Requirements for Generators Art 13 (4) and (5): Recommendations

November 2017

General

- EUTurbines welcomes the update of the IGD on frequency stability related parameters, addressing, among others, the admissible active power reduction from maximum output with falling frequency (NC RfG Art 13 (4) and (5))

- RfG Art 13 does not make a distinction between dynamic and steady-state behaviour. It also does not clearly state how ambient conditions and technological constraints should be taken into account

- In that discussion, EUTurbines calls to carefully consider the technical and ambient limitations in the case of gas turbines

Power vs. frequency: RfG wording

Art 13:

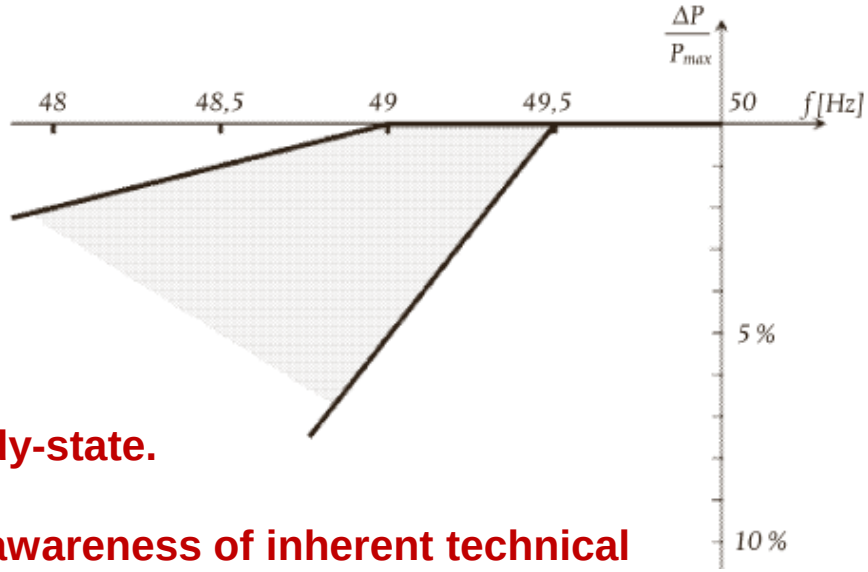
(4).The relevant TSO shall specify admissible active power reduction from maximum output with falling frequency in its control area as a rate of reduction falling within the boundaries, illustrated by the full lines in Figure 2:

…

(5).The admissible active power reduction from maximum output shall:

a) clearly specify the ambient conditions applicable;

b) take account of the technical capabilities of power-generating modules



No requirement to dynamic behaviour.

The requirement can be interpreted as steady-state.

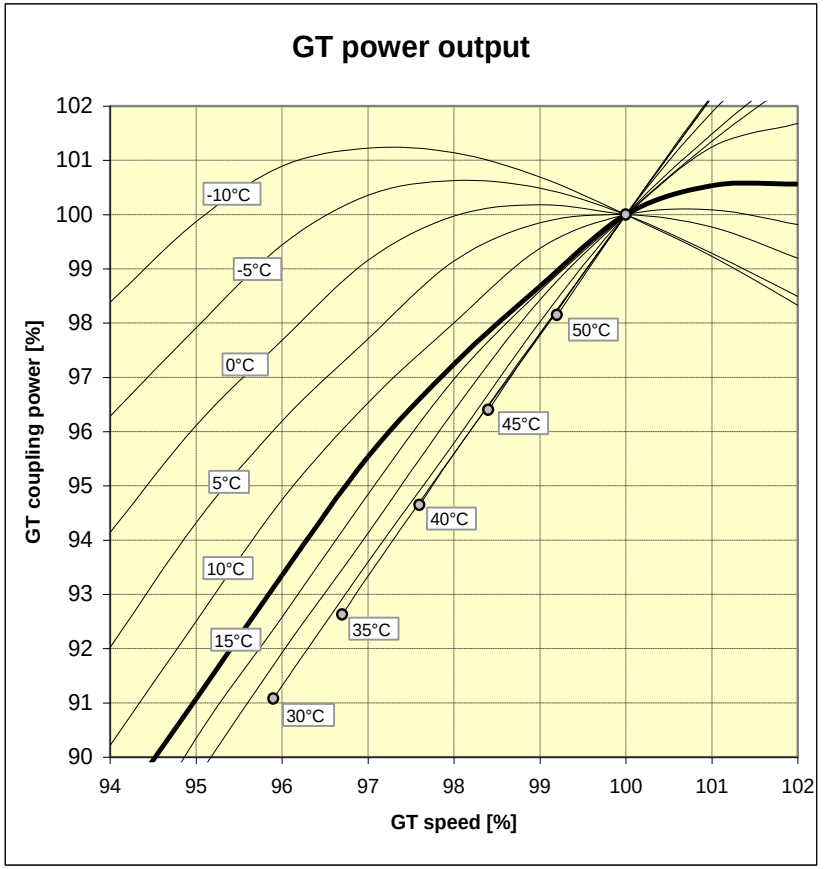
Art 13 (5) has been introduced to RfG after awareness of inherent technical constraints of some relevant technologies: equal to or prevailing Art 13 (4)!

