

- B.7.2.2 A Party (or Applicant, as applicable) shall, in a Participation Notice in respect of a Generator Unit, specify if the Unit is:
- (a) a Wind Power Unit;
  - (b) an Energy Limited Generator Unit;
  - (c) a Pumped Storage Unit;
  - (d) a Battery Storage Unit;
  - (e) a Demand Side Unit;
  - (f) an Aggregated Generator Unit;
  - (g) a Trading Unit;
  - (h) an Assetless Unit;
  - (i) a Dual Rated Generator Unit; or
  - (j) a Solar Power Unit.
  - (k) A Dispatchable Demand Unit
- B.7.2.3 A Party (or Applicant, as applicable) shall also, in a Participation Notice in respect of a Generator Unit, specify if the Unit is or is intended to be a Capacity Market Unit or a part of a Capacity Market Unit (and, in the latter case, which Capacity Market Unit).
- B.7.2.4 A Party (or Applicant, as applicable) shall also, in a Participation Notice in respect of a Generator Unit, specify if the Unit is either or both of the following:
- (a) Dispatchable;
  - (b) Controllable.
- B.7.2.5 A Party (or Applicant, as applicable) shall also, in a Participation Notice in respect of a Generator Unit, specify if the Unit has Priority Dispatch.
- B.7.2.6 A Generator Unit may only be specified as an Energy Limited Generator Unit if it is:
- (a) connected to a hydro turbine which is driven either by the controlled flow of water from a reservoir or by the flow of a river; and
  - (b) subject to a physical upper limit on the amount of energy that can be generated in a Trading Day.
- B.7.2.7 A Dispatchable Demand Unit, a Pumped Storage Unit or a Battery Storage Unit may only be registered as a Generator Unit and not a Supplier Unit.
- B.7.2.8 A Generator Unit may only be specified as a Dual Rated Generator Unit if the Regulatory Authorities have given their written consent for the registration of the relevant Generator Unit by the Party (or Applicant) concerned as a Dual Rated Generator Unit.

D.4.2.9 The Forecast Minimum Output Profile submitted at or prior to any Gate Closure, shall contain the Participant's forecast of the average level of Minimum Output, in MW, for the Generator Unit for each Imbalance Settlement Period in the Trading Day. The Forecast Minimum Output values must be zero except as otherwise specified.

D.4.2.10 The Forecast Minimum Stable Generation Profile submitted at or prior to any Gate Closure, shall contain the Participant's forecast of the average level of Minimum Stable Generation, in MW, for the Generator Unit for each Imbalance Settlement Period in the Trading Day. The Forecast Minimum Stable Generation values can be positive but cannot be negative.

**Comment [A1]:** Important to ensure DDUs are included on the list of units which can have a negative value for Forecast Minimum Output.

D.4.2.11 A Participant shall ensure that values of the Forecast Availability Profile submitted in respect of Pumped Storage Units or Battery Storage Units, as part of Commercial Offer Data, shall be equal to the expected generation availability for that Pumped Storage Unit or Battery Storage Unit (as the case may be) in each relevant Imbalance Settlement Period.

**Comment [A2]:** If a DDU has a mandatory zero Forecast Minimum Stable Generation Profile (instead of a negative one) will the TSO be able to dispatch it into the negative range?

D.4.2.12 A Participant shall ensure that values of the Forecast Minimum Output Profile submitted in respect of Dispatchable Demand Units, Pumped Storage Units or Battery Storage Units, as part of Commercial Offer Data, shall be equal to the expected pumping capability for that Dispatchable Demand Units, Pumped Storage Unit or storage capability for that Battery Storage Unit (as the case may be) in each relevant Imbalance Settlement Period.

D.4.2.13 Participants shall submit Commercial Offer Data in accordance with the provisions of Appendix I "Offer Data" of the Code, for each of their Demand Side Units in respect of its offered Demand Reduction.

D.4.2.14 A Participant shall ensure that values of the Energy Limit submitted in respect of Energy Limited Generator Units must not exceed the total energy that the Energy Limited Generator Unit is physically capable of generating during the Trading Day.

D.4.2.15 In respect of a Dispatchable Demand Unit, a Participant shall ensure the Forecast Availability Profile component of Complex Bid Offer Data, including Default Data, are submitted with a value of zero.

D.4.2.16

#### D.4.3 Start Up Costs and No Load Costs

D.4.3.1 A Participant shall ensure that Complex Bid Offer Data in respect of each of its Generator Units which are not Demand Side Units shall include:

- (a) one No Load Cost;
- (b) a Cold Start Up Cost, a Warm Start Up Cost and a Hot Start Up Cost, where the Cold Start Up Cost must be greater than or equal to the Warm Start Up Cost, and the Warm Start Up Cost must be greater than or equal to the Hot Start Up Cost; and
- (c) a Warm Cooling Boundary and a Hot Cooling Boundary, where the Warm Cooling Boundary duration must be greater than or equal to the Hot Cooling Boundary duration.

D.4.3.2 A Participant shall ensure that Complex Bid Offer Data in respect of a Demand Side Unit shall include a single Shut Down Cost.

D.4.3.3 In respect of a Dispatchable Demand Unit, Pumped Storage Unit or Battery Storage Unit, a Participant shall ensure the No Load Cost, Cold Start Up Cost, Warm Start Up Cost and Hot Start Up Cost components of Complex Bid Offer Data, including Default Data, are submitted with a value of zero.

D.4.4 **Incremental and Decremental Price Quantity Pairs**

**Comment [A3]:** Consider if only a single PQ pair is appropriate for a DDU.

D.4.4.1 A Participant submitting Commercial Offer Data in respect of a Generator Unit, u:

- (a) shall include a set of Incremental Price Quantity Pairs; and
- (b) shall include a set of Decremental Price Quantity Pairs.

D.4.4.2 Each set of Incremental Price Quantity Pairs and Decremental Price Quantity Pairs shall include a minimum of one and a maximum of ten Price Quantity Pairs, each comprising a Price and a Quantity.

D.4.4.3 Each Price can be either positive or negative but cannot exceed the Market Price Cap (PCAP) or be lower than the Market Price Floor (PFLOOR).

D.4.4.4 Each Participant shall, in respect of each of its Generator Units, ensure that each set of Price Quantity Pairs that is submitted for an Imbalance Settlement Period:

- (a) is submitted in order of increasing Quantity;
- (b) has both Prices and Quantities that are monotonically increasing; and
- (c) does not include more than one Price for the same Quantity.

D.4.4.5 Each Participant shall ensure, in the Commercial Offer Data that it submits, that the Price in each Incremental Price Quantity Pair shall be greater than or equal to:

- (a) the Price in each Decremental Price Quantity Pair that has a Quantity that is less than the Quantity in the applicable Incremental Price Quantity Pair; and
- (b) the Price in the Decremental Price Quantity Pair that has the lowest Quantity out of all those Decremental Price Quantity Pairs that have a Quantity greater than or equal to the Quantity in the applicable Incremental Price Quantity Pair.

D.4.4.6 The Market Operator shall adjust the greatest Quantity specified in a set of Price Quantity Pairs to a sufficiently high value such that it is greater than the value of all function of time Dispatch Quantities ( $qD_{uoh}(t)$  or  $qD_{uoy}(t)$ , as applicable) and Final Physical Notification Quantity ( $qFPN_{uh}(t)$  or  $qFPN_{uy}(t)$ , as applicable) for the Generator Unit, u, in the Period, h, or Imbalance Settlement Period,  $\gamma$ , as applicable, in order to ensure that Bid Offer Acceptances can be calculated over the entire operating range of the Generator Unit.

D.4.4.7 The Market Operator shall adjust the lowest Quantity specified in a set of Price Quantity Pairs to a sufficiently low value such that it is less than or equal to the value of all function of time Dispatch Quantities ( $qD_{uoh}(t)$  or  $qD_{uoy}(t)$ , as applicable) and the function of time Final Physical Notification Quantity ( $qFPN_{uh}(t)$  or  $qFPN_{uy}(t)$ , as applicable) for the Generator Unit, u, in the Period, h, or Imbalance Settlement Period,  $\gamma$ , as applicable in order to ensure that Bid Offer Acceptances can be calculated over the entire operating range of the Generator Unit.

- D.4.4.8 If both negative and positive Quantities are submitted but a Quantity equal to zero is not submitted as part of a set of Price Quantity Pairs, the Market Operator shall include an additional Price Quantity Pair with a Quantity equal to zero, and a Price which is equal to the Price corresponding to the first positive Quantity in the set of Price Quantity Pairs.
- D.4.4.9 For the purposes of all calculations within this Code, the Market Operator shall determine the Price that shall apply at each level of Output for each Generator Unit,  $u$ , such that for levels of Output less than or equal to a Quantity specified in the set of Price Quantity Pairs (the “upper bound Quantity”) and greater than the next lowest Quantity specified in the set of Price Quantity Pairs, the Price corresponding to the upper bound Quantity applies.
- D.4.4.10 Intentionally Blank
- D.4.4.11 A Participant, in respect of a Generator Unit which is Dispatchable, has Priority Dispatch and has zero marginal costs, shall ensure that each Price corresponding to a Quantity in a set of Decremental Price Quantity Pairs is zero.
- D.4.4.12 Where a Generator Unit is Dispatchable, has Priority Dispatch and has non-zero marginal costs, each Price corresponding to a Quantity in a set of Decremental Price Quantity Pairs in respect of this Generator Unit shall be set to zero by the Market Operator for the purposes of the Imbalance Pricing calculations detailed in Section E. For the avoidance of doubt, the submitted values will be used for the calculation of Commercial Offer Data for Bid Offer Acceptances in section F.3 for the determination of Settlement Payments, Settlement Charges, Capacity Payments, Capacity Charges as detailed in Section F from Section F.5 onwards and these Price values shall be deemed to be zero for the calculation of Commercial Offer Data for Bid Offer Acceptances in section F.3 for use in Imbalance Pricing Calculations in Section E.

**Comment [A4]:** D.4.4.8: Might be here or might be Appendix I, need to consider where it is stated that the first inc price and dec price submitted is generally from the quantity submitted down to zero (or the min output). May need to make it more clear that for DDUs and batteries, their first PQ pair will apply from their negative min output level up to their next PQ pair, and so on up to zero, rather than what might be intuitive of the prices which apply from zero downwards – always has to be monotonically increasing

## D.6 SYSTEM DATA

### D.6.1 Provision of Forecast Data by the System Operators

- D.6.1.1 Each System Operator shall submit to the Market Operator the following forecast values pertaining to its Jurisdiction in accordance with Appendix K “Other Market Data Transactions”:
- (a) Annual Load Forecast;
  - (b) Monthly Load Forecast;
  - (c) Four Day Load Forecast; and
  - (d) Wind and Solar Power Unit Forecast.
- D.6.1.2 The Market Operator shall calculate the Annual Combined Load Forecast Quantity for each Imbalance Settlement Period,  $\gamma$ , within the relevant Year as the sum of the submitted values of the Annual Load Forecast for each Jurisdiction within 5 Working Days of receipt of the Annual Load Forecast from every System Operator.

### D.6.2 Net Output Function

- D.6.2.1 Each System Operator, each Meter Data Provider and each Participant shall provide all values expressed in MW, MW/min or MWh that are required under this Code, in each case net of Unit Load.

D.6.2.2 The Net Output Function is a linear transformation that shall be used by each System Operator to convert values relating to Gross Output to values that are net of Unit Load.

D.6.2.3 The Net Output Function and its application are set out in this paragraph 0. If  $XG_u$  is a quantity gross of Unit Load at the relevant time, then  $XN_u$  is the quantity net of Unit Load, pertaining to a Generator Unit,  $u$  at that time, calculated as follows:

$$XN_u = ULS_u \times XG_u - FUL_u$$

where:

- (a)  $FUL_u$  is the Fixed Unit Load for Generator Unit,  $u$ , for the relevant time; and
- (b)  $ULS_u$  is the Unit Load Scalar for Generator Unit,  $u$ , for the relevant time.

D.6.2.4 Each System Operator shall ensure that, with the exception of Pumped Storage Units, Battery Storage Units, Interconnector Residual Capacity Units, Dispatchable Demand Units and Interconnector Error Units, the results of applying the Net Output Function shall be positive and shall be set to zero if negative.

#### D.6.4 **Actual Availability**

D.6.4.1 The Market Operator shall calculate the Actual Availability Quantity ( $qAA_{uy}$ ) for each Generator Unit for each Imbalance Settlement Period, as set out in this section 0.

**Comment [A5]:** not a top priority .  
D.6.4: May need to calculate some sort of equivalent to half hour actual availability for min output, based on real-time min output profile? Maybe needed for all units when taking negative reserves into account. Also if we're applying some sort of a negative firm access approach. Would be a change to systems to have this calculated, probably no harm to introduce it anyway as it may become useful for batteries and DDUs, but not a top priority because it only has a potential future use rather than a required current use.

F.4.2.13 The Market Operator shall calculate the Combined Loss Adjustment Factor (FCLAF<sub>vγ</sub>) for each Trading Site Supplier Unit, v, in each Imbalance Settlement Period, γ, as follows:

*If MIC > MEC, then*

$$FCLAF_{v\gamma} = 1$$

*Else*

*If  $\sum_{u \in s} QM_u \leq 0$ , then*

$$FCLAF_{v\gamma} = 1$$

*Else*

*If  $\sum_{u \in s} qCR_u \neq 0$ , then*

$$FCLAF_{v\gamma} = \frac{\sum_{u \in s} (FCLAF_{u\gamma} \times qCR_u)}{\sum_{u \in s} (qCR_u)}$$

*Else*

$$FCLAF_{v\gamma} = \text{Max}(\{FCLAF_{u\gamma}\} \forall u \in s)$$

where:

- (a) qCR<sub>u</sub> is the Registered Capacity of Generator Unit, u;
- (b) QM<sub>uγ</sub> is the Metered Quantity for Generator Unit, u, in Imbalance Settlement Period, γ;
- (c) FCLAF<sub>uγ</sub> is the Combined Loss Adjustment Factor for Generator Unit, u, in Imbalance Settlement Period, γ;
- (d)  $\sum_{u \in s}$  is a summation over all Generator Units, u, not including the Trading Unit, in the Trading Site, s, to which the Trading Site Supplier Unit is registered;
- (e) The expression  $\text{Max}(\{FCLAF_{u\gamma}\} \forall u \in s)$  denotes the highest Combined Loss Adjustment Factor (FCLAF<sub>uγ</sub>) of each Generator Unit, u, not including the Trading Unit, in the Trading Site, s, to which the Trading Site Supplier Unit is registered, in Imbalance Settlement Period, γ;
- (f) MIC is the registered Maximum Import Capacity of the site associated with the Trading Site Supplier Unit, excluding any MIC associated with a Dispatchable Demand Unit; and
- (g) MEC is the registered Maximum Export Capacity of the site associated with the Trading Site Supplier Unit.

F.4.2.14 The Market Operator shall calculate the Combined Loss Adjustment Factor ( $FCLAF_{\Omega\gamma}$ ) for each Capacity Market Unit,  $\Omega$ , in each Imbalance Settlement Period,  $\gamma$ , as follows:

If  $\sum_{u \in \Omega} qCR_u \neq 0$ , then

$$FCLAF_{\Omega\gamma} = \frac{\sum_{u \in \Omega} (FCLAF_{u\gamma} \times qCR_u)}{\sum_{u \in \Omega} (qCR_u)}$$

Else

$$FCLAF_{\Omega\gamma} = \text{Max}(\{FCLAF_{u\gamma}\} \forall u \in \Omega)$$

where:

- (a)  $qCR_u$  is the Registered Capacity of Generator Unit,  $u$ ;
- (b)  $FCLAF_{u\gamma}$  is the Combined Loss Adjustment Factor for Generator Unit,  $u$ , in Imbalance Settlement Period,  $\gamma$ ;
- (c)  $\sum_{u \in \Omega}$  is a summation over all Generator Units,  $u$ , in the Capacity Market Unit,  $\Omega$ ; and
- (d) The expression  $\text{Max}(\{FCLAF_{u\gamma}\} \forall u \in \Omega)$  denotes the highest Combined Loss Adjustment Factor ( $FCLAF_{u\gamma}$ ) of each Generator Unit,  $u$ , in the Capacity Market Unit,  $\Omega$ , in Imbalance Settlement Period,  $\gamma$ .

F.6.2.4 When calculating the value for the Accepted Bid Offer Quantity ( $qBOA_{u(i)h}(t)$ ) for the Decs resulting from the Bid Offer Acceptance, the Market Operator shall calculate the relevant variables as follows:

$$qDA_{u(i)h}(t) = \text{Min}(qD_{u(i)h}(t), qDA_{u(i-1)h}(t))$$

$$qDA_{u(i-1)h}(t) = \text{Min}(qD_{u(i-1)h}(t), qAVAILO_{uh}(t))$$

$$qD_{u(i=0)h}(t) = qFPN_{uh}(t)$$

$$qBOUR_{u(i=0)h}(t) = 0$$

**Comment [A6]:** Provision needed to ensure no bias trading in negative volumes. Unit cannot profit from trading to -30MW but only able to consume -20MW

$$qBOLR_{u(i=0)h}(t) = 0$$

## F.11 FIXED COST PAYMENTS AND CHARGES

### F.11.1 Determination of Periods of Physical Operation and Market Operation

F.11.1.1 The following provisions of section 0 do not apply to any Unit which is:

- (a) An Assetless Unit;
- (b) A Trading Unit;
- (c) An Interconnector Error Unit;
- (d) An Interconnector Residual Capacity Unit;
- (e) A Unit which has Priority Dispatch, which is not Dispatchable; or
- (f) A Generator Unit which is not Dispatchable and not Controllable.
- (g) A Dispatchable Demand Unit

### F.13.2 Calculation of Testing Charges

F.13.2.1 The Market Operator shall calculate the Testing Charge ( $C_{TEST_{uy}}$ ) for each Generator Unit,  $u$ , except for any Interconnector Error Unit and dispatchable Demand Unit,  $u$ , in each Imbalance Settlement Period,  $\gamma$ , for which it is Under Test as follows:

$$C_{TEST_{uy}} = - \text{Max}(Q_{MLF_{uy}}, 0) \times P_{TESTTARIFF_{uy}}$$

where:

- (a)  $Q_{MLF_{uy}}$  is the Loss-Adjusted Metered Quantity for Generator Unit,  $u$ , Under Test in Imbalance Settlement Period,  $\gamma$ ; and
- (b)  $P_{TESTTARIFF_{uy}}$  is the Testing Tariff Price for Generator Unