

Parameter	Variable Speed Diesel	Fixed Speed Diesel	Comments
Reliability and Asset Life			Converter based solutions reduce loading transient under aggressive step load application by optimising engine speed and torque for improved engine response.
Step Response			Converter based solutions offer a faster and larger step load response. They eliminate the crank angle and actuator response delay inherent of diesel based generation response. They control power flow by controlling the current from the inverter. Direct current control provides a faster response to a power command.
Frequency Control (P)			Converter solutions are available as static frequency converters in conventional applications. They adopt IGBT technology to offer robust and reliable frequency regulation. The system functions by converting the input AC power through a sine-wave rectifier to a DC link and then through an AC sine-wave inverter to produce a clean, full sine-wave output at the new frequency and voltage.
Voltage Control (Q)			Converter solutions are available as voltage conditioners or sag correction in conventional applications. A variable speed diesel approach integrates this capability into the diesel point of common coupling. Weather is the most common cause of external sags and momentary interruptions all around the world. Lightning strikes on power lines create line to ground faults causing voltage sags across a wide area. High winds can blow tree branches into power lines, connecting the line with the ground and shorting between phases. A series of sags will occur as the branches repeatedly touch the power lines. Many types of electronic equipment are sensitive to voltage sags, including motor starter contactors and control relays. Inverter based solutions provide fast, accurate voltage sag and surge correction as well as continuous voltage regulation and load voltage compensation.
Renewable Generation Smoothing (P&Q)			Converter based solutions increase network stability under high renewable penetrations given their ability to offer LVRT, HVRT, ZVRT.
Fault Current Contribution			Inverters, even with disabled protective functions, will feed a current in the range of 1.1 to 1.5 times their nominal currents which is significantly lower than the 4 to 10 times fault to nominal current ratio typically caused by rotating machines. For a worst case scenario, the contribution of an inverter will not exceed 1.5 p.u.
Capacity Firming			Converter solutions provide wide bandwidth performance with a flexible and highly modular power electronic configuration.
Spinning Reserve			Converter solutions can accurately emulate the response characteristics of conventional generators, offering synthetic inertia to emulate generator contribution. System frequency rate of change is used to model inertia, with the converter able to deliver or draw power to suit the requirement.
Reactive Support			Current imbalance, inrush generated sags and harmonics are common power quality problems within micro-grids. Converter based solutions offer reactive power conditioning instantly, while providing continuous reactive power correction. Inverter technology also offers a step-less response which minimizes system disturbances and ensures seamless power quality.
Low Voltage Ride Through			Configurable low, high and zero voltage ride through capabilities
Reverse Power Acceptance			Bi-directional power flows are permitted with ESS pairing possible
Over-Rated Operation			Converters can typically accepted 200% rated capacity from a 75% preload

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Black Start Capability			Converter solutions offer zero voltage ride through capability
Islanded Capability			Converters offer grid forming capability, able to run in either islanded or anti-islanded configurations
Load Balancing and Harmonic Cancellation			Combining harmonic filtering and displacement power factor correction with VAr injection gives a complete power factor solution, considering both displacement and distortion power factor. Converter solutions are offer improved responsiveness over passive filters.
Conversion Efficiency			Power converter introduces 1-2% conversion losses, however, these losses are offset via improved generator efficiency.
Maintenance			Low maintenance using reliable modular components. Mean time to repair is < 30 minutes.
Low Load Operation			Efficiency and permissible low load application are constrained under fixed speed application, owing to an inability of the engine to maintain thermal inertia.
Synchronising			Faster and more reliable grid synchronising under converter based approaches
Uninterrupted power supply			Converter based solutions don't have any continuous operation limit