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Appendix 1 Documentation

Energy storage facility category a

Technical regulation 3.3.1 for electrical energy storage facilities

EFFECTIVE FROM 18 December 2019

Please note: This is a translation. In case of inconsistencies, the Danish version applies.

# Appendix 1 Documentation

Appendix 1 specifies the documentation requirements for the five facility categories, see section 1.1.4 in the regulation:

A. Energy storage facilities up to 125 kW

B. Energy storage facilities from and including 125 kW up to 3 MW

C. Energy storage facilities from and including 3 MW up to 25 MW

D. Energy storage facilities from and including 25 MW or connected at voltages above 100 kV

SX. Category A or B energy storage facilities

T. Temporarily connected energy storage facilities

Documentation, see specifications in section 9 of the regulation, must be sent electronically to the electricity supply undertaking.

The technical documentation must include configuration parameters and configuration data applicable to the energy storage facility at the time of commissioning.

All appendix subsections must be filled in for the facility in question.

If information changes after the time of commissioning, updated documentation must be submitted as required in section 2.2.

Templates for Appendix 1 for the various facility categories are available on Energinet's website [www.energinet.dk](http://www.energinet.dk). It is thus possible to print only the appendix to be filled in.

Documentation – category A

* 1. Documentation for category A energy storage facilities

Documentation must be filled in with data for the energy storage facility and sent to the electricity supply undertaking.

* + 1. Identification

|  |  |
| --- | --- |
| Facility | Description of the facility |
| GSRN no. |  |
| Facility owner name and address |  |
| Facility owner telephone no. |  |
| Facility owner e-mail |  |
| Inverter – manufacture |  |
| Inverter – model |  |
| Inverter – rated power |  |
| Storage medium – manufacture |  |
| Storage medium – model no. |  |
| Storage medium –  usable energy storage capacity [kWh] |  |

* + 1. Positive list

Only applies to facilities up to 50 kW.

|  |  |
| --- | --- |
| Is the energy storage facility on the positive list?  If No, B1.2. must also be filled in. | Yes  No |

* + 1. Active power control

|  |  |
| --- | --- |
| Is the frequency response function for overfrequency activated?  If Yes, with which settings?  Frequency threshold (fRO):  Droop:  Time for island operation detection (minimum response time): | Yes  No  \_\_\_\_\_\_\_\_ Hz  \_\_\_\_\_\_\_\_ %  \_\_\_\_\_\_\_\_ ms |

* + 1. Reactive power control
       1. Power factor control

|  |  |
| --- | --- |
| Is the power factor control function activated?  If Yes, with which set point?  (Value differing from cosφ 1.0 must be agreed with the electricity supply undertaking.) | Yes  No  \_\_\_\_\_\_\_\_ cosφ  Inductive  Capacitive |

* + - 1. Automatic power factor control

|  |  |
| --- | --- |
| Is the automatic power factor control function activated?  (Not to be activated without agreement with the electricity supply undertaking.)  If Yes, with which set points?  Point 1 – P/Pn  Point 1 – Power factor (inductive)  Point 2 – P/Pn  Point 2 – Power factor (inductive)  Point 3 – P/Pn  Point 3 – Power factor (inductive) | Yes  No  \_\_\_\_\_\_\_\_ %  \_\_\_\_\_\_ cosφ  \_\_\_\_\_\_\_\_ %  \_\_\_\_\_\_ cosφ  \_\_\_\_\_\_\_\_ %  \_\_\_\_\_\_ cosφ |

* + - 1. Q control

|  |  |
| --- | --- |
| Is the Q control function activated?  If Yes, with which set point?  (Value differing from 0 kVAr must be agreed with the electricity supply undertaking.) | Yes  No  \_\_\_\_\_\_\_\_ kVAr |

* + 1. Protection
       1. Relay settings

Please state current values at the time of commissioning in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Protective function** | **Symbol** | **Setting** | | **Trip time** | |
| Overvoltage (step 2) | U>> |  | V |  | ms |
| Overvoltage (step 1) | U> |  | V |  | s |
| Undervoltage (step 1) | U< |  | V |  | s |
| Undervoltage (step 2)\* | U<< |  | V |  | ms |
| Overfrequency | f> |  | Hz |  | ms |
| Underfrequency | f< |  | Hz |  | ms |
| Change of frequency\* | df/dt |  | Hz/s |  | ms |

\* At least one of the functions must be activated.

* + 1. Signature

|  |  |
| --- | --- |
| Date of commissioning |  |
| Installation contractor |  |
| Person responsible for  commissioning |  |
| Signature  (person responsible for commissioning) |  |
| Facility owner |  |
| Signature (facility owner) |  |

* 1. Documentation for category A energy storage facilities

Documentation must be filled in with data for the energy storage facility to be included on the positive list, or if the facility is not on the positive list.

