



Guascor Energy Engines power generation units meet the most stringent grid connection requirements

General Overview:

The current stage of energy transition, fostered by the different decarbonization strategies being adopted to reduce global warming, has led to a major change in the existing electricity generation model. The centralized generation model based on large gas and coal-fired plants has given way to a decentralized generation system in which the use of renewable energies has become vitally important. However, the increasing contribution of (non-manageable/predictable) renewables to the mains distribution system, as well as the demand for greater grid flexibility and response speed, is a great challenge to the electricity distribution grid capacity in most industrialized countries.

With the aim of increasing the competitiveness and efficiency of power grids, while maintaining security of energy supply to end consumers, a set of fair and harmonized rules has been established to regulate grid access, cross-border electricity trade and the secure operation of national electricity systems.

In most industrialized countries, compliance with the applicable grid codes (grid code requirements) is the basic requirement for the reliable supply of electrical energy to the grid. Each generating unit connected to the grid must be able to react unconditionally to load fluctuations and transient events as well as to absorb frequency changes in the grid, complying with the grid code requirements for static and dynamic grid stabilization.

Guascor Energy commitment:

In its ongoing commitment to meeting the highest standards, Guascor Energy has developed solutions to meet the requirements set out in the grid codes for power generator sets.

In the case of Germany, these standards are precisely defined in the Medium Voltage Directive VDE-AR-N 4110 and the High Voltage Directive VDE-AR-N 4120.

Performance tests carried out on the gas generators with independent validation have confirmed the compliance of Guascor Energy gas power generation units with the directives of the German grid code.

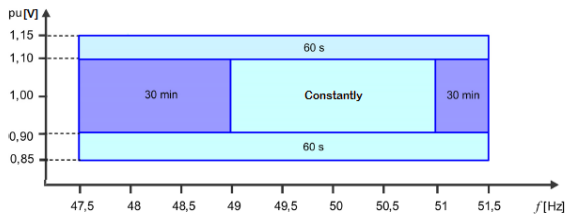
In fact, DNV-GL has issued a unit certificate confirming that all Guascor Energy S, H and E series gas engines meet the requirements of **VDE-AR-M 4110:2018-11**, further proof of Guascor Energy Engines' commitment to meeting the highest quality and safety standards and requirements, ensuring stability in the power grid.



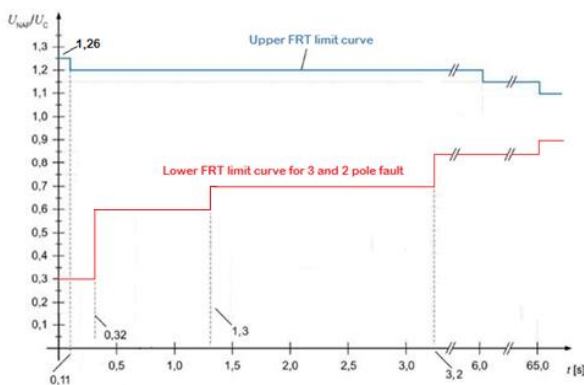
Guascor Energy power generation sets ensure:

Proper operation under following conditions:

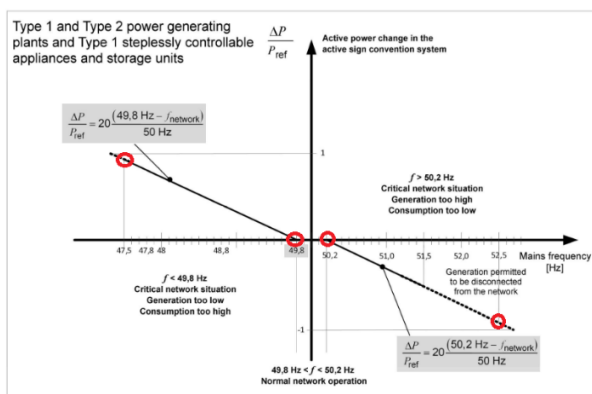
- Voltage range: $\pm 10\%$ nominal voltage
- Frequency range: $+1.5\%/-2.5\%$ line frequency



- Transient voltage dips: up to 30% for 320 ms



- Frequency stability through Frequency Sensitive Mode (FSM)
- Power adjustment for frequency changes: LFSM-O, LFSM-U



Key

P_{ref} corresponds to $P_{b,inst}$ or corresponds to P_{nom} , respectively, for Type 2 power generating plants (without storage unit(s)) at the moment where 50.2 Hz is exceeded

ΔP power change

f mains frequency

Figure 18 – Active power adjustment of Type 1 and Type 2 power generating plants and of Type 1 controllable appliances and storage units for overfrequency and underfrequency with a static of 5% and frequency limit values of 49,8 Hz and 50,2 Hz for the onset of active power adjustment

The main advantages for our customers:

- Certified according to medium voltage guidelines of:
 - German VDE AR-N-4110 y FGW TG8:2019-02
 - European Standard EN 50549-2
- Grid stability protection during mains fluctuations without grid disconnection of the genset in the transient time range of 0-250 ms.
- Verification of grid stability through the use of simulation models.
- Greater power plant reliability and availability during grid fluctuations.

The business:

Guascor Energy has more than 50 years of experience in the development and manufacture of internal combustion engines. We deliver worldwide efficient and environmentally friendly products and services in distributed power generation, combined heat and power (CHP), waste-to-energy applications.

Guascor Energy is no stranger to the energy revolution that is taking place at the global level and is also working hard on the development of new products and solutions that are tailored to the new needs that the energy generation market demands.

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