1. Blank forms, questionnaires for new systems

This annex is split into:

* C.1 (Part A): The operator questionnaire and
* C.2 (Part B): The grid operator questionnaire.
	1. Part A: Operator questionnaire for the system certificate

See BDEW MV guideline, Annex F.1.

See TCC High-Voltage, Annexes E.1, E.4 and E.6.

Part A and the extract from the test report 'Power quality' in accordance with TG 3 must be handed over to the grid operator as requested by Part B.

The table below should also be filled out.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Manufacturer** | **Type name** | **Rated power****in kW** |  | **Commissioning date for existing systems at the GCP** | **Planned** **commissioning date** | **Project ID / serial number** | **List of the constituent PGUs in the PGS** (all the PGUs in the PGS of the applicant; existing system PGUs are to be marked with a (\*)). | **Data questionnaire for WT operators**TO BE COMPLETED AFTER THE FIRST TABLE, PART A |
| Example | XYZ | ABCxxxxx | 2000 |  | 1XXXX1\* | 20/09/2013 | xxxxx1 |
| **1** |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |
| **5** |  |  |  |  |  |  |  |
| **6** |  |  |  |  |  |  |  |
| **7** |  |  |  |  |  |  |  |
| **8** |  |  |  |  |  |  |  |
| **9** |  |  |  |  |  |  |  |
| **10** |  |  |  |  |  |  |  |
| **11** |  |  |  |  |  |  |  |
| **12** |  |  |  |  |  |  |  |  |  |
| **13** |  |  |  |  |  |  |  |
| **14** |  |  |  |  |  |  |  |
| **15** |  |  |  |  |  |  |  |

* 1. Part B: Grid operator questionnaire

**TCC High-Voltage, Annex E.7, can also be applied for high-voltage connections**

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** Connection/modification of a power generating system | **TG 8, Annex C, Part B****1 (9)** |
| **Name of** **power generating system**  |  |
| **Agreed connected active power PAV and apparent power SAV** |  |
| **Grid operator including contact person and contact details** |  |
| **Registration number of grid operator** |  |
| **Name of substation** |  |
| **Name of grid connection point** |  |
| Project data:See checklist TG 8, Annex C, Part A (F1)[ ]  **Document attached**[ ]  **Document not attached** |
| **Other remarks** |

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****2 (9)** |
| **1. The setting values of the protective devices at the grid connection point**Basis: BDEW MV guideline, and TCC High-Voltage |
| **1.1 Short-circuit protective devices**(mark with a cross where applicable) |
| [ ]  **Distance protection; type:** |
| Setting parameter | Prescribed setting values | [ ]  separatesettings sheetattachedRemarks: |
| Old (actual) | New (setpoint) |
| Overcurrent excitation I >> [A] |  |  |
| Undervoltage excitation | I > [A] |  |  |
| U < [V] |  |  |
| Zero phase sequence system excitation | IE > [A] |  |  |
| UNE> [V] |  |  |
| [ ]  **Time overcurrent protection; type:** |
| Setting parameter | Prescribed setting values | [ ]  separatesettings sheetattachedRemarks: |
| Old (actual) | New (setpoint) |
| I >> [A] |  |  |
| tI>> [ms] |  |  |
| I > [A] |  |  |
| tI> [ms] |  |  |
| [ ]  **Earth fault protection; type:** |
| Setting parameter | Prescribed setting values | [ ]  integrated in distance protection or time overcurrent protection[ ]  separate settings sheet attachedRemarks: |
| Old (actual) | New (setpoint) |
| IE >> [A] |  |  |
| tIE>> [ms] |  |  |
| IE > [A] |  |  |
| tIE> [ms] |  |  |
| UE > [V] |  |  |
| tUE> [ms] |  |  |

Note: For all physical variables, PRIMARY VALUES are to be given. (e. g. I>> 360 A instead of I>> 1.2 In; U< 16 kV instead of U< 0.8 Un).

