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**All CE TSOs' proposal for additional properties of  
FCR in accordance with Article 154(2) of the  
Commission Regulation (EU) 2017/1485 of 2  
August 2017 establishing a guideline on  
electricity transmission system operation**

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All Transmission System Operators of Synchronous Area Continental Europe are taking into account the following;

### Whereas

- 7  
8 (1) This document is a common proposal developed by all Transmission System Operators of  
9 Synchronous Area CE (hereafter referred to as “TSOs”) regarding the development of the additional  
10 properties of Frequency Containment Reserves (hereafter referred to as “FCR additional properties”)  
11 in accordance with Article 154(2) of Commission Regulation (EU) 2017/1485 of 2 August 2017  
12 establishing a guideline on electricity transmission system operation (hereafter referred to as “SO  
13 GL”).  
14
- 15 (2) The FCR additional properties proposal takes into account the general principles and goals set in the  
16 Commission Regulation EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity  
17 transmission system operation. The goal of the Commission Regulation (EU) 2017/1485 is to ensure  
18 the operational security of the interconnected transmission system. It sets for this purpose  
19 requirements for approval of terms and conditions or methodologies of TSOs, in particular  
20 concerning additional properties of the FCR in accordance with Article 154(2).  
21
- 22 (3) With respect to Article 154 of SO GL which determines only FCR technical minimum requirements,  
23 all TSOs of a Synchronous Area have the right to specify, in the synchronous area operational  
24 agreement, common additional properties of the FCR required to ensure operational security in the  
25 Synchronous Area, by means of a set of technical parameters and within the ranges in Article 15(2)(d)  
26 of Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on  
27 requirements for grid connection of generators and Articles 27 and 28 of Commission Regulation  
28 (EU) 2016/1388 of 17 August 2016 establishing a Network Code on demand connection. To reflect  
29 the individual needs of the Synchronous Area CE, the TSOs of Synchronous Area CE propose  
30 respective additional properties described below.  
31
- 32 (4) The proposal specifies conditions for FCR providing units and/or FCR providing groups: with respect  
33 to activation of FCR and in particular with respect to FCR availability also in stressed system status  
34 with a view also to new technologies.  
35
- 36 (5) Article 6(2)(d)(iii) of the SO GL requires all TSOs to develop methodologies, conditions and values  
37 included in the synchronous area operational agreement in Article 118 concerning the additional  
38 properties of the FCR in accordance with Article 154(2).  
39
- 40 (6) According to Article 6 of SO GL the FCR additional properties proposal is expected to reduce the  
41 risk of inappropriate activation of FCR and of unavailability of FCR in stressed system state. With  
42 this in mind the proposed additional properties presented below will contribute to system stability  
43 and therefore to the achievement of the objectives of Article 4 of the SO GL.  
44
- 45 (7) Specification of activation of FCR has the goal to ensure fast response and therefore help to stabilize  
46 the system. Specifications for FCR providing units and/or FCR providing groups with limited energy  
47 reservoir aim at ensuring sufficient availability also in stressed system status. Specifications for  
48 frequency measurement aim at ensuring availability of independent functionality of FCR providing  
49 units and/or FCR providing groups in particular in case of system split or communication problems.

50 The transition period is defined to avoid too abrupt change of requirements for already existing FCR  
51 providing units and/or FCR providing groups.  
52

53 (8) In conclusion, the FCR additional properties proposal contributes to the general objectives of the  
54 Commission Regulation (EU) 2017/1485 to the benefit of all market participants and electricity end  
55 consumers.  
56

57 **SUBMIT THE FOLLOWING FCR ADDITIONAL PROPERTIES PROPOSAL TO ALL REGULATORY**  
58 **AUTHORITIES:**

59 **Article 1**  
60 **Subject matter and scope**

61 The additional properties of FCR as determined in this proposal shall be considered as the common  
62 proposal of all TSOs of CE in accordance with Article 154(2) of SO GL and shall cover the requirements in  
63 addition to Article 154 for FCR providing units and/or FCR providing groups.

64 **Article 2**  
65 **Definitions and interpretation**

- 66 1. For the purposes of the FCR additional properties proposal, terms used in this document shall have the  
67 meaning of the definitions included in Article 3 of the SO GL, Article 2 of Regulation (EC) 714/2009,  
68 Article 2 of Directive 2009/72/EC, Article 2 of Commission Regulation (EU) 543/2013 and Article 2 of  
69 Commission Regulation (EU) 2016/631.  
70
- 71 2. In this FCR additional properties proposal, unless the context requires otherwise:  
72 a) the singular indicates the plural and vice versa;  
73 b) the table of contents and headings are inserted for convenience only and do not affect the  
74 interpretation of this FCR additional properties proposal; and  
75 c) any reference to legislation, regulations, directive, order, instrument, code or any other enactment  
76 shall include any modification, extension or re-enactment of it then in force.