Power vs. frequency

The facts:

- Gas turbines output is influenced by different external factors. Depending on ambient conditions, power drop exceeds allowed values in Art 13 figure 2.
- Principle steady-state behaviour is shown in att. figure (values are only indicative!)
- Dynamic behaviour is worse since compensating power control loops need time to react to frequency drop (if reserve is available)

Technical and ambient limitations to be considered in requirement !



EUTurbines‘ position: System stability aspects

At 2 Hz/s (system split with f <49 Hz): system defence plan (load shedding) prevails.

Important for SPGM: stay connected!

Dynamic capability only helpful for PFR design case (<0,1 Hz/s, nadir approx. 10 s), but not for system split

After frequency stabilisation (balanced load) requirement is irrelevant, additional disturbance is rather critical than helpful

Dynamic behaviour is relevant but any requirement needs to be carefully defined!

EUTurbines's position: SPGM technology aspects

Intrinsic behaviour of some SPGM technologies is pure physics and a matter of fact

Required dynamic capability is not achievable for any compensating load control actions (see also RfG FSM: start after 2 s!)

Consequence:

Either dynamic capability is intrinsically there or it just cannot be achieved

Proposed reference temperatures are without justification and far from reality

Compliance test will not be possible – to be based on calculations and simulations

System relevance of dynamic behaviour is understood but should be limited to intrinsic capability, data provided by the manufacturer

EUTurbines‘ position: Considerations

- EUTurbines acknowledges the need for reliable and known dynamic behaviour of SPGMs under system conditions with underfrequency excursions. The steady-state behaviour is less relevant since in this moment load balance is given.
- The intrinsic behaviour of some technologies cannot be changed; stringent dynamic requirements cannot be achieved
- The capability can only be ensured through calculations and simultations
- The temperature reference, hence, would be an arbitrary distinction between „intrinsic compliance“ and „no access to the system“ based on manufacturers‘ data: open field for unnecessary legal issues
- It must be avoided that proven and relevant technologies need to be derated (huge loss of efficiency and useless installed capacity) or need to conduct a CBA which has no additional benefit

EUTurbines‘ position: Recommendations (1)

Recommendations:

- Explain that short-term dynamic behaviour is more important than steady-state behaviour

- Accept that there are technological constraints, in particular on a short time (dynamic) basis. Either technologies can inherently sustain (furthermore in 0.5s) or they need more time to react and respond than the 2Hz/s event lasts. In the last case, it is pointless to specify any time requirement, as active compensation of power would anyway come too late

- Choose a „relaxed“ requirement within the range given by RfG

EUTurbines‘ position: Recommendations (2)

Recommendations:

- Consider Art 13 (5) (technology and ambient conditions) in a way that each technology or utility shall state the inherent power vs. frequency with ambient temperature as a variable parameter (within the typical T range of the Member State). EUTurbines suggests using a similar wording to already existing practices, such as in Germany:

  … Technologies, which are not capable of complying with the limit in Art 13(4) figure 2 under certain circumstances, shall document this limitation and the relevant underlying ambient conditions …

Only this approach allows:

- Compliance with the provisions of RfG
- Minimum complexity of requirement definition
- Viable compliance process