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****3 (9)** |
| **1.2 PGS grid protection**  |
| [ ]  **Connection to the EHV/HV grid**[ ]  **to be taken from TCC ………………….of …………………** |
| Function | Setting parameter | Recommendation from TCC High-Voltage | Grid operator setting specifications |  |
| *High voltage side* |
| Overvoltage protection | U> [kV] | 1.25 Un  |  | Un=rated voltage of the HV grid |
| tU> [ms] | 500 ms  |  |
| Undervoltage protection | U< [kV] | 0.8 Un |  |
| tU< [s] | 5.0 s |  |
| Overfrequency protection | f> [Hz] | 51.5 Hz |  |
| tf> [ms] | ≤ 100 ms |  |
| Underfrequency protection | f< [Hz] | 47.5 Hz |  |
| tf< [ms] | ≤ 100 ms |  |
| *Low voltage side* |
| Overvoltage protection | U>> [kV] | 1.20 UMV  |  | UMV=Controller setpoint voltage [[1]](#footnote-2) |
| tU>> [ms] | 300 ms  |  |
| U> [kV] | 1.1 UMV  |  |
| tU> [s] | 180s  |  |
| **Other remarks** |

Note: For all physical variables, PRIMARY VALUES are to be given (e. g. I>> 360 A instead of I>> 1.2 In; U< 16 kV instead of U< 0.8 Un).

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****4 (9)** |
| [ ]  **Connection to the MV grid**[ ]  **to be taken from TCC ………………….of …………………** |
| **Function** | **Setting parameter** | **Setting values in accordance with BDEW MV guideline** | **Grid operator setting specifications** |  |
| Overvoltage protection | U>> [kV] | 1.15 Uc |  | Uc= agreed supply voltage |
| tU>> [ms] | ≤ 100 ms |  |
| U> [kV] | 1.08 Uc |  |
| tU> [s] | 1 min |  |
| Undervoltage protection | U< [kV] | 0.8 Uc |  |
| tU< [s] | 2.7 s |  |
| U<< [kV] |   |  |
| tU<< [s] |   |  |
| Overfrequency protection | f> [Hz] | 51.5 Hz |  |
| tf> [ms] | ≤ 100 ms |  |
| Underfrequency protection | f< [Hz] | 47.5 Hz |  |
| tf< [ms] | ≤ 100 ms |  |
| **Other remarks** |

Note: For all physical variables, PRIMARY VALUES are to be given (e. g. I>> 360 A instead of I>> 1.2 In; U< 16 kV instead of U< 0.8 Un).

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****5 (9)** |
| **1.3 System protection** |
| [ ]  **Connection to the EHV/HV grid**[ ]  **to be taken from TCC ………………….of …………………** |
| Function | Setting parameter | Recommendation from VDE TCC High-Voltage | Grid operator setting specifications[[2]](#footnote-3) |  |
| Reactive power direction undervoltage protection[[3]](#footnote-4) | UQ🡪&U< [kV] | 0.85 Un |  | Un=rated voltage of the HV gridExcitation voltage  |
| ULL > FG  | 0.95 Un  |  | Reconnection enabling voltage  |
| t1Q🡪&U< [ms] | 500 ms |  | 1st step - trigger at GCP  |
| ϕ | 3°  |  | Excitation angle[[4]](#footnote-5)  |
| Imin Q(U)  | 0.1 Itransformer  |  | Minimum current[[5]](#footnote-6) |
| Qmin Q(U)  | 0.05 SAmax  |  | Reactive power discrimination threshold[[6]](#footnote-7) |
| **Other remarks** |
| **[ ]  Connection to the MV grid****[ ]  to be taken from TCC ………………….of …………………** |
| Function | Setting parameter | Setting values in accordance with BDEW MV guideline | Grid operator setting specifications |  |
| Reactive power undervoltage protection | UQ🡪&U< [kV] | 0.85 UC |  | Uc of the MV grid |
| t1Q🡪&U< [ms] | 500 ms |  | Trigger power circuit breaker at the GCP or PGU |
| **Other remarks** |

Note: For all physical variables, PRIMARY VALUES are to be given (e. g. I>> 360 A instead of I>> 1.2 In; U< 16 kV instead of U< 0.8 Un).