77 **Article 3**  
78 **Additional properties of Frequency Containment Reserves**

- 79 1. Each TSO shall ensure that either each FCR providing unit and FCR providing group or – in case a TSO  
80 utilizes combined responses to fulfil its FCR delivery – the activation of all FCR providing units and  
81 FCR providing groups are not artificially delayed, begin as soon as possible but no later than 2 s after a  
82 Frequency Deviation, and the activation shall rise at least linearly or quicker. If the delay in initial  
83 activation of active power frequency response is greater than two seconds and/or the activation of active  
84 power frequency response cannot be linearly or quicker, the power generating facility owner shall provide  
85 technical evidence to the respective TSO demonstrating why a longer time is needed. These requirements  
86 should be checked during prequalification according to Article 155 in the SO GL.  
87
- 88 2. Each FCR providing unit or group shall be capable to stay connected to the grid within the frequency  
89 range of 47,5 to 51,5 Hz for time periods specified by the TSO taking into account the technical boundary  
90 conditions of the respective FCR providing units or FCR providing groups in accordance with Article  
91 154(6) of the SO GL. Each TSO shall in dialog with the DSOs ensure that distributed FCR is not  
92 significantly reduced by load shedding actions.

93 3. FCR providing units or FCR providing groups are deemed to have limited energy reservoirs (LER) in  
94 case a full continuous activation for a period of 2 hours in either positive or negative direction might,  
95 without consideration of the effect of an active energy reservoir management, lead to a limitation of its  
96 capability to provide the full FCR activation in accordance with Article 156(8) of the SO GL, due to the  
97 depletion of its energy reservoir(s) taking into account the effective energy reservoir(s). FCR providing  
98 units or groups not deemed as LER that contain technical entities with limited energy reservoirs shall  
99 ensure to be able to fully activate their FCR provision in accordance with Article 156(7) of the SO GL.  
100 For the avoidance of doubt FCR providing units or groups that contain technical entities with unlimited  
101 energy reservoirs and technical entities with limited energy reservoirs shall not be considered LER in  
102 case their energy reservoir does not limit the capability to provide FCR according to Article 156(7) of  
103 the SO GL.

104 In case FCR providing units or FCR providing groups containing technical entities with limited energy  
105 reservoirs have to compensate a possible lack of energy and hence a lack of FCR, they shall be able to  
106 shift FCR activation to technical entities available in order to ensure FCR provision. In any case the  
107 shifting of FCR activation shall guarantee continuity of the FCR provision. FCR providing units or FCR  
108 providing groups considered as LER shall respect the minimum time period of FCR full activation  
109 according to Article 156(9), 156(10) and 156(11) of the SO GL. Technical entities with unlimited energy  
110 reservoir of FCR providing units or FCR providing groups must not limit their FCR provision in case  
111 technical entities with limited energy reservoir (of that FCR providing group/unit) are already exhausted  
112 in either the positive or negative direction according to Article 156(8) of SO GL.  
113

114 For prequalification, the TSOs shall require that FCR providing units or FCR providing groups respect  
115 the following:

116 • FCR providing units or FCR providing groups using technical entities with limited energy reservoir  
117 shall have an active energy reservoir management. The active energy reservoir management shall  
118 ensure a continuous physical activation of FCR in normal state according to Article 156(9) of the SO  
119 GL. Following Article 156(9) of the SO GL, the FCR provider shall ensure that FCR providing units  
120 or FCR providing groups considered as LER have an energy reservoir dimensioning sufficient to  
121 cover a Frequency Deviation of 200 mHz for at least [15-30] minutes in positive and negative  
122 direction by additionally taking into account possible frequency deviations that might happen before  
123 entering into Alert State. To enable the active energy reservoir management, such FCR providing  
124 units or FCR providing groups considered as LER shall have a ratio of rated power to prequalified  
125 power of at least 1.25:1 or an alternative solution with equivalent effect. Any lead time for the  
126 charging process needs to be considered for the energy reservoir management. The value in brackets  
127 given in this paragraph is depending on the minimum activation period to be ensured by FCR  
128 providers according Article 156 (9),(10) and (11) of the SO GL.

129 • The energy reservoir management of FCR providing units and FCR providing group shall not rely  
130 on over fulfilment of activation.

131 • FCR providing units or FCR providing groups with limited energy reservoirs which are connected  
132 to the grid by means of inverters shall ensure that close to the limit of its energy reservoir the  
133 remaining capacity is sufficient for keeping its reactivity on short-term frequency deviations.  
134 Therefore, the unit shall switch from normal mode into reserve mode at  $t_{FAT}$  (full activation time of  
135 aFRR according to Article 158(1)(f) of the SO GL) before exhaustion of the energy reservoir due to  
136 maximum FCR provision in one direction. During the reserve mode the unit shall only react on  
137 short-term frequency deviations by following the zero-mean frequency:

138 • 
$$\overline{\Delta f_{zero-mean}(t)} = \Delta f(t) - \frac{1}{n(t-t_{FAT})} \sum_{i=0}^{n(t-t_{FAT})} \Delta f(t-t_i) \text{ (reserve mode)}$$

139 • For transition from normal mode into reserve mode a linear transition function T should be applied  
140 within the transition period of  $t_{\text{exhaustion}} - t_{\text{FAT}}$  to  $t_{\text{exhaustion}}$  :

141 •  $f_{\text{reaction}}(t) = \overline{\Delta f_{\text{zero-mean}}(t)} \cdot T + (1 - T) \cdot \Delta f(t)$   
142

143 The fulfilment of requirements stated above and in Article 156(9), (10) and (11) of the SO GL shall be  
144 subject of the prequalification process specified by TSO.

145 4. FCR providing units and groups shall be based on local frequency measurement at least per connection  
146 point or below at side of generating units when it is feasible from technical solution at the power  
147 generating module or demand unit.

148 5. FCR providing groups shall have decentralized frequency measurements per connection point (based on  
149 local frequency measurement ) that can be used either by default or as a fallback solution to ensure an  
150 autonomous function and a proper activation in case of errors of the central control (e.g. outage of  
151 SCADA, faults of communication lines) or system split of the electrical grid. In case of central control,  
152 additional requirements are the following:

153 i. An observation function shall detect any kind of errors of the central control or frequency deviations  
154 among the technical entities. The FCR provider shall initiate appropriate counter-measures  
155 immediately to ensure the FCR provision is not significantly negatively impacted.

156 ii. The minimum accuracy of the local frequency measurement used for the fully decentralized  
157 fallback can be reduced if accepted by the reserve connecting TSO .

158 6. For a time period of 4 years after the entry into force of this proposal and in case no decentralized fallback  
159 procedure according to 5. can be implemented within a FCR providing group or in case the fallback  
160 procedure cannot fulfill the reserve connecting TSO's requirements (e.g. accuracy or reliability of local  
161 frequency measurements) an implementation of a centralized control of FCR providing groups is  
162 temporary allowed under the following conditions:

163 i. To mitigate the risk of misbehavior of technical entities in case of errors of the central control (e.g.  
164 outage of SCADA, faults of communication lines) and to limit the impact on frequency, a single  
165 centralized FCR controller shall not control more than 30 MW of FCR.

166 ii. In line with Article 156(6a) of the SOGL the reserve connecting TSOs shall observe the share of  
167 FCR provided in this central control way within the procurement process and shall implement a limit  
168 of total amount of procured volume per LFC block to 75 MW, pursuant to Article 154(4) of the  
169 SOGL.

170 7. Each TSO shall require that FCR providing units and FCR providing groups continue providing FCR and  
171 are not allowed to reduce activation in case of a frequency deviation outside the frequency range of +/-  
172 200 mHz up to the frequency ranges as defined in Article 3.2.

#### 173 **Article 4**

#### 174 **Publication and implementation of the FCR additional properties proposal**

175 1. The TSOs shall publish the FCR additional properties proposal without undue delay after all NRAs have  
176 approved the proposal or a decision has been taken by the Agency for the Cooperation of Energy  
177 Regulators in accordance with Article 8(1) and Article 11 of the SO GL.  
178

179 2. The TSOs shall start to implement the FCR additional properties as specified in this proposal immediately  
180 after the NRAs have approved the proposal in accordance with Article 6(3) SO GL or a decision has been  
181 taken by the Agency in accordance with Article 6(8) SO GL. The transitional period for the  
182 implementation of additional properties of FCR by the affected FCR providers shall be two years: one

183 year for TSOs to adapt their Terms & Conditions and one additional year for FCR providers to implement  
184 the additional properties on FCR.

185 **Article 5**  
186 **Language**

187 The reference language for this FCR additional properties proposal shall be English. For the avoidance of  
188 doubt, where TSOs need to translate this FCR additional properties proposal into their national language(s),  
189 in the event of inconsistencies between the English version published by TSOs in accordance with Article 8  
190 of the SO GL Regulation and any version in another language, the relevant TSOs shall, in accordance with  
191 national legislation, provide the relevant national regulatory authorities with an updated translation of the  
192 FCR additional properties proposal.