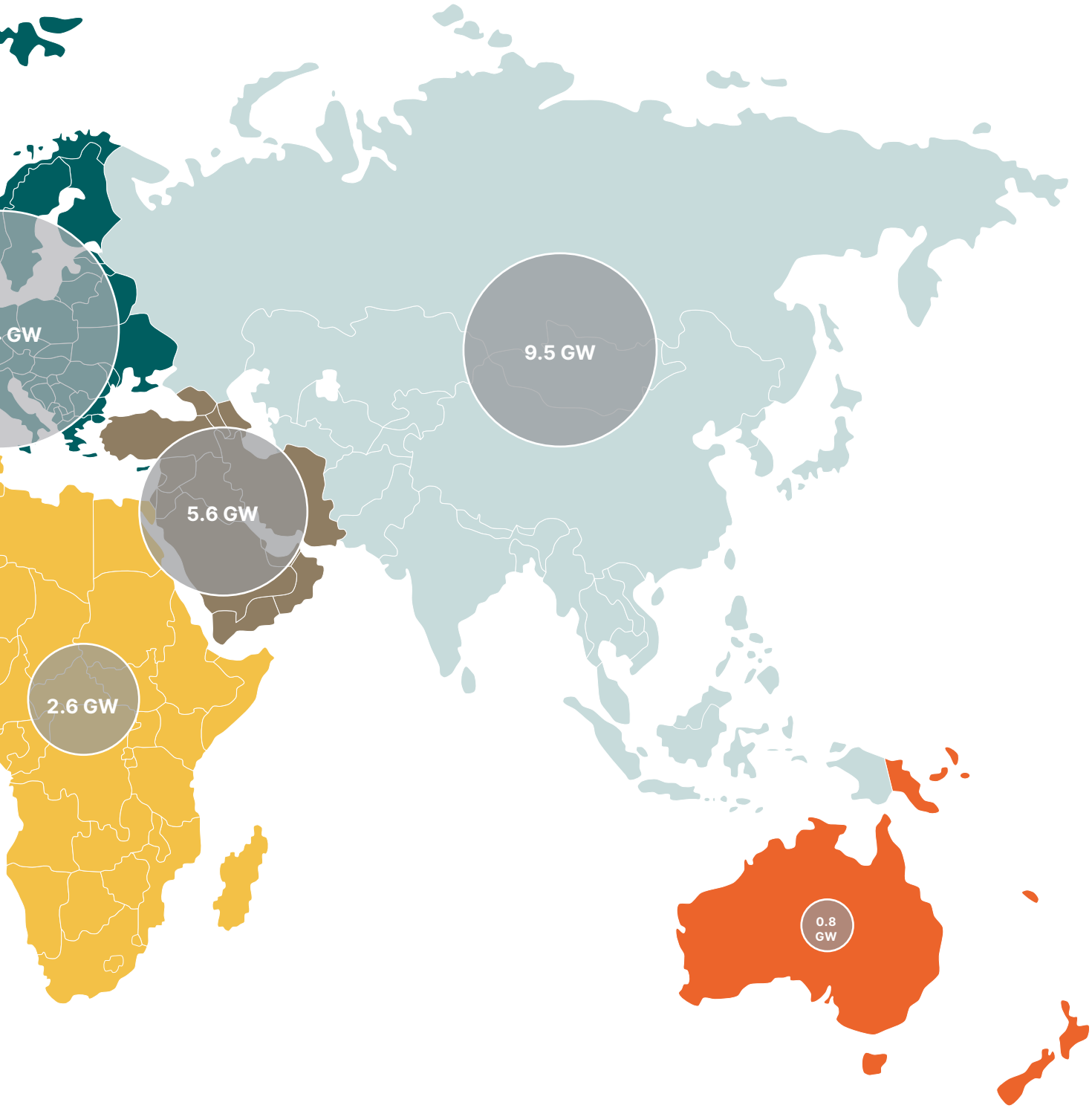
GLOBAL INSTALLED BASE

More than 60 GW power installed



Region	No. of units
Africa	1 070
Asia	3 139
Europe	7 653
Latin America	554
Middle East	1 905
North America	935
Oceania	416
Total	**15 000 +**

**Based on existing records since approx. 1960*


GW
9.5 GW
5.6 GW
2.6 GW
0.8
GW

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For more information, please visit
gevernova.com/power-conversion

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