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****6 (9)** |
| **2. Setting values of the grid protection device on the power generating unit**Basis: BDEW MV guideline and TCC High-Voltage  |
| **2.1 Grid protection**  |
| [ ]  **A) Connection to the EHV/HV grid**[ ]  **B) Connection to the MV grid or MV grid with direct substation connection****[ ]  to be taken from TCC ………………….of …………………** |
| Function | Setting parameter | For **A)** Recommendation in accordance with TCC High-Voltage | For **B)** recommendedSetting values in accordance with BDEW MV guideline | Prescribed setting values[[7]](#footnote-8) by grid operator |
| Overvoltage protection | U>> | 1.25[[8]](#footnote-9) ULV | 1.15 ULV/1.20 ULV 7 |  |
| tU>> | 100 ms | ≤ 100 ms |  |
| Undervoltage protection | U< | 0.8 ULV | 0.8 ULV |  |
| tU< | Staggered, see below | 0.3/1.5 …2.4 s[[9]](#footnote-10) |  |
| U<< | 0.3 ULV | 0.45 ULV |  |
| tU<< | 800 ms | 0 …300 ms6 |  |
| Overfrequency protection | f> | 51.5 Hz | 51.5 Hz |  |
| tf> | ≤ 100 ms | ≤ 100 ms |  |
| Underfrequency protection | f< | 47.5 Hz | 47.5 Hz[[10]](#footnote-11) |  |
| tf< | ≤ 100 ms | ≤ 100 ms |  |
| Where staggering is to be completed within a power generating system, please define the following staggered values: | Setting parameter of the staggering | Setting values |
| tU<,1 | **1.5 s** |  |
| tU<,2 | **1.8 s** |  |
| tU<,3 | **2.1 s** |  |
| tU<,4 | **2.4 s** |  |
| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****7 (9)** |
| **2.2 Dynamic grid support - low voltage ride-through (LVRT) mode** |
| Function  | Prescribed setting values by grid operator | Location at which the k factor must be adhered to  |
| LVRT mode:reactive current feed-in dependent upon the depth of the voltage dip, with a specific k factor[[11]](#footnote-12) [[12]](#footnote-13)[ ]  k factor in accordance with SDLWindV – setting range: k = 0-10[ ]  k factor in accordance with BDEW MV guideline– k ≥ 2[ ]  k factor in accordance with TCC High-Voltage 2<k<6 | Where k= … |  |
| [ ]  GCP[ ]  PGU |
| **Other remarks****As an alternative, the following LVRT mode may be selected:**LVRT mode: no reactive current feed-in, zero active power feed-in in case of a fault [ ]  activateThis LVRT mode is not a requirement from SDLWindV, BDEW MV guideline and TCC High-Voltage. This mode can only be fulfilled by certain PGUs. If this option cannot be fulfilled by the PGU, then this point must be agreed upon with the grid operator. |

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| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****8 (9)** |
| **3. Static reactive power behaviour** |
| [ ]  **EHV / HV grid** | [ ]  Version 1 in accordance with Section 10.2.2 of TCC High-Voltage[ ]  Version 2 in accordance with Section 10.2.2 of TCC High-Voltage[ ]  Version 3 in accordance with Section 10.2.2 of TCC High-Voltage[ ]  …….. underexcited to ……….. overexcited (separate regulation) |
| [ ]  **MV grid** | [ ]  0.95 underexcited to 0.95 overexcited in accordance with BDEW MV guideline[ ]  …….. underexcited to ……….. overexcited (separate regulation) |
| **Requirements with regard to reactive power behaviour of existing units on mixed farms [[13]](#footnote-14),[[14]](#footnote-15)** | [ ]  cos ϕ = ……… at the grid connection point [ ]  overexcited [ ]  underexcited[ ]  cos ϕ = ……… at the PGUs [ ]  overexcited [ ]  underexcited[ ]  …….. underexcited to ……….. overexcited[ ]  ………………………………………………………………………………………. |
| **Defined reactive power setpoint and procedure**[ ]   **to be taken from TCC ………………….of …………………** |
| 1. Fixed displacement factor cos φ
 |  [ ]  activate with ……. cos ϕ = …….. [ ]  overexcited [ ]  underexcited [ ]  variable via telecontrol system[[15]](#footnote-16)[ ]  schedule  |
| 1. Displacement factor cos ϕ (P)[[16]](#footnote-17)
 | [ ]  activate with cos ϕ = f(x) where f(x) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and x := \_\_\_\_\_\_\_\_\_\_\_ *Example: f(x)= -0.05 x + 1 mit x := P/Pn*  |
| 1. Fixed reactive power
 | [ ]  activate with Q = \_\_\_\_\_\_ kvar [ ]  variable via telecontrol system[[17]](#footnote-18)[ ]  schedule[[18]](#footnote-19)  |
| 1. Reactive power/voltage characteristic Q(U)[[19]](#footnote-20)[[20]](#footnote-21)
 | Gradient m = ……….. kvar/kV Voltage dead band = ………..kV Upper voltage boundary U (Qmax) = ………kV Lower voltage boundary U (Qmin) = ………kV Reference voltage: U0 = ……..kV variable via telecontrol systemRise time Tan = …..s (standard: Tan = 5 s)  |
| 1. Adjusting time
 | [ ]  activate with 1 min[ ]  activate with 10 s[ ]  activate with ……. (at least 10 s) |
| 1. Q (P) characteristic[[21]](#footnote-22)
 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Pmom/PAV[ %]*  |  |  |  |  |  |
| *QEA,soll/PAV[ %]*  |  |  |  |  |  |

 |
| Behaviour on telecontrol system failure[[22]](#footnote-23)  | [ ]  Continued operation using the last received value[ ]  *U*0 = ……..kV; Q = …... kvar; cos φ = …….. (depending on methodselected)  |
| **Other remarks** |
| **Data questionnaire for grid operators of new systems****Certification of a power generating system** | **TG 8, Annex C, Part B****9 (9)** |
| **4. Grid data** |
| ***Parameter*** | ***Value*** | ***Unit*** |
| Rated voltage UnHV: Rated voltage of the grid Un  |  | kV |
| Rated short-term current *I*k (for *T*k = 1 s)[[23]](#footnote-24) |  |  |
| Agreed supply voltage Uc[[24]](#footnote-25) |  | kV |
| Controller setpoint voltage Usetpoint[[25]](#footnote-26) |  | kV |
| Total connectable power at PCC STotal[[26]](#footnote-27)**[ ]** STotal can be requested from the responsible grid operator in confidential correspondence. |  | MVA |
| Min. grid short-circuit power at PCC[[27]](#footnote-28) SkV |  | MVA |
| Grid impedance phase angle at PCC ψk  |  | ° |
| Grid short-circuit power at grid connection point Sk(If no values are given, the values at the PCC are adopted for the GCP.) |  | MVA |
| Grid impedance phase angle at grid connection point ψk(If no values are given, the values at the PCC are adopted for the GCP.) |  | ° |
| Grid cable percentage  |  |  % of system length  |
| ***Neutral point treatment in same grid***Note: *"The information listed here is required for evaluating asymmetrical faults; if the information is not given only a limited evaluation is possible."* | **[ ]  solid earthing**[ ]  **low-resistance neutral point treatment \_\_\_Ω****[ ]  short-term, low-resistance neutral point treatment****\_\_\_Ω****[ ]  zero phase sequence impedance R0\_\_\_Ω, X0\_\_\_Ω****[ ]  resonance neutral point earthing \_\_\_Ω****[ ]  isolated** |
| HV side transformer neutral point wiring (where present)  | **[ ]** Free neutral point**[ ]** Solid earthing *I*k1p = .......... kA,*T*k = ........ s **[ ]** With earthing resistance *R*ME = ......... , *I*r = .......... A, *T*k = ........ s **[ ]** With surge voltage protector *u*r = ........... kV **[ ]** With neutral earthing reactor *I*r = ...........A **[ ]** Fixed**[ ]** Infinitely variable |
| For high-voltage connections:Grid operator's specifications for neutral point handling of connected party's components, which are electrically connected with the grid operator's grid. |  |
| Ripple control frequency |  | Hz |
| ***For MV connections*** |  |  |
| Apparent power of the upstream grid transformer[[28]](#footnote-29) *SGrid* |  | MVA |
| R of the upstream grid transformer |  | Ohm |
| X of the upstream grid transformer |  | Ohm |
| ***Vector group of the upstream grid transformer***  |  |  |
| ***For HV or EHV connections*** |  |  |
| Reference power [[29]](#footnote-30) *S0* |  |  |
| ***Vector group of the upstream grid transformer, only for HV connections***  |  |  |
| **Other remarks** |
|  |  |
|  |  |
| Place, date | Signature of grid operator |