* + 1. Identification

|  |  |
| --- | --- |
| Facility | Description of the facility |
| Facility owner name and address |  |
| Facility owner telephone no. |  |
| Facility owner e-mail |  |
| Inverter – manufacture |  |
| Inverter – model |  |
| Inverter – rated power |  |
| Storage medium – manufacture |  |
| Storage medium – model no. |  |
| Storage medium –  usable energy storage capacity [kWh] |  |

* + 1. Normal operation

|  |  |
| --- | --- |
| Can the facility be started and operate continuously within the normal operation range, restricted only by protective settings, c.f. requirements in section 7?  Where to find documentation that this requirement has been met? | Yes  No |

* + 1. Tolerance of frequency deviations

|  |  |
| --- | --- |
| Will the energy storage facility remain connected to the public electricity supply grid during frequency deviations as specified in section 4?  Where to find documentation that this requirement has been met? | Yes  No |
| Will the facility remain connected in the event of frequency changes of 2.0 Hz/s in the POC?  If Yes, reference to documentation: | Yes  No |

* + 1. Start-up and automatic reclosing of an energy storage facility

|  |  |
| --- | --- |
| Does start-up and automatic reclosing occur after three minutes following voltage and frequency coming within the areas specified in section 4.3.1?  Where to find documentation that this requirement has been met? | Yes  No |

* + 1. Power quality

Please state how each power quality parameter result was achieved.

* + - 1. Rapid voltage changes

|  |  |
| --- | --- |
| Does the energy storage facility comply with the rapid voltage changes threshold specified in section 5.1.1.3?  Where to find documentation that this requirement has been met? | Yes  No |

* + - 1. DC content

|  |  |
| --- | --- |
| Does DC content at normal operation exceed 0.5% of rated current?  Where to find documentation that this requirement has been met? | Yes  No |

* + - 1. Current imbalance

|  |  |
| --- | --- |
| Does the current imbalance at normal operation exceed 16 A?  Where to find documentation that this requirement has been met? | Yes  No |
| If the facility is made up of single-phase energy storage units, have measures been taken to ensure that the above threshold is not exceeded?  Where to find documentation that this requirement has been met? | Yes  No |

* + - 1. Flicker

|  |  |
| --- | --- |
| Is the flicker contribution for the entire facility below the threshold specified in section 5.1.1.4?  Where to find documentation that this requirement has been met? | Yes  No |

* + - 1. Harmonics

|  |  |
| --- | --- |
| Are all harmonics for the entire facility below the thresholds specified in section 5.1.1.5?  Where to find documentation that this requirement has been met? | Yes  No |

* + - 1. Interharmonics

This part must only be filled in for energy storage facilities larger than 50 kW.

|  |  |
| --- | --- |
| Are all interharmonics for the entire energy storage facility below the thresholds specified in section 5.1.1.6?  Where to find documentation that this requirement has been met? | Yes  No |

* + - 1. Disturbances in the 2-9 kHz range

This part must only be filled in for energy storage facilities larger than 50 kW.

|  |  |
| --- | --- |
| Is the emission of disturbances with frequencies in the 2-9 kHz range lower than 0.2% of rated current In as required in section 5.1.1.7?  Where to find documentation that this requirement has been met? | Yes  No |

* + 1. Control functions
       1. Active power control
          1. Frequency response at overfrequency

|  |  |
| --- | --- |
| Is the energy storage facility equipped with a frequency response function in case of overfrequency? | Yes  No |

* + - * 1. Absolute power constraint

|  |  |
| --- | --- |
| Is the energy storage facility equipped with an absolute power constraint function? | Yes  No |

* + - * 1. Ramp rate constraint function

|  |  |
| --- | --- |
| Is the energy storage facility equipped with a ramp rate constraint function? | Yes  No |

* + - 1. Reactive power control
         1. Work area

|  |  |
| --- | --- |
| Can the energy storage facility supply reactive power at Pn and varying operating voltages, as specified in section 6.3?  Where to find documentation that this requirement has been met? | Yes  No |
| Can the energy storage facility supply reactive power at varying active power as specified in section 6.3?  Where to find documentation that this requirement has been met? | Yes  No |

* + - * 1. Power factor control

|  |  |
| --- | --- |
| Is the energy storage facility equipped with a power factor control function  as specified in sections 6.3.2 and 6.3.2.1? | Yes  No |

* + - * 1. Automatic power factor control

|  |  |
| --- | --- |
| Is the energy storage facility equipped with automatic power factor control  as specified in sections 6.3.4 and 6.3.4.1? | Yes  No |

* + - * 1. Q control

|  |  |
| --- | --- |
| Is the energy storage facility equipped with a Q control function  as specified in sections 6.3.1 and 6.3.1.1? | Yes  No |

* + 1. Protection against electricity system faults
       1. Relay settings

The table below lists default values for relay settings. If default values deviate from the values specified in section 7.2.1, documentation must be provided to ensure that relay settings can be set to the correct values upon commissioning.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Protective function** | **Symbol** | **Setting** | | **Trip time** | |
| Overvoltage (step 2) | U>> |  | V |  | ms |
| Overvoltage (step 1) | U> |  | V |  | s |
| Undervoltage (step 1) | U< |  | V |  | s |
| Undervoltage (step 2) | U<< |  | V |  | ms |
| Overfrequency | f> |  | Hz |  | ms |
| Underfrequency | f< |  | Hz |  | ms |
| Frequency change | df/dt |  | Hz/s |  | ms |

* + 1. Signature

|  |  |
| --- | --- |
| Date |  |
| Company |  |
| Person responsible for  commissioning |  |
| Signature  (person responsible for commissioning) |  |
| Facility owner |  |
| Signature (facility owner) |  |