



Annex to technical regulation 3.2.1 for power plants up to and including 11 kW

Exemptions for plant category A1

This is a translation of the original Danish regulation text. In case of any discrepancies, the Danish version shall prevail.

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Revision view

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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 as well as A1 in relevant text.	2	30.04.2017
2, 3	Added new effective date and information on the annex that this text replaces. Added exemptions for absolute power limit, ramp rate limit, automatic power factor control, droop at automatic connection and increased power factor requirements.	3	24.05.2017

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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 *plant* is one or more *electricity-generating units*. The *plant* is connected to the *public electricity supply grid* via one *Point of Connection*.

1.2.2 Plant owner

The *plant owner* is the legal owner of a *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 the total *rated power* at the *Point of Connection*:

- 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 voltage systems indicates the ratio of active power P to apparent power S , where $P = S \cdot \cos \varphi$. Likewise, reactive power $Q = S \cdot \sin \varphi$. 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 undertaking

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

The *grid company* is the company licensed to operate the *public electricity supply grid* **up to and including** 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 downward regulation of active power as a function of grid frequencies above a certain frequency f_R with a view to stabilising the grid frequency.

1.2.8 Public electricity supply grid

Public electricity supply grids are 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 the *public electricity supply grid*.

2. Objective, scope and regulatory provisions

2.1 Objective

The objective of this annex to technical regulation 3.2.1 is to specify exemptions for A1 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* up to and including 11 kW that are 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 **7 June 2017 and replaces:**

- Annex to technical regulation 3.2.1 for power plants up to and including 11 kW revision 2

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

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 3.2.1 for power plants up to and including 11 kW, and any relevant documentation should be enclosed.

2.4 Complaints

Complaints in respect of 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 undertaking* enforces the provisions of this annex may be lodged with the *transmission system operator*.

2.5 Normative reference

1. Technical regulation 3.2.1: "Technical regulation 3.2.1 for power plants up to and including 11 kW", dated 29 June 2016, document no. 15/01353-1.

3. Exemptions from technical requirement in POC

The following exemptions apply to A1 plants with asynchronous generators.

References used in this section refer to technical regulation 3.2.1 for power plants up to and including 11 kW.

3.1 Normal operating conditions, see section 3.2

A1 plants with asynchronous generators are not required to have an upward active power regulation function at a maximum specified droop of 10% P_n /min. in connection with automatic connection.

This is a time-limited exemption, valid up to and including 4 May 2019. Thus, the requirement for an upward active power regulation function at a maximum specified droop of 10% P_n /min. in connection with automatic connection will apply to A1 plants with asynchronous generators connected to the grid under technical regulation 3.2.1 after 4 May 2019.

3.2 Frequency response in the event of overfrequency, cf. section 5.2.1

A1 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, so that the current active power is reduced 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 F_R , or
- be regulated downwards in the event of an increase in the grid frequency until the grid frequency has been stabilised and is below F_R .

Following an incident in the *public electricity supply grid*, resulting in a downward regulation of active power from a plant, the plant must not regulate upwards again earlier than specified in section 3.2.

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.

3.3 Absolute power limit, see section 5.2.2.1

A1 plants with asynchronous generators are not required to have an absolute power limit function, if stall control of the asynchronous generator is used and the stall control is activated at P_n with a $\pm 5\%$ tolerance.

3.4 Ramp rate limit, see section 5.2.2.2

A1 plants with asynchronous generators are not required to have a ramp rate limit function.

This is a time-limited exemption, valid up to and including 4 May 2019. Thus, the ramp rate limit function requirement will apply to A1 plants with asynchronous generators connected to the grid under technical regulation 3.2.1 after 4 May 2019.

3.5 Q control, see section 5.3.1

A1 plants with asynchronous generators are not required to have a Q control function. This exemption requires that the plant owner makes an agreement with or obtains the approval of 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 A1 plants with asynchronous generators connected to the grid under technical regulation 3.2.1 after 4 May 2019.

3.6 Power Factor control, see section 5.3.2

A1 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 or obtains the approval of 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 Power Factor control function requirement will apply to A1 plants with asynchronous generators connected to the grid under technical regulation 3.2.1 after 4 May 2019.

3.7 Automatic Power Factor control, see section 5.3.3

A1 plants with asynchronous generators are not required to have an automatic Power Factor control function. This exemption requires that the plant owner makes an agreement with or obtains the approval of the relevant grid company concerning the lack of an automatic Power Factor control function.

This is a time-limited exemption, valid up to and including 4 May 2019. Thus, the automatic Power Factor control function requirement will apply to A1 plants with asynchronous generators connected to the grid under technical regulation 3.2.1 after 4 May 2019.

3.8 Category A1 plants, see section 5.6.1

A1 plants with asynchronous generators exempted from requirements for Q control, Power Factor control and automatic Power Factor control functions must operate in a 0.95-1.00 Power Factor interval at an active power production above 20% of rated power.

This is a time-limited exemption, valid up to and including 4 May 2019. Thus, the requirement in section 5.6.1 will apply to A1 plants with asynchronous generators connected to the grid under technical regulation 3.2.1 after 4 May 2019.