1. UCUCMV is the controller setpoint voltage of the tap changer on the HV/MV transformer. If the defined controller setpoint voltage deviates from the given value, the overvoltage protection setting values must be converted correspondingly. The defined controller setpoint voltage must be given in the conformity declaration. [↑](#footnote-ref-2)
2. Settings on the basis of the FNN specifications 'Blindleistungsrichtung-Unterspannungsschutz (Q(U)-Schutz)' [↑](#footnote-ref-3)
3. With regard to system protection for new systems, the TC 2007 requirements apply. In this respect, the first step must have an effect on the individual PGUs. For this, active connections to the individual PGUs are necessary. Remote connections do not meet the requirements with regard to speed of signal transfer. The voltage at the GCP is to be analysed for reconnection. [↑](#footnote-ref-4)
4. Depending on protection device used. [↑](#footnote-ref-5)
5. Depending on protection device used; setting recommendation 0.1 I transformer, but max. 0.15 IN of the installed power generating units. [↑](#footnote-ref-6)
6. Depending on protection device used. [↑](#footnote-ref-7)
7. Settings will follow the prescribed values, provided that these do not impair the self-protection of the PGU. Where prescribed setting values are not compatible with the self-protection of the PGU, further consultation with the GO will be required. [↑](#footnote-ref-8)
8. ULV is the voltage on the low-voltage side of the generator transformer. It is given by ULV = UMV ∙ ü. UMV corresponds to Uc for a medium-voltage connection [↑](#footnote-ref-9)
9. Observe the information in BDEW MV guideline. [↑](#footnote-ref-10)
10. If specified it must be taken into consideration whether the PGS is connected in a zone with automatic frequency-actuated load shedding. [↑](#footnote-ref-11)
11. It must be indicated whether the k factor has been selected in accordance with TCC High-Voltage, BDEW MV guideline or SDLWindV. The SDLWindV mode is intended for WTs and is not a requirement for all other PGUs. [↑](#footnote-ref-12)
12. If the dynamic grid support is deactivated the grid protection settings must be adapted accordingly. [↑](#footnote-ref-13)
13. If several existing systems exist with different reactive power responses or agreements with the grid operator, please attach detailed information on a separate sheet. [↑](#footnote-ref-14)
14. In addition to the agreed operating mode of the existing systems, their true response must also be considered. The calculation method is described in TG 8. [↑](#footnote-ref-15)
15. The GO must include specifications of the telecontrol system / they are to be taken from the grid operator's TCC. [↑](#footnote-ref-16)
16. Is limited by the setting range given above. [↑](#footnote-ref-17)
17. The GO must include specifications of the telecontrol system / they are to be taken from the grid operator's TCC. [↑](#footnote-ref-18)
18. If schedules are demanded, they must be provided as a separate sheet or given under Other remarks. [↑](#footnote-ref-19)
19. [↑](#footnote-ref-20)
20. Recommendations to be taken from 10.2.2.4. [↑](#footnote-ref-21)
21. Up to 10 value pairs can be specified. [↑](#footnote-ref-22)
22. If setpoint input is performed via telecontrol system. [↑](#footnote-ref-23)
23. For dimensioning the short-circuit resistance of the high-voltage substation. [↑](#footnote-ref-24)
24. The generator transformer steps of the PGU are selected based on Un. Uc is the voltage at the GCP specified by the GO. [↑](#footnote-ref-25)
25. The upper and lower boundaries are given for dynamic setpoint input. [↑](#footnote-ref-26)
26. If STotal is not given, then STotal = SA. [↑](#footnote-ref-27)
27. For the preparation of the system certificate, the GO will supply grid data, the grid short-circuit power SkV and the grid impedance phase angle ψk at the grid connection point initially determined. This data will form the basis for the verification of the guideline-compliant response of the PGS. The dimensioning of system components for short-circuit resistance will be governed by more stringent requirements, in accordance with the technical connection conditions of the grid operator. [↑](#footnote-ref-28)
28. The system operator is provided with SGrid, STotal and SkV by the GO. STotal is the total connectable or planned apparent power at the PCC. The share 'owed' to the PGS is determined with the values handed over. If no information is provided, the procedure according to Chapter 4.3.4 is to be used. [↑](#footnote-ref-29)
29. If the PGS is connected to a section between two transformer substations, the thermal break-even performance of this section is applied for the reference power S0. When the PGS is directly connected to a transformer substation, or connected via the customer's own line, the maximum generating power that can be connected to the transformer substation is to be used for S0. [↑](#footnote-ref-30)