To Danish players in the balance market

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Technical conditions for participating in automatic balancing in Denmark (FRR-A)

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0. Introduction

This document contains information about the conditions which are described in general terms only in 'Ancillary services to be delivered in Denmark, Tender conditions'. Doc. no. 13/80940-84, valid from 1 June 2015. (Danish language)

The conditions set out in this document are the conditions which a supplier of automatic balancing also called LFC or FRR-A, must meet in order to be able to participate in the:

- market for capability contracts
- the capacity market
- the automatic activation market

Note

The capability market is a market in which the player undertakes to participate in the capacity market, which will be established according to Energinet.dk's needs. It is a condition for being able to participate in this market that the player has a system capable of handling an activation signal.

The requirement for activation time of FRR-A is different in DK1 and DK2.

- DK1: Full activation has to be achieved within 15 min
- DK2: Full activation has to be achieved within 5 min

1. Technical conditions

The BRP can decide whether he wants to deliver FRR-A capacity from from a single unit or from an aggregated portfolio of units.
Energinet.dk will only have one communication line per BRP. If the BRP only have one single unit he wants to use in this market, Energinet.dk will allow a direct communication to this unit from the Energinet.dk Scada system. If the BRP has more units in his portfolio that will submit capacity bid separately or as an aggregated capacity bid, Energinet.dk will only allow one communication line, in this case to the BRP's Scada system. The BRP is then responsible for the communication to its units.

The BRP must obtain approval of the system capable of receiving and reacting to the activation signal from Energinet.dk and transmitting status signals etc. to Energinet.dk in accordance with the tender conditions. The BRP communication system, must be ensured that the system is capable of transmitting and receiving signals to and from individual plant.

The set-point value from the LFC function from Energinet.dk will be a "continuous" signal with a refresh interval of 4 to 10 seconds. The reserved capacity will be activated in as a pro-rata distribution according to the result of the capacity auction.

The basis for the control of the supply in day-to-day operations is that the BRP operates according to the power schedule submitted. The activation signal is an additional signal to the power schedule. If capacity is composed of both production and consumption, 5-minute power schedules for both production and consumption must be available.

1.1 Concept approval

The BRP must submit a description of the system that is to receive and execute activations; the description must account on how the requirements in these conditions are satisfied. This description must be approved by Energinet.dk before participation in market for capability contracts, the capacity market and the automatic balancing market.

1.2 Communication test

A signal test must be carried out between Energinet.dk and the BRP as well as between the BRP and at least one plant. Documentation of a successful signal test must be available before it can be followed up with a functional test.

The approval procedure contains a signal test as well as an activation test that documents the functionality of the BRP's system. As the BRP's supply of capacity respectively energy, is based on portfolio supply, the ongoing follow-up during normal operations will constitute an important element in the assessment of whether the BRP meets the conditions.

1.3 Functional test

Energinet.dk sends an activation signal to the BRP, which can either be sent as a step or as a ramp. In the case the test is done via a ramp of *x* MW/min., the ramp signal will be equivalent to.

$$x = {}^{P}/_{t}$$

Where *P* is the capacity to be used in the test and *t* is the time set as the requirement for full response, which is 15 minutes in DK1 and 5 minutes in DK2. Hence if a BRP in DK 2 wants to pre-qualify a capacity of 15 MW, he has to be able to follow a ramp of (15 MW /5 min) = 3 MW/min or react on a step of 15 MW. The response delivered from the unit or aggregated portfolio has to be within the area between 'Test Step/Ramp' and 'Minimum Response' in Figure 1,2 or 3. When tested against a ramp, the minimum response corresponds to a "delay" between the set point change and the measured response of max. 135 seconds. (Equivalent to three Pt1 time constants with Tau = 45 sec)

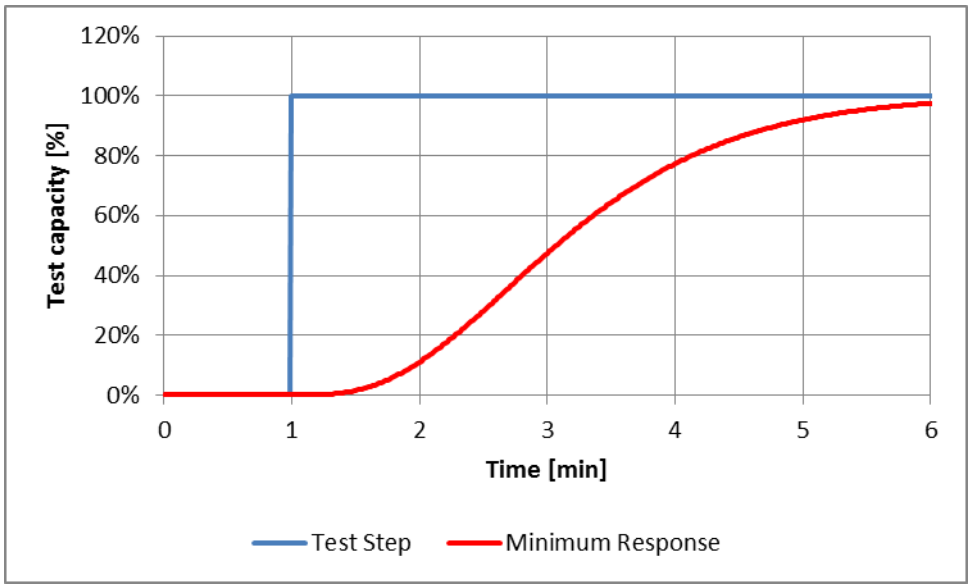

Figure 1 Example of minimum response when the unit/portfolio is tested against a step set-point change in DK2, where 90% of full activation has to be reached within 5 min

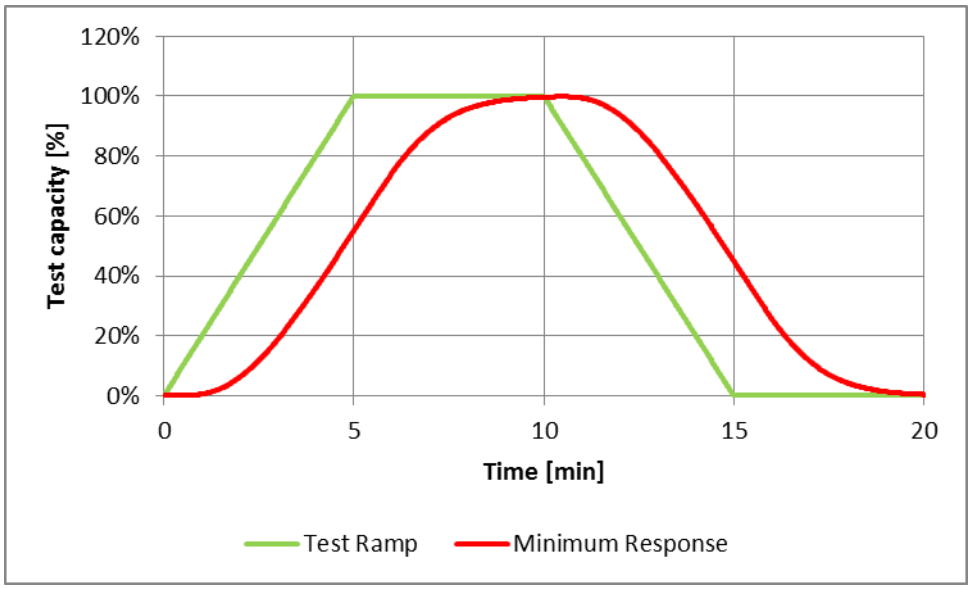

Figure 2 Example of requirements when the unit/portfolio is tested against a ramp in DK2, where the response between 20% and 80% shall be at maximum 135 seconds delayed from Test Ramp

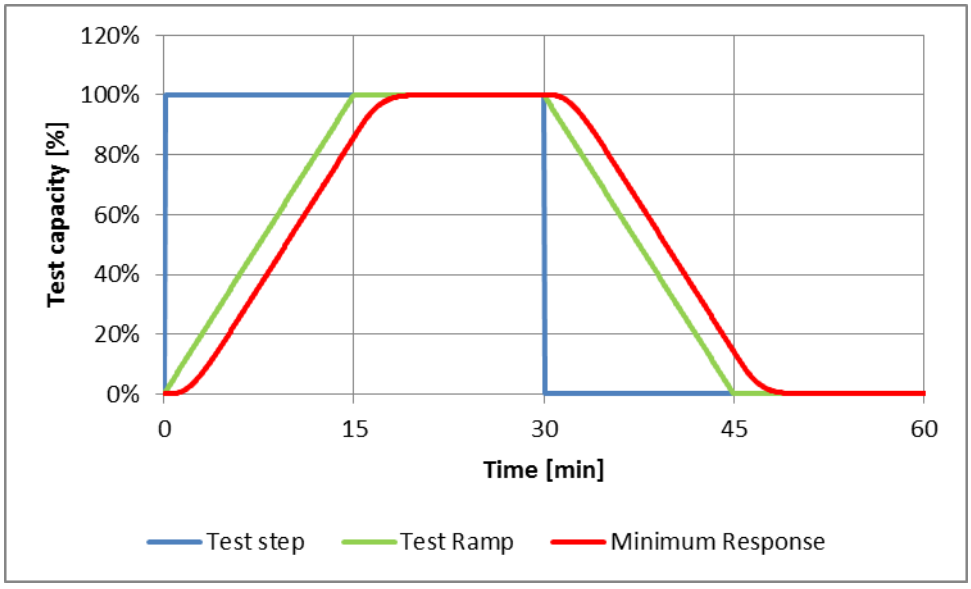

*Figure 3 Example of required response when the unit/portfolio is tested against a step **or** a ramp set-point change in DK1, where the response between 20% and 80% shall be at maximum 135 seconds delayed from Test Ramp values. 85% of full activation has to be reached within 15 min*

1.4 Approval document

Energinet.dk prepares an approval document which approves the BRP's system for participation in the capability market, the FRR-A capacity market as well as the automatic balancing market.

2. Conditions related to performance

2.1 Spinning or not spinning units.

If the reserved FRR-A capacity comes from a single unit, then this unit must always be spinning and connected to the grid.

If however the reserved capacity comes from a portfolio of units some of the capacity can come from units which are not connected to the grid. The running capacity have to be at least equal to what the set-point ask for, as illustrated in Figure 5. The minimum requirements of running capacity, both upwards and downwards, relates to the actual power, with a power corresponding to approximately ramp rate in 1.5 min.
This means that, in DK2, at least 30% of the reserved capacity, in addition to actual power, must be spinning reserves, while reserved capacity exceeding these 30% may be placed on units which is not connected to the grid but is capable of responding within 1.5 minutes. In DK1, the requirement is also 1.5 minutes, corresponding to at least 10% of the reserved capacity must be spinning reserves.

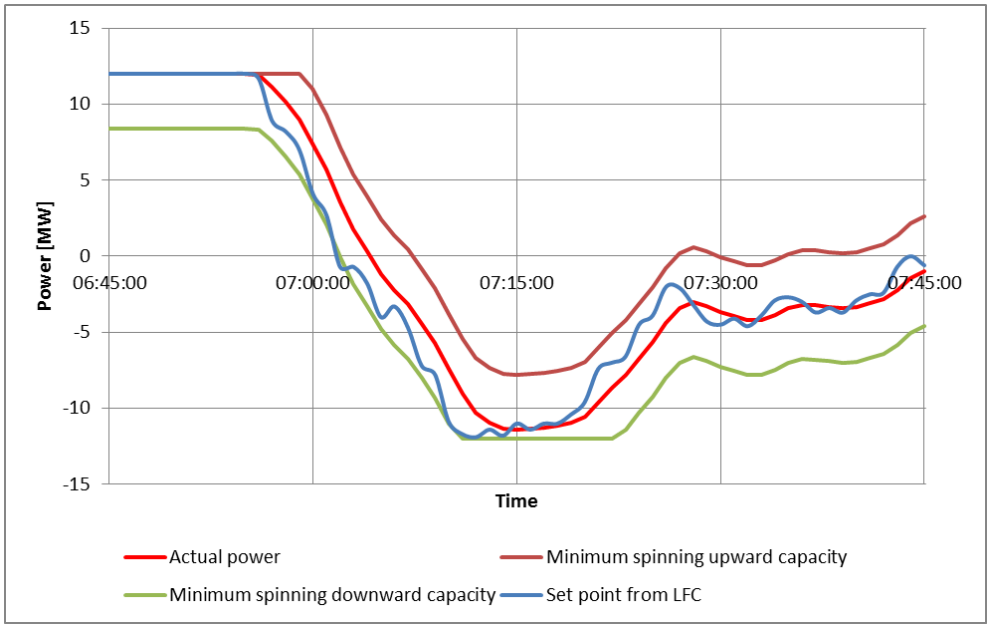

Figure 4 Example of a schedule for activation of FRR-A in DK2 from a capacity of +/- 12 MW.

2.2 Configuration of PBR control system.

The PBR can by own choice decide if they will not have or have a "Supplier imbalance controller, AGC", that control power output as close as possible to the 5 min power schedule taken into account both power from FCR and the FRR-A activation signal. In case the PBA choose not to have a Supplier imbalance controller, the configuration of the balancing control follows the principles in Figure 5 or Figure 6. In the case the PBA choose to implement an AGC the configuration shall be based on the principle shown in figure 7.

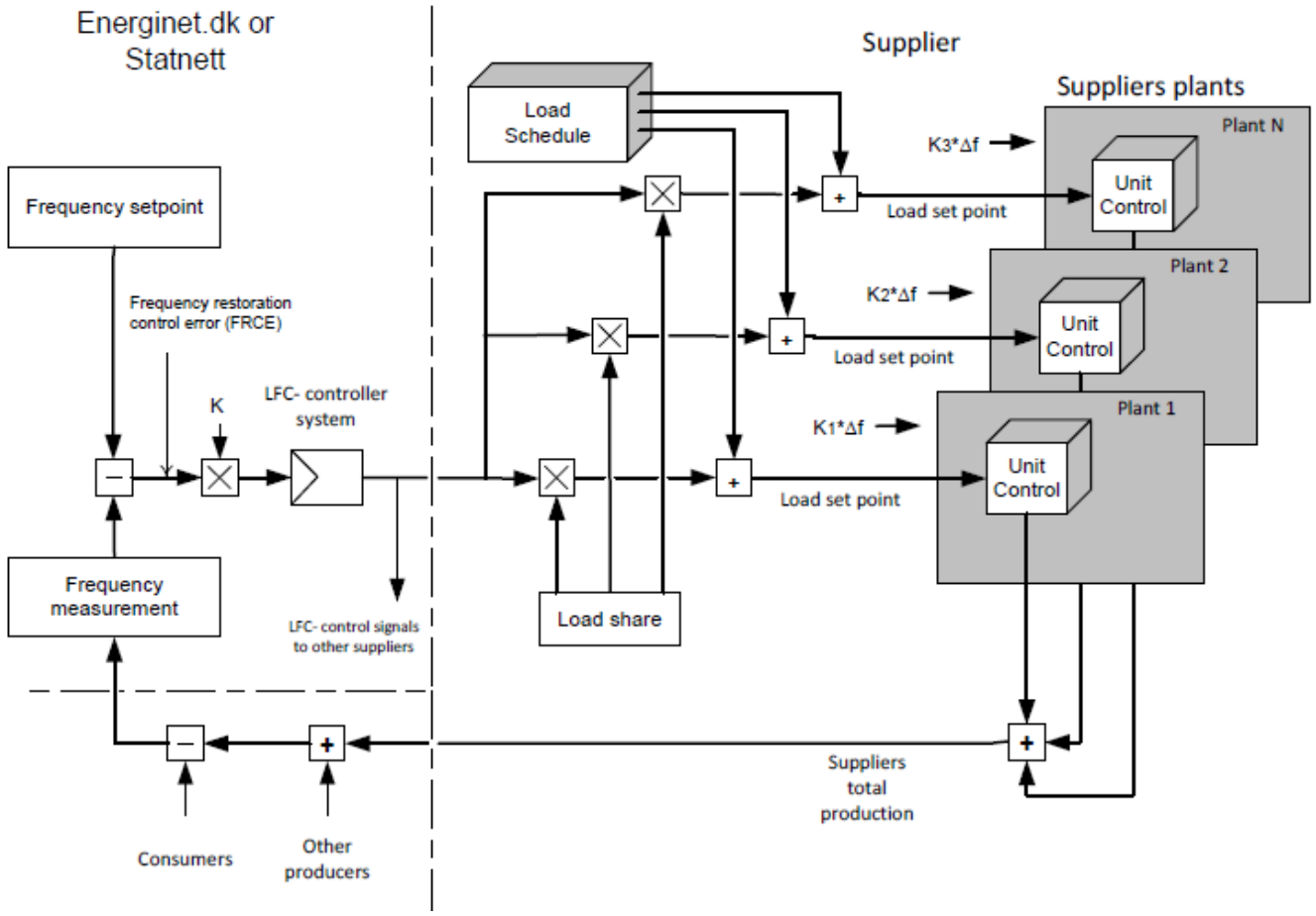

Figure 5 Principle for the design of the system in DK2 where the BRP has no Supplier imbalance controller.

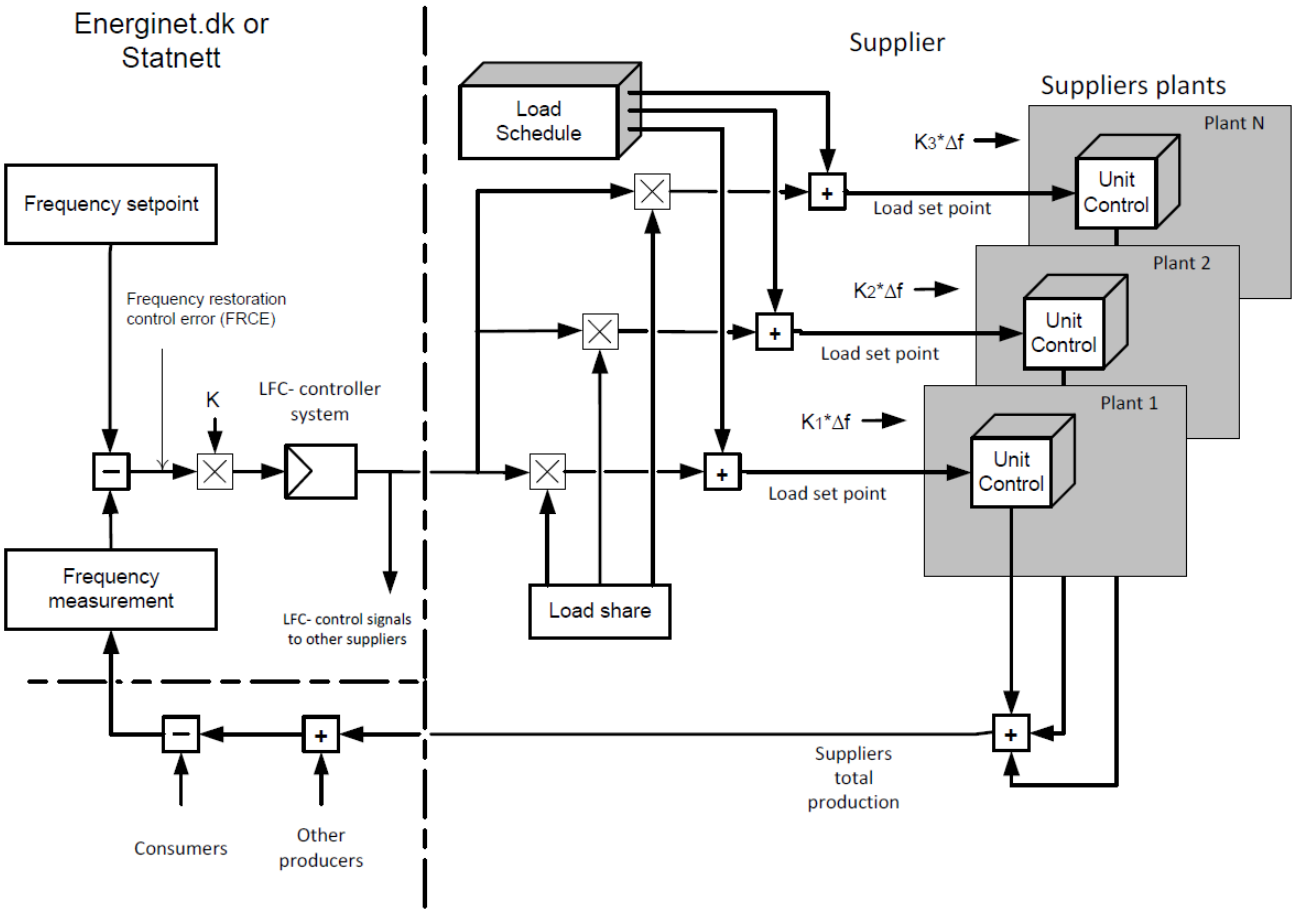

Figure 6 Principle for the design of the system in DK1 where the BRP has no Supplier imbalance controller.

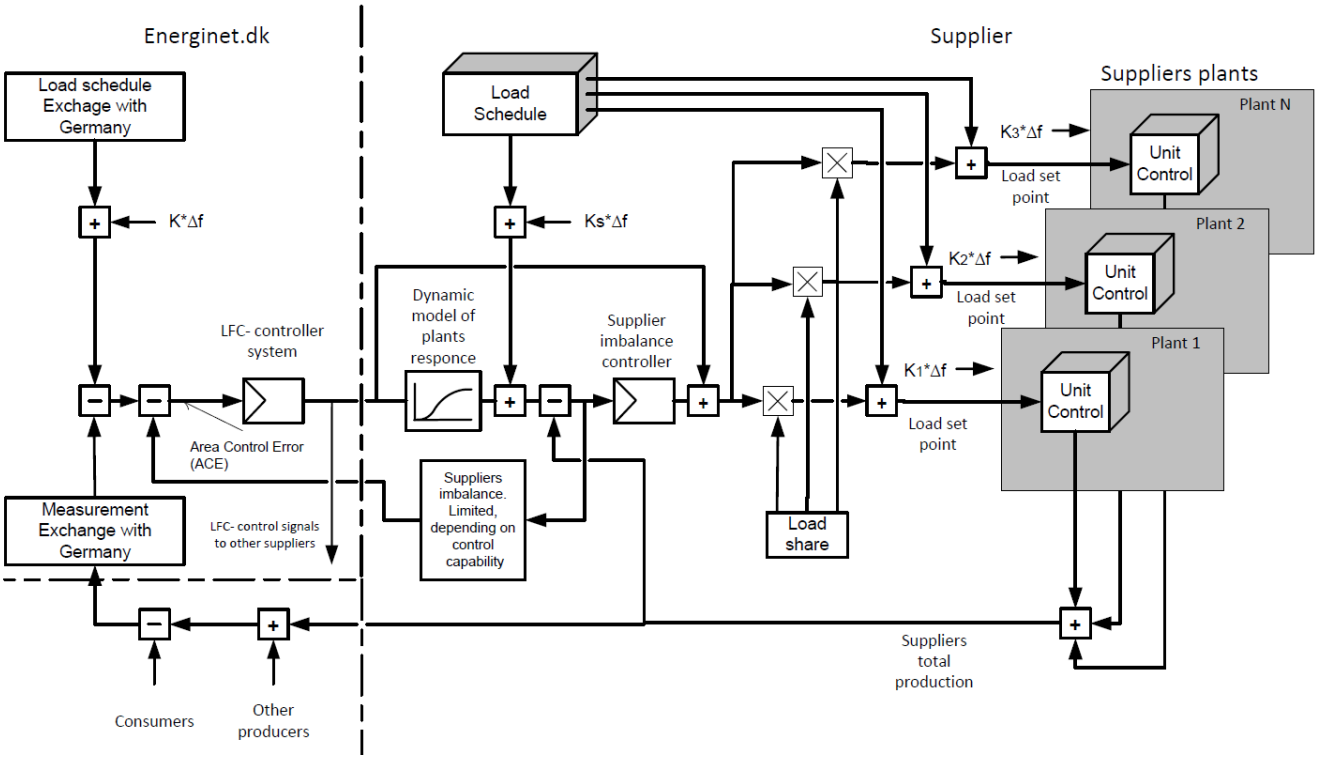

Figure 7 Principle for the design of the system in DK1 where the BRP has a Supplier imbalance controller.

If a BRP in DK2 wants to have a Supplier imbalance controller, the 'Deviation expected' signal from the BRP to Energinet.dk is not a requirement, unless it becomes necessary. The current set up of LFC in Nordic area may change.

The 'Deviation expected' signal from the BRP to Energinet.dk is not a requirement for the control method without power control circuit –in both DK-W and DK-E.

The two values for 'Time constant up' and 'Time constant down' are no longer required. Originally, these values were required to calculate the power supplied based on the activation signal, but this calculation is performed by utilising an expected response, equivalent to three Pt1 time constants with Tau = 45 sec. (Pt3 = 45 sec). If a BRP wants Energinet.dk to utilise an online value, this can be established. The signal should be understood as three identical Pt1 time constants of a duration of x seconds for each direction.

3. Signal list

The signal list is reproduced in 'Ancillary services to be delivered in Denmark, Tender conditions', Doc. 13/80940-84.

In DK1, the signal for up-reserves and down-reserves, respectively, is for the remaining capacity, relative to immediate power, while in DK2, it is an absolute value equivalent to the reserved capacity or the sum of the reserved capacity plus the capacity made available for activation without being reserved.