Annex to technical regulation 3.2.3 for thermal plants above 11 kW

Exemptions for plant category A2

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All sections	Consultation document submitted for public consultation (document not available in English).	1	21.04.2017
1, 2.1.1, 3.1, 3.2, 3.3	Added P_n, asynchronous generator added in text	2	30.04.2017

Contents

1. Terminology, abbreviations and definitions

1.1 Abbreviations

This section contains the abbreviations used in this document.

1.1.1 f_R

f_R denotes the frequency at which a *plant* is to begin downward regulation with the agreed *droop*.

1.1.2 $P_{current}$

$P_{current}$ denotes the current level of active power.

1.1.3 P_{min}

P_{min} denotes the lower limit for active power control.

1.1.4 P_n

P_n denotes the *rated power* of a *plant*.

1.1.5 POC

Point of Connection *Point of Connection* (*POC*).

1.2 Definitions

This section contains the definitions used in this document.

1.2.1 Plant

A unit which produces three-phase alternating current and where there is a direct functional correlation between the unit's main components.

In case of doubt, the *transmission system operator* decides whether a *plant* can be considered as consisting of one or more *plants* under the rules of this regulation.

1.2.2 Plant owner

The *plant owner* is the entity that legally owns the *plant*. In certain situations, the term company is used instead of *plant owner*. The *plant owner* may hand over operational responsibility to a *plant operator*.

1.2.3 Plant categories

Plant categories in relation to total *rated power* at the *POC*:

A1. *Plants* up to and including 11 kW
A2. *Plants* above 11 kW up to and including 50 kW
B. *Plants* above 50 kW up to and including 1.5 MW
C. *Plants* above 1.5 MW up to and including 25 MW
D. *Plants* above 25 MW or connected to over 100 kV

1.2.4 Power Factor (PF)

The *Power Factor*, cosine φ, for AC power systems indicates the ratio of active power P to apparent power S, where P = S*cosine φ. Similarly, the reactive power Q=S*sinus φ. The angle between current and voltage is denoted by φ.

1.2.5 Power Factor control

Power Factor control is the control of the reactive power proportionately to the active power generated.

1.2.6 Electricity supply enterprise

The *electricity supply enterprise* is the enterprise to whose grid a *plant* is electrically connected. Responsibilities in the *public electricity supply grid* are distributed across several grid companies and one transmission enterprise.

The grid company is the company licensed to operate the *public electricity supply grid* of **up to** 100 kV.

The transmission enterprise is the enterprise licensed to operate the *public electricity supply grid* **above** 100 kV.

1.2.7 Frequency response

Frequency response is the automatic upward or downward regulation of active power as a function of grid frequencies above or below a certain frequency f_R with a view to stabilising the grid frequency.

Note 1:
LFSM-O, Limited Frequency Sensitive Mode – Overfrequency.
The operational mode in which a *plant* reduces active power if the system frequency exceeds a set value.

LFSM-U, Limited Frequency Sensitive Mode – Underfrequency.
The operational mode in which a *plant* increases active power if the system power drops below a set value.

1.2.8 Public electricity supply grid

Transmission and distribution grids that serve to transmit electricity for an indefinite group of electricity suppliers and consumers on terms laid down by public authorities.

The distribution grid is defined as the *public electricity supply grid* with a **maximum** *rated voltage* of 100 kV.

The transmission grid is defined as the *public electricity supply grid* with a *rated voltage* **above** 100 kV.

1.2.9 Q control

Q control is the control of reactive power independent of active power generated.

1.2.10 Droop

Droop is the trajectory of a curve which a control function must follow.

1.2.11 Transmission system operator (TSO)

Enterprise entrusted with the overall responsibility for maintaining security of supply and ensuring the effective utilisation of an *interconnected electricity supply system*.

2. Objective, scope and regulatory provisions

2.1 Objective

The objective of this annex to technical regulation 3.2.3 is to specify exemptions for A2 *plants* that use asynchronous generators and are connected to the *public electricity supply grid*.

2.1.1 New plants

The exemptions apply to all *plants* with asynchronous generators with a *rated power* above 11 kW up to and including 50 kW connected to the *public electricity supply grid* and commissioned as of the effective date of this annex.

2.2 Statutory authority

The annex is issued pursuant to Section 7(1)(i), (iii) and (iv) of Danish Executive Order no. 891 of 17 August 2011 (Executive Order on transmission system operation and the use of the electricity transmission grid, etc. (*Systemansvarsbekendtgørelsen*)). Under Section 7(1) of the Executive Order on transmission system operation and the use of the electricity transmission grid, etc., this annex has been prepared following discussions with market participants and been subject to public consultation before being registered with the Danish Energy Regulatory Authority.

This annex is effective within the framework of the Danish Electricity Supply Act (Elforsyningsloven), see Consolidated Act no. 1329 of 25 November 2013 as amended.

2.3 Effective date

This annex is effective as of **1 May 2017**:

Please direct requests for additional information and questions relating to this annex to Energinet.dk.

Contact information is available at www.energinet.dk.

The annex was registered with the Danish Energy Regulatory Authority pursuant to the provisions of section 26 of the Danish Electricity Supply Act and Section 7 of the Danish Executive Order on transmission system operation and the use of the electricity transmission grid, etc.

As regards *plants*, the construction of which was finally ordered in a binding written order before this annex was registered with the Danish Energy Regulatory Authority, but which are scheduled to be commissioned after this annex comes into force, an exemption can be applied for in accordance with section 2.9 of technical regulation 3.2.3 for thermal plants above 11 kW, and any relevant documentation should be enclosed.

2.4 Complaints

Complaints about this annex may be lodged with the Danish Energy Regulatory Authority, www.energitilsynet.dk.

Complaints about the *transmission system operator's* enforcement of the provisions of this annex may also be lodged with the Danish Energy Regulatory Authority.

Complaints about how the individual *electricity supply enterprise* enforces the provisions of this annex may be lodged with the *transmission system operator*.

2.5 Normative reference

1. **Technical regulation TR 3.2.3:** "Technical regulation TR 3.2.3 for thermal plants above 11 kW", dated 10. January 2017, document no. 14/26077-68.

3. Exemptions from technical requirements in POC

The following exemptions apply to A2 *plants* with asynchronous generators.

References used in this section refer to TR 3.2.3 for thermal plants above 11 kW.

3.1 Frequency response in the event of overfrequency, cf. section 5.1.1

A2 *plants* with asynchronous generators can implement frequency response in the event of overfrequency with an approximate droop consisting of minimum four set points, with the first set point and related first reduction of active power at the frequency 50.2 Hz, F_R, and the plant's current active power level, $P_{current}$.

The following three set points are distributed equally between F_R and 52 Hz, reducing current active power by max. 25 % of P_n in three downward steps to any minimum level of active power, P_{min}. If the grid frequency exceeds 52 Hz, the plant must disconnect.

This means that the response can be realised using minimum four steps instead of a variably adjustable droop.

Power levels for the four set points must be met with a ± 10 % accuracy.

When the grid frequency increases and is either identical to or greater than F_R, $P_{current}$ must;

- be maintained, in the event that the frequency does not exceed FR, or
- be regulated downwards in the event of an increase in the grid frequency until the grid frequency has stabilised and is below F_R.

Following an incident in the *public electricity supply grid*, which has resulted in a downward regulation of the *plant's* active power, the *plant* cannot regulate upwards again until voltage is within the normal operating voltage range and frequency is in the 47.00-50.20 Hz range.

Compliance with this exemption can be documented with relevant functional specifications supplemented with accurate and *plant*-specific test documentation. The test can be done by the manufacturer and is not required to be performed or validated by a third party.

3.2 Q control, see section 5.2.1

A2 *plants* with asynchronous generators are not required to have a *Q control* function.

This exemption requires that the *plant owner* makes an agreement with the relevant grid company concerning the lack of a *Q control* function.

This is a time-limited exemption, valid up to and including 4 May 2019. Thus, the *Q control* function requirement will apply to A2 *plants* with asynchronous generators connected to the grid under TR 3.2.3 after 4 May 2019.

3.3 Power Factor control, see section 5.2.2

A2 *plants* with asynchronous generators are not required to have a *Power Factor control* function.

This exemption requires that the *plant owner* makes an agreement with the relevant grid company concerning the lack of a *Power Factor control* function.

This is a time-limited exemption, valid up to and including 4 May 2019. Thus, the *Q control* function requirement will apply to A2 *plants* with asynchronous generators connected to the grid under TR 3.2.3 after 4 May 2019.