SPE response to ACER public consultation

on amendments to the Grid Connection Network Codes

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| Article | Amendment proposal | Reasoning | Relation to other provisions |
|  | **Determination of significance**  1.   The power-generating modules shall comply with the requirements on the basis of the voltage level of their connection point and their maximum capacity according to the categories set out in paragraph 2.  2.   Power-generating modules within the following categories shall be considered as significant:   |  |  | | --- | --- | | (a) | maximum capacity of 0,8 kW or more (type A); |  |  |  | | --- | --- | | (b) | and maximum capacity at the threshold according to Table 1 (type B); |  |  |  | | --- | --- | | (c) | connection point below 110 kV and maximum capacity at or above a threshold specified by each relevant TSO in accordance with paragraph 3 (type C). This threshold shall not be above the limits for type C power-generating modules contained in Table 1; or |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (d) | connection point at 110 kV or above and a maximum capacity above type B in table 1 (type D). A power-generating module is also of type D if its connection point is below 110 kV and its maximum capacity is at or above a threshold specified in accordance with paragraph 3 (type D). This threshold shall not be above the limit for type D power-generating modules contained in Table 1.  *Table 1*  **Thresholds and limits for thresholds for type B, C and D power-generating modules**   |  |  |  |  | | --- | --- | --- | --- | | **Synchronous areas** | **Capacity threshold from which a power-generating module is of type B** | **Limit for maximum capacity threshold from which a power-generating module is of type C** | **Limit for maximum capacity threshold from which a power-generating module is of type D** | | Continental Europe | 0,5 MW | 50 MW | 75 MW | | Great Britain | 1 MW | 50 MW | 75 MW | | Nordic | 1,5 MW | 10 MW | 30 MW | | Ireland and Northern Ireland | 0,1 MW | 5 MW | 10 MW | | Baltic | 0,5 MW | 10 MW | 15 MW | |   (new) If a Member State deems it necessary to introduce the criterion “connection point at a voltage level at 110kV or above” for PGMs larger than 15 MW, to make it a type D PGM, it has the option to do so.  This however must not lead to a distortion of a level playing field between PGM of different size or an incentive to inefficient splitting of installations into smaller units.  3.   Proposals for maximum capacity thresholds for types C and D power-generating modules shall be subject to approval by the relevant regulatory authority or, where applicable, the Member State. In forming proposals the relevant TSO shall coordinate with adjacent TSOs and DSOs and shall conduct a public consultation in accordance with Article 10. A proposal by the relevant TSO to change the thresholds shall not be made sooner than three years after the previous proposal.  4.   Power-generating facility owners shall assist this process and provide data as requested by the relevant TSO.  5.   If, as a result of modification of the thresholds, a power-generating module qualifies under a different type, the procedure laid down in Article 4(3) concerning existing power-generating modules shall apply before compliance with the requirements for the new type is required. | The Voltage criterion existing in the actual RfG should be removed for type A and BPGMs, below 15 MW capacity, as we expect requirements for Type A and B PGMs related to system security to be increased as proposed in the ACER policy paper under point 63, second sentence.  The voltage criterion imposes – in relation to its significance - disproportionate requirements to relatively small PGMs with a capacity below 15 MW in terms of capabilities as well as notification and compliance processes, in case they utilize existing infrastructure connected to the HV System.  Especially when those PGMs are installed in HV-connected demand-facilities, applying the same requirements as those PGMs of a capacity of >50MW would mean that the potential of such installations would be jeopardized due to additional economic burdens without obvious technical reasons.    If there are any concerns with that, a member state should go through a stakeholder process , if he deems it necessary to apply the voltage level criterion in order to determine the significance.  However, this provision should not distort the level playing field between higher and lower capacity PGMs, or result into an incentive to inefficiently split larger installations into smaller units. We assume that for the determination of significance, the overall capacity is the sum of the PGMs.  The threshold between type A and B should be fixed in order to harmonize products and processes for mass market of small PGMs over Europe. |  |
| Article 6 | **Application to power-generating modules, pump-storage power-generating modules, combined heat and power facilities, industrial sites and mixed customer sites in general**  1.   Offshore power-generating modules connected to the interconnected system shall meet the requirements for onshore power-generating modules, unless the requirements are modified for this purpose by the relevant system operator or unless the connection of power park modules is via a high voltage direct current connection or via a network whose frequency is not synchronously coupled to that of the main interconnected system (such as via a back-to-back convertor scheme).  2.   Pump-storage power-generating modules shall fulfil all the relevant requirements in both generating and pumping operation mode. Synchronous compensation operation of pump-storage power-generating modules shall not be limited in time by the technical design of power-generating modules. Pump-storage variable speed power-generating modules shall fulfil the requirements applicable to synchronous power-generating modules as well as those set out in point (b) of Article 20(2), if they qualify as type B, C or D.  3.   With respect to power-generating modules embedded in the networks of industrial sites, power-generating facility owners, system operators of industrial sites and relevant system operators whose network is connected to the network of an industrial site shall have the right to agree on conditions for disconnection of such power-generating modules together with critical loads, which secure production processes, from the relevant system operator's network. The exercise of this right shall be coordinated with the relevant TSO.  4.   Except for requirements under paragraphs 2 and 4 of Article 13 or where otherwise stated in the national framework, requirements of this Regulation relating to the capability to maintain constant active power output or to modulate active power output shall not apply to power-generating modules of facilities for combined heat and power production embedded in the networks of industrial sites, where all of the following criteria are met:   |  |  | | --- | --- | | (a) | the primary purpose of those facilities is to produce heat for production processes of the industrial site concerned; |  |  |  | | --- | --- | | (b) | heat and power-generating is inextricably interlinked, that is to say any change of heat generation results inadvertently in a change of active power-generating and vice versa; |  |  |  | | --- | --- | | (c) | the power-generating modules are of type A, B, C or, in the case of the Nordic synchronous area, type D in accordance with points (a) to (c) of Article 5(2). |   5.   Combined heat and power-generating facilities shall be assessed on the basis of their electrical maximum capacity.  6. For mixed customer sites (MCS) the following applies:   |  |  | | --- | --- | | (a) the type classification according to table 1 does not refer to the installed capacity, but the maximum feed-in capacity as agreed with the relevant system operator. |  | | (b) if the MCS was taken into operation before the application date of this regulation, the requirements of the PGM may apply at their connection to the MCS. |  | | The existing network RfG does not consider mixed customer sites.  Mixing production, demand and especially storage is a key enabler for the green transition as it reduces the impact on the electricity grid significantly.  When mixing production, demand and especially storage in the same installation, these units should not be evaluated separately, as this would prevent internal optimisations.  The suggested changes, where mixed customer sites are evaluated in the connection point to the grid as a combined facility will enable internal optimization.  6a) In mixed customer sites, it makes sense to limit the infeed capacity and focus on self-consumption. The most important impact parameters of a PGM to the network are related to the maximum infeed capacity to the grid, rather than installed capacity.  6b) If possible, no adjustment shall be required at the connection point of the existing load facility. Especially in medium voltage connected existing demand facilities, a control reference point at the PCC often leads to significant additional cost for measuring equipment / reconstruction of the switchgear etc. Such cost may jeopardize investments into such PGMs. A reference point within the MCS - at least for relatively small plants in relation to the connection point's capacity - is technically feasible. | The suggestion on MCS - 6a) and 6b) - is directly related to the definition of the "maximum capacity" [Art 2 (16) (EU) 2016/631] and the "connection point" [Art 2 (15) (EU) 2016/631] and should therefore be implemented in coordination with both. |
| Article 7 | **Regulatory aspects**  1.   Requirements of general application to be established by relevant system operators or TSOs under this Regulation shall be subject to approval by the entity designated by the Member State and be published. The designated entity shall be the regulatory authority unless otherwise provided by the Member State.  (new 1) If a TSO or relevant system operator deems it necessary to apply more stringent requirements to PGMs that are foreseen for a type of a higher power threshold, there has to be a comprehensible rationale as well as a national stakeholder process.  (new 2) If a relevant system operator deems it necessary to apply more stringent requirements to PGMs than defined during the implementation in the member state, there has to be a comprehensible rationale as well as a national stakeholder process.  (new 3) When Relevant system operators or TSOs are establishing requirements under this regulation, they shall disclose how they incorporated the principles set out in article 7(3).  2.   For site specific or regional requirements to be established by relevant system operators or TSOs under this Regulation, Member States may require approval by a designated entity.  3.   When applying this Regulation, Member States, competent entities and system operators shall:   |  |  | | --- | --- | | (a) | apply the principles of proportionality and non-discrimination; |  |  |  | | --- | --- | | (b) | ensure transparency; |  |  |  | | --- | --- | | (c) | apply the principle of optimisation between the highest overall efficiency and lowest total costs for all parties involved; |  |  |  | | --- | --- | | (d) | respect the responsibility assigned to the relevant TSO in order to ensure system security, including as required by national legislation; |  |  |  | | --- | --- | | (e) | consult with relevant DSOs and take account of potential impacts on their system; |  |  |  | | --- | --- | | (f) | take into consideration agreed European standards and technical specifications. | | (g) | seek the highest degree of harmonization with other system operators in the same synchronous area for requirements set out for type A, B, C and D |   4.   The relevant system operator or TSO shall submit a proposal for requirements of general application, or the methodology used to calculate or establish them, for approval by the competent entity within two years of entry into force of this Regulation.  5.   Where this Regulation requires the relevant system operator, relevant TSO, power-generating facility owner and/or the distribution system operator to seek agreement, they shall endeavour to do so within six months after a first proposal has been submitted by one party to the other parties. If no agreement has been found within this time frame, each party may request the relevant regulatory authority to issue a decision within six months.  6.   Competent entities shall take decisions on proposals for requirements or methodologies within six months following the receipt of such proposals.  7.   If the relevant system operator or TSO deems an amendment to requirements or methodologies as provided for and approved under paragraph 1 and 2 to be necessary, the requirements provided for in paragraphs 3 to 8 shall apply to the proposed amendment. System operators and TSOs proposing an amendment shall take into account the legitimate expectations, if any, of power-generating facility owners, equipment manufacturers and other stakeholders based on the initially specified or agreed requirements or methodologies.  8.   Any party having a complaint against a relevant system operator or TSO in relation to that relevant system operator's or TSO's obligations under this Regulation may refer the complaint to the regulatory authority which, acting as dispute settlement authority, shall issue a decision within two months after receipt of the complaint. That period may be extended by two months where additional information is sought by the regulatory authority. That extended period may be further extended with the agreement of the complainant. The regulatory authority's decision shall have binding effect unless and until overruled on appeal.  9.   Where the requirements under this Regulation are to be established by a relevant system operator that is not a TSO, Member States may provide that instead the TSO be responsible for establishing the relevant requirements. | New 1: Proposed changes shall achieve a harmonisation between types B, C, D  New 2: Harmonize the requirements of different DSOs within a member state to avoid unnecessary efforts for installers, planners, vendors.  New 3: Proposed changes shall achieve a harmonisation between types B, C, D  2. Proposed changes shall achieve a harmonisation between grid operators in one member state. Even slightly different requirements for different system operators within a Member State (e.g. several 100 in Germany) lead to unproportionate efforts for manufacturers and installers  3g) Where possible, System Operators and Member States should harmonize their requirements, e.g. by applying European Standardization where possible in order to support European-wide, efficient installation and application of Renewable Energy |  |
| Article 13 | *Article 13*  **General requirements for type A power-generating modules**  1.   Type A power-generating modules shall fulfil the following requirements relating to frequency stability:   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | (a) | With regard to frequency ranges:   |  |  | | --- | --- | | (i) | a power-generating module shall be capable of remaining connected to the network and operate within the frequency ranges and time periods specified in Table 2; |  |  |  | | --- | --- | | (ii) | the relevant system operator, in coordination with the relevant TSO, and the power-generating facility owner may agree on wider frequency ranges, longer minimum times for operation or specific requirements for combined frequency and voltage deviations to ensure the best use of the technical capabilities of a power-generating module, if it is required to preserve or to restore system security; |  |  |  | | --- | --- | | (iii) | the power-generating facility owner shall not unreasonably withhold consent to apply wider frequency ranges or longer minimum times for operation, taking account of their economic and technical feasibility. | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (b) | With regard to the rate of change of frequency withstand capability, a power-generating module shall be capable of staying connected to the network and operate at rates of change of frequency up to a value specified by the relevant TSO, unless disconnection was triggered by rate-of-change-of-frequency-type loss of mains protection. The relevant system operator, in coordination with the relevant TSO, shall specify this rate-of-change-of-frequency-type loss of mains protection.  *Table 2*  **Minimum time periods for which a power-generating module has to be capable of operating on different frequencies, deviating from a nominal value, without disconnecting from the network.**   |  |  |  | | --- | --- | --- | | **Synchronous area** | **Frequency range** | **Time period for operation** | | Continental Europe | 47,5 Hz-48,5 Hz | To be specified by each TSO, but not less than 30 minutes | | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than the period for 47,5 Hz-48,5 Hz | | 49,0 Hz-51,0 Hz | Unlimited | | 51,0 Hz-51,5 Hz | 30 minutes | | Nordic | 47,5 Hz-48,5 Hz | 30 minutes | | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than 30 minutes | | 49,0 Hz-51,0 Hz | Unlimited | | 51,0 Hz-51,5 Hz | 30 minutes | | Great Britain | 47,0 Hz-47,5 Hz | 20 seconds | | 47,5 Hz-48,5 Hz | 90 minutes | | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than 90 minutes | | 49,0 Hz-51,0 Hz | Unlimited | | 51,0 Hz-51,5 Hz | 90 minutes | | 51,5 Hz-52,0 Hz | 15 minutes | | Ireland and Northern Ireland | 47,5 Hz-48,5 Hz | 90 minutes | | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than 90 minutes | | 49,0 Hz-51,0 Hz | Unlimited | | 51,0 Hz-51,5 Hz | 90 minutes | | Baltic | 47,5 Hz-48,5 Hz | To be specified by each TSO, but not less than 30 minutes | | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than the period for 47,5 Hz-48,5 Hz | | 49,0 Hz-51,0 Hz | Unlimited | | 51,0 Hz-51,5 Hz | To be specified by each TSO, but not less than 30 minutes | |   2.   With regard to the limited frequency sensitive mode — overfrequency (LFSM-O), the following shall apply, as determined by the relevant TSO for its control area in coordination with the TSOs of the same synchronous area to ensure minimal impacts on neighbouring areas:   |  |  | | --- | --- | | (a) | the power-generating module shall be capable of activating the provision of active power frequency response according to figure 1 at a frequency threshold and droop settings specified by the relevant TSO; |  |  |  | | --- | --- | | (b) | instead of the capability referred to in paragraph (a), the relevant TSO may choose to allow within its control area automatic disconnection and reconnection of power-generating modules of Type A at randomised frequencies, ideally uniformly distributed, above a frequency threshold, as determined by the relevant TSO where it is able to demonstrate to the relevant regulatory authority, and with the cooperation of power-generating facility owners, that this has a limited cross-border impact and maintains the same level of operational security in all system states; |  |  |  | | --- | --- | | (c) | the frequency threshold shall be between 50,2 Hz and 50,5 Hz inclusive; |  |  |  | | --- | --- | | (d) | the droop settings shall be between 2 % and 12 %; |  |  |  | | --- | --- | | (e) | the power-generating module shall be capable of activating a power frequency response with an initial delay that is as short as possible. If that delay is greater than two seconds, the power-generating facility owner shall justify the delay, providing technical evidence to the relevant TSO; |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | (f) | the relevant TSO may require that upon reaching minimum regulating level, the power-generating module be capable of either:   |  |  | | --- | --- | | (i) | continuing operation at this level; or |  |  |  | | --- | --- | | (ii) | further decreasing active power output; | |  |  |  | | --- | --- | | (g) | the power-generating module shall be capable of operating stably during LFSM-O operation. When LFSM-O is active, the LFSM-O setpoint will prevail over any other active power setpoints.  ***Figure 1***  **Active power frequency response capability of power-generating modules in LFSM-O**  Image  Pref is the reference active power to which ΔΡ is related and may be specified differently for synchronous power-generating modules and power park modules. ΔΡ is the change in active power output from the power-generating module. fn is the nominal frequency (50 Hz) in the network and Δf is the frequency deviation in the network. At overfrequencies where Δf is above Δf1, the power-generating module has to provide a negative active power output change according to the droop S2. |   3.   The power-generating module shall be capable of maintaining constant output at its target active power value regardless of changes in frequency, except where output follows the changes specified in the context of paragraphs 2 and 4 of this Article or points (c) and (d) of Article 15(2) as applicable.  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:   |  |  | | --- | --- | | (a) | below 49 Hz falling by a reduction rate of 2 % of the maximum capacity at 50 Hz per 1 Hz frequency drop; |  |  |  | | --- | --- | | (b) | below 49,5 Hz falling by a reduction rate of 10 % of the maximum capacity at 50 Hz per 1 Hz frequency drop. |   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.  ***Figure 2***  **Maximum power capability reduction with falling frequency**  Image  The diagram represents the boundaries in which the capability can be specified by the relevant TSO. |   6.   The power-generating module shall be equipped with a logic interface (input port) in order to cease active power output within five seconds following an instruction being received at the input port. The Member States and respective energy regulators shall specify requirements for equipment to make PGMs operable remotely. The specified requirements have to be based on present technical standards. Increased efforts must be made by the relevant system operator to ensure the long-term applicability of the specified standard.  7.   The relevant TSO shall specify the conditions under which a power-generating module is capable of connecting automatically to the network. Those conditions shall include:   |  |  | | --- | --- | | (a) | frequency ranges within which an automatic connection is admissible, and a corresponding delay time; and |  |  |  | | --- | --- | | (b) | maximum admissible gradient of increase in active power output. |   Automatic connection is allowed unless specified otherwise by the relevant system operator in coordination with the relevant TSO.  8. The activation of additional power reduction requirements, aside from countering unforeseen short-term events to ensure grid stability, must be based on an agreement with the party concerned. | 1. Due to the huge number of small customers effected by TYP A requirements, the accompanying costs must be as low as possible. Therefore, the use of common standards is emphasized to ensure competition and lower the costs. In this regard the chosen standard must be at least applicable in the near to midterm future. 2. The use of the implemented remote control to provide more flexibility must be an optional case. This is ensured by a mandatory agreement of the customers. Regarding the additional costs for implementing an APC (especially relevant for single-family-houses), this would also ensure that an APC is only used when really necessary. 3. For PGMs of type A, a standardization of the interface is crucial. There is a high need for harmonization for secure, harmonized remote access solutions for mass applications. System-operator specific configuration of remote control access leads to significant effort for planners , installers and manufacturers. |  |
| Article 14 | *Article 14*  **General requirements for type B power-generating modules**  1.   Type B power-generating modules shall fulfil the requirements set out in Article 13, except for Article 13(2)(b).  2.   Type B power-generating modules shall fulfil the following requirements in relation to frequency stability:   |  |  | | --- | --- | | (a) | to control active power output, the power-generating module shall be equipped with an interface (input port) in order to be able to reduce active power output following an instruction at the input port; and |  |  |  | | --- | --- | | (b) | the relevant system operator shall have the right to specify the requirements for further equipment to allow active power output to be remotely operated. |   3.   Type B power-generating modules shall fulfil the following requirements in relation to robustness:   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (a) | with regard to fault-ride-through capability of power-generating modules:   |  |  | | --- | --- | | (i) | each TSO shall specify a voltage-against-time-profile in line with Figure 3 at the connection point for fault conditions, which describes the conditions in which the power-generating module is capable of staying connected to the network and continuing to operate stably after the power system has been disturbed by secured faults on the transmission system; |  |  |  | | --- | --- | | (ii) | the voltage-against-time-profile shall express a lower limit of the actual course of the phase-to-phase voltages on the network voltage level at the connection point during a symmetrical fault, as a function of time before, during and after the fault; |  |  |  | | --- | --- | | (iii) | the lower limit referred to in point (ii) shall be specified by the relevant TSO using the parameters set out in Figure 3, and within the ranges set out in Tables 3.1 and 3.2; |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | (iv) | each TSO shall specify and make publicly available the pre-fault and post-fault conditions for the fault-ride-through capability in terms of:   |  |  | | --- | --- | | — | the calculation of the pre-fault minimum short circuit capacity at the connection point, |  |  |  | | --- | --- | | — | pre-fault active and reactive power operating point of the power-generating module at the connection point and voltage at the connection point, and |  |  |  | | --- | --- | | — | calculation of the post-fault minimum short circuit capacity at the connection point; | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (v) | at the request of a power-generating facility owner, the relevant system operator shall provide the pre-fault and post-fault conditions to be considered for fault-ride-through capability as an outcome of the calculations at the connection point as specified in point (iv) regarding:   |  |  | | --- | --- | | — | pre-fault minimum short circuit capacity at each connection point expressed in MVA, |  |  |  | | --- | --- | | — | pre-fault operating point of the power-generating module expressed in active power output and reactive power output at the connection point and voltage at the connection point, and |  |  |  | | --- | --- | | — | post-fault minimum short circuit capacity at each connection point expressed in MVA. |   Alternatively, the relevant system operator may provide generic values derived from typical cases;  ***Figure 3***  **Fault-ride-through profile of a power-generating module**  Image  The diagram represents the lower limit of a voltage-against-time profile of the voltage at the connection point, expressed as the ratio of its actual value and its reference 1 pu value before, during and after a fault. Uret is the retained voltage at the connection point during a fault, tclear is the instant when the fault has been cleared. Urec1, Urec2, trec1, trec2 and trec3 specify certain points of lower limits of voltage recovery after fault clearance.  *Table 3.1*  **Parameters for Figure 3 for fault-ride-through capability of synchronous power-generating modules**   |  |  |  |  | | --- | --- | --- | --- | | **Voltage parameters (pu)** | | **Time parameters (seconds)** | | | Uret: | 0,05-0,3 | tclear: | 0,14-0,15 (or 0,14-0,25 if system protection and secure operation so require) | | Uclear: | 0,7-0,9 | trec1: | tclear | | Urec1: | Uclear | trec2: | trec1-0,7 | | Urec2: | 0,85-0,9 and ≥ Uclear | trec3: | trec2-1,5 |   *Table 3.2*  **Parameters for Figure 3 for fault-ride-through capability of power park modules**   |  |  |  |  | | --- | --- | --- | --- | | **Voltage parameters (pu)** | | **Time parameters (seconds)** | | | Uret: | 0,05-0,15 | tclear: | 0,14-0,15 (or 0,14-0,25 if system protection and secure operation so require) | | Uclear: | Uret-0,15 | trec1: | tclear | | Urec1: | Uclear | trec2: | trec1 | | Urec2: | 0,85 | trec3: | 1,5-3,0 | |  |  |  | | --- | --- | | (vi) | the power-generating module shall be capable of remaining connected to the network and continuing to operate stably when the actual course of the phase-to-phase voltages on the network voltage level at the connection point during a symmetrical fault, given the pre-fault and post-fault conditions in points (iv) and (v) of paragraph 3(a), remain above the lower limit specified in point (ii) of paragraph 3(a), unless the protection scheme for internal electrical faults requires the disconnection of the power-generating module from the network. The protection schemes and settings for internal electrical faults must not jeopardise fault-ride-through performance; |  |  |  | | --- | --- | | (vii) | without prejudice to point (vi) of paragraph 3(a), undervoltage protection (either fault-ride-through capability or minimum voltage specified at the connection point voltage) shall be set by the power-generating facility owner according to the widest possible technical capability of the power-generating module, unless the relevant system operator requires narrower settings in accordance with point (b) of paragraph 5. The settings shall be justified by the power-generating facility owner in accordance with this principle; | |  |  |  | | --- | --- | | (b) | fault-ride-through capabilities in case of asymmetrical faults shall be specified by each TSO. |   4.   Type B power-generating modules shall fulfil the following requirements relating to system restoration:   |  |  | | --- | --- | | (a) | the relevant TSO shall specify the conditions under which a power-generating module is capable of reconnecting to the network after an incidental disconnection caused by a network disturbance; and |  |  |  | | --- | --- | | (b) | installation of automatic reconnection systems shall be subject both to prior authorisation by the relevant system operator and to the reconnection conditions specified by the relevant TSO. |   5.   Type B power-generating modules shall fulfil the following general system management requirements:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | (a) | with regard to control schemes and settings:   |  |  | | --- | --- | | (i) | the schemes and settings of the different control devices of the power-generating module that are necessary for transmission system stability and for taking emergency action shall be coordinated and agreed between the relevant TSO, the relevant system operator and the power-generating facility owner; |  |  |  | | --- | --- | | (ii) | any changes to the schemes and settings, mentioned in point (i), of the different control devices of the power-generating module shall be coordinated and agreed between the relevant TSO, the relevant system operator and the power-generating facility owner, in particular if they apply in the circumstances referred to in point (i) of paragraph 5(a); | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (b) | with regard to electrical protection schemes and settings:   |  |  | | --- | --- | | (i) | the relevant system operator shall specify the schemes and settings necessary to protect the network, taking into account the characteristics of the power-generating module. The protection schemes needed for the power-generating module and the network as well as the settings relevant to the power-generating module shall be coordinated and agreed between the relevant system operator and the power-generating facility owner. The protection schemes and settings for internal electrical faults must not jeopardise the performance of a power-generating module, in line with the requirements set out in this Regulation; |  |  |  | | --- | --- | | (ii) | electrical protection of the power-generating module shall take precedence over operational controls, taking into account the security of the system and the health and safety of staff and of the public, as well as mitigating any damage to the power-generating module; |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (iii) | protection schemes may cover the following aspects:   |  |  | | --- | --- | | — | external and internal short circuit, |  |  |  | | --- | --- | | — | asymmetric load (negative phase sequence), |  |  |  | | --- | --- | | — | stator and rotor overload, |  |  |  | | --- | --- | | — | over-/underexcitation, |  |  |  | | --- | --- | | — | over-/undervoltage at the connection point, |  |  |  | | --- | --- | | — | over-/undervoltage at the alternator terminals, |  |  |  | | --- | --- | | — | inter-area oscillations, |  |  |  | | --- | --- | | — | inrush current, |  |  |  | | --- | --- | | — | asynchronous operation (pole slip), |  |  |  | | --- | --- | | — | protection against inadmissible shaft torsions (for example, subsynchronous resonance), |  |  |  | | --- | --- | | — | power-generating module line protection, |  |  |  | | --- | --- | | — | unit transformer protection, |  |  |  | | --- | --- | | — | back-up against protection and switchgear malfunction, |  |  |  | | --- | --- | | — | overfluxing (U/f), |  |  |  | | --- | --- | | — | inverse power, |  |  |  | | --- | --- | | — | rate of change of frequency, and |  |  |  | | --- | --- | | — | neutral voltage displacement. | |  |  |  | | --- | --- | | (iv) | changes to the protection schemes needed for the power-generating module and the network and to the settings relevant to the power-generating module shall be agreed between the system operator and the power-generating facility owner, and agreement shall be reached before any changes are made; | |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | (c) | the power-generating facility owner shall organise its protection and control devices in accordance with the following priority ranking (from highest to lowest):   |  |  | | --- | --- | | (i) | network and power-generating module protection; |  |  |  | | --- | --- | | (ii) | synthetic inertia, if applicable; |  |  |  | | --- | --- | | (iii) | frequency control (active power adjustment); |  |  |  | | --- | --- | | (iv) | power restriction; and |  |  |  | | --- | --- | | (v) | power gradient constraint; | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | (d) | with regard to information exchange:   |  |  | | --- | --- | | (i) | power-generating facilities shall be capable of exchanging information with the relevant system operator or the relevant TSO in real time or periodically with time stamping, as specified by the relevant system operator or the relevant TSO; |  |  |  | | --- | --- | | (ii) | the relevant system operator, in coordination with the relevant TSO, shall specify the content of information exchanges including a precise list of data to be provided by the power-generating facility. | |   6. Advanced capabilities such as congestion management or capabilities related to non-frequency ancillary services according to DIRECTIVE (EU) 2019/944 are non-mandatory requirements for Type B PGMs. Such capabilities should be harmonised to the highest extent between member states and then be applied in the framework of ancillary services market frameworks. | 6) Advanced capabilities introduce additional costs to power-generating modules. These costs should only be taken if the capability is actually needed. Otherwise a lot of sunk costs will be introduced.  Procurement of such capabilities rather than applying them to all generators helps to find the economically most favourable solution.  The suggested changes state that specified advanced capabilities should be non-mandatory. This will reduce the grid connection costs significantly. |  |
| Article 30 | *Article 30*  **Operational notification of type A power-generating modules**  1.   The operational notification procedure for connection of each new type A power-generating module shall consist of submitting an installation document. The power-generating facility owner shall ensure that the required information is filled in on an installation document obtained from the relevant system operator and is submitted to the system operator. Separate installation documents shall be provided for each power-generating module within the power-generating facility.  The relevant system operator shall ensure that the required information can be submitted by third parties on behalf of the power-generating facility owner.  2.   The member states shall specify the content of the installation document to be used on national level by the relevant system operators, which shall have at least the following information:   |  |  | | --- | --- | | (a) | the location at which the connection is made; |  |  |  | | --- | --- | | (b) | the date of the connection; |  |  |  | | --- | --- | | (c) | the maximum capacity of the installation in kW; |  |  |  | | --- | --- | | (d) | the type of primary energy source; |  |  |  | | --- | --- | | (e) | the classification of the power-generating module as an emerging technology according to Title VI of this Regulation; |  |  |  | | --- | --- | | (f) | reference to equipment certificates issued by an authorised certifier used for equipment that is in the site installation; |  |  |  | | --- | --- | | (g) | as regards equipment used, for which an equipment certificate has not been received, information shall be provided as directed by the relevant system operator; and |  |  |  | | --- | --- | | (h) | the contact details of the power-generating facility owner and the installer and their signatures. |   3.   The power-generating facility owner shall ensure that the relevant system operator or the competent authority of the Member State is notified about the permanent decommissioning of a power-generating module in accordance with national legislation.  The relevant system operator shall ensure that such notification can be made by third parties, including aggregators. | 2. Documents and data required shall be harmonised over all DSOs in at least one member state. |  |
| Article 32 | *Article 32*  **Procedure for type B and C power-generating modules**  1.   For the purpose of operational notification for connection of each new type B and C power-generating module, a power-generating module document (‘PGMD’) shall be provided by the power-generating facility owner to the relevant system operator and shall include a statement of compliance.  For each power-generating module within the power-generating facility, separate independent PGMDs shall be provided.  2.   The format of the PGMD to be used on national level by the relevant system operators and the information to be given therein shall be specified by the member states. The procedure and the effort for obtaining the PGMD shall be in a sensible proportion to the PGM’s size and significance. The relevant system operator shall have the right to request that the power-generating facility owner include the following in the PGMD:   |  |  | | --- | --- | | (a) | evidence of an agreement on the protection and control settings relevant to the connection point between the relevant system operator and the power-generating facility owner; |  |  |  | | --- | --- | | (b) | itemised statement of compliance; |  |  |  | | --- | --- | | (c) | detailed technical data of the power-generating module with relevance to the grid connection as specified by the relevant system operator; |  |  |  | | --- | --- | | (d) | equipment certificates issued by an authorised certifier in respect of power-generating modules, where these are relied upon as part of the evidence of compliance; |  |  |  | | --- | --- | | (e) | for Type C power-generating modules, simulation models pursuant to point (c) of Article 15(6); |  |  |  | | --- | --- | | (f) | compliance test reports demonstrating steady-state and dynamic performance as required by Chapters 2, 3 and 4 of Title IV, including use of actual measured values during testing, to the level of detail required by the relevant system operator; and |  |  |  | | --- | --- | | (g) | studies demonstrating steady-state and dynamic performance as required by Chapters 5, 6 or 7 of Title IV, to the level of detail required by the relevant system operator. |   3.   The relevant system operator, on acceptance of a complete and adequate PGMD, shall issue a final operational notification to the power-generating facility owner.  4.   The power-generating facility owner shall notify the relevant system operator or the competent authority of the Member State about the permanent decommissioning of a power-generating module in accordance with national legislation.  5.   Where applicable, the relevant system operator shall ensure that the commissioning and decommissioning of Type B and Type C power-generating modules can be notified electronically.  6.   Member States may provide that the PGMD shall be issued by an authorised certifier. | Efforts to show compliance shall be kept in a reasonable relation to the plant's cost. Therefore, documents and the related process shall be harmonised between the RSOs of a member state and take the PGMs significance and value into account. The smaller the PGM (“Mass market products”), the less project-specific technical requirements and notification effort can be afforded. |  |
| Article 41 | *Article 41*  **Tasks of the relevant system operator**  1.   The relevant system operator shall assess the compliance of a power-generating module with the requirements applicable under this Regulation, throughout the lifetime of the power-generating facility. The power-generating facility owner shall be informed of the outcome of this assessment.  For type A power-generating modules, the relevant system operator shall rely upon equipment certificates issued by an authorised certifier for this assessment. **Type A power-generating modules which have been successfully certified in one Member State shall not require any additional assessment in another Member State.**  2.   The relevant system operator shall have the right to request that the power-generating facility owner carry out compliance tests and simulations according to a repeat plan or general scheme or after any failure, modification or replacement of any equipment that may have an impact on the power-generating module's compliance with the requirements of this Regulation.  The power-generating facility owner shall be informed of the outcome of those compliance tests and simulations.  3.   The relevant system operator shall make publicly available a list of information and documents to be provided as well as the requirements to be fulfilled by the power-generating facility owner within the framework of the compliance process. The list shall cover at least the following information, documents and requirements:   |  |  | | --- | --- | | (a) | all the documentation and certificates to be provided by the power-generating facility owner; |  |  |  | | --- | --- | | (b) | details of the technical data on the power-generating module of relevance to the grid connection; |  |  |  | | --- | --- | | (c) | requirements for models for steady-state and dynamic system studies; |  |  |  | | --- | --- | | (d) | timeline for the provision of system data required to perform the studies; |  |  |  | | --- | --- | | (e) | studies by the power-generating facility owner to demonstrate the expected steady-state and dynamic performance in accordance with the requirements set out in Chapters 5 and 6 of Title IV; |  |  |  | | --- | --- | | (f) | conditions and procedures, including the scope, for registering equipment certificates; and |  |  |  | | --- | --- | | (g) | conditions and procedures for the use of relevant equipment certificates issued by an authorised certifier by the power-generating facility owner. |   (new) If a relevant network operator deems it necessary to extend the list defined during the implementation in the member state, there has to be a comprehensible rationale and a national stakeholder process shall be done.  4.   The relevant system operator shall make public the allocation of responsibilities between the power-generating facility owner and the system operator for compliance testing, simulation and monitoring.  5.   The relevant system operator may totally or partially delegate the performance of its compliance monitoring to third parties. In such cases, the relevant system operator shall continue ensuring compliance with Article 12, including entering into confidentiality commitments with the assignee.  6.   If compliance tests or simulations cannot be carried out as agreed between the relevant system operator and the power-generating facility owner due to reasons attributable to the relevant system operator, then the relevant system operator shall not unreasonably withhold the operational notification referred to in Title III. | Where compliance with this Regulation has been proven for Type A modules once, this shall be sufficient proof within the entire internal market. Type A modules shall not be subject to repeated individual certification in every Member State.  Harmonize the requirements of different DSOs within a member state to avoid unnessecary efforts for installers, planners, vendors. |  |
| Article 71 | *Article 71*  **Amendment of contracts and general terms and conditions**  1.   Regulatory authorities shall ensure that all relevant clauses in contracts and general terms and conditions relating to the grid connection of new power-generating modules are brought into compliance with the requirements of this Regulation.  2.   All relevant clauses in contracts and relevant clauses of general terms and conditions relating to the grid connection of existing power-generating modules subject to all or some of the requirements of this Regulation in accordance with Article 4(1) shall be amended in order to comply with the requirements of this Regulation. The relevant clauses shall be amended within three years following the decision of the regulatory authority or Member State as referred to in Article 4(1).  3.   Regulatory authorities shall ensure that national agreements between system operators and owners of new or existing power-generating facilities subject to this Regulation and relating to grid connection requirements for power-generating facilities, in particular in national network codes, reflect the requirements set out in this Regulation.  4. **The relevant system operators shall not establish requirements for grid connection to their grid which go beyond what is laid down in this Regulation. Where additional requirements are necessary for the secure operation of the system, the NRA may after consultation with all relevant stakeholders lay down a limited set of options for additional requirements for grid connection from which system operators may choose.** | Today, in some Member States such as Germany, each of the 900 DSOs can establish individual additional grid connection requirements for their grid. This leads to a substantial fragmentation of the internal market for energy technologies and products which can be offered on a national level. Instead, only where necessary a limited set of national – or even better European – options to go beyond the RfG should be offered. |  |