



# Gas Turbine Replacement

Electric motors and drive systems for downstream process optimization

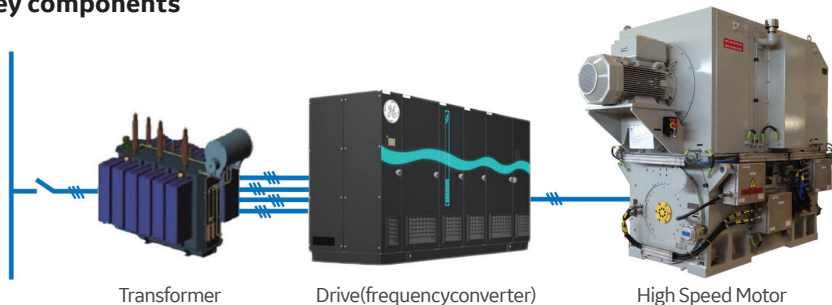
## REPLACING GAS TURBINES WITH ELECTRIC SYSTEMS CAN HELP SAVE COSTS AND IMPROVE PERFORMANCE

Oil & Gas companies are tightening their grip on costs, and evaluating new ways to improve efficiency. In the downstream segment of the oil and gas industry—refineries, petrochemical and fertilizer 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 gas turbines. Today electrification represents most likely the best solution—replacing old gas turbines with electric systems offers clear benefits like increased process efficiency and shutdown maintenance interval hence lowering operational costs and improving availability without compromising on reliability.

## ENHANCED EFFICIENCY AND INCREASED PLANT PERFORMANCE

GE's 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, GE solution offers a smaller footprint and preserves the plant layout in constrained environments, allowing a smooth plant integration.

### Key components



### VARIABLE FREQUENCY DRIVE (VSI)

MV7 range: reliable, scalable and modular

#### Features

- 1 to 100 MW, up to 13,8 kV
- Standard drive with high performance control
- Power factor >0.95 helps to eliminate reactive power injected to the grid

#### Benefits

- No torque pulsation on the shaft line
- No harmonics filter needed due to minimum harmonics level on the network
- Reduced noise and vibrations on the motor, allowing longer life cycle and reduced maintenance

### HIGH SPEED INDUCTION MOTOR

Efficient, compact, cost-effective

#### Features

- Variable frequency standalone motor directly coupled to a compressor without gearbox
- 2 poles, up to 18,000 rpm
- Water to air cooled motor or TEPV motor
- Several rotor diameters
- 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 record: almost 200 high speed motors installed globally

## ELECTRIFICATION CONSULTING

With current oil prices, and increasing costs, it is more critical than ever that industrial operators adopt innovative ways to reduce CAPEX and OPEX.

GE experts can help you make informed decisions that continue to deliver across the lifetime of your project.

- Support in the **economic evaluation**: high level estimations of value in technology selection
- **Site survey**: existing field data capture & hardware audit, to understand the technical and environmental constraints and determine the opportunities
- **Documentation analysis**: current operating profile review and analysis (existing compressor, consumption, operating costs, etc.)
- **Replacement studies**: configuration proposals
- **Estimations**: OPEX estimations and value demonstration (maintenance costs, efficiency savings, emissions, availability and reliability value, spares needed, etc.)
- **Business plan**: commercial offer (report out and implementation roadmap)

# TECHNOLOGY COMPARISON

	<b>GAS TURBINE</b>	<b>ELECTRIC VSDS</b>	<b>BENEFITS OF THE ELECTRIC SOLUTION</b>
<b>DRIVER EFFICIENCY</b>	25-35%	>95%	▶ <b>High efficiency</b>
SPEED RANGE	50-105%	0-105%	▶ <b>Full flexibility</b>
<b>DYNAMIC RESPONSE</b>	0-100% in 10 minutes Max Load Step 50%	Almost immediate	▶ <b>Full flexibility in terms of power demand</b>
STARTING TIME	> 15 minutes	< 1 minute	▶ <b>Minimum startup time requirement/Very high starting and operating reliability and availability</b>
<b>INRUSH CURRENT DURING START-UP</b>	Not applicable	Inrush current = nominal current	
ENVIRONMENTAL IMPACT	CO <sub>2</sub> /NOX emissions (exhaust)	Not applicable	▶ <b>Emission-free/Meets with environmental restrictions</b>
<b>NOISE LEVEL</b>	Usually >105 dB(A) Require noise enclosure	Usually between 85 and 90 dB(A)	▶ <b>Lower noise</b>
FOOTPRINT	Large (lube oil coolers, ventilation ducts, exhaust silencers, noise enclosure)	Small in hazardous area, medium in electrical room	▶ <b>Minimum space requirement</b>
<b>INSTALLATION &amp; COMMISSIONING</b>	Complex auxiliary pipework and electrical & instrumentation tie-in	Limited to electrical & instrumentation tie-in	▶ <b>Reduced pipework requirement</b>
REQUIRED MAINTENANCE	1-yearly periodic inspection (1 week shutdown) - Dry gas seal	1-yearly periodic inspection (few days without shutdown) + shutdown every 5-6 years	▶ <b>Minimum maintenance period over life cycle</b>
<b>MAINTENANCE COST</b>	Compulsory periodic maintenance and parts replacement	Minimal parts replacement required	▶ <b>Minimum maintenance cost</b>
POWER REQUIREMENTS	Low voltage (415 V)	High voltage (>3 kV)	▶ <b>Suitable for most areas, including with limited power availability</b>

## CONTACT US

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## OUR CENTERS OF EXCELLENCE FOR THE OIL & GAS INDUSTRY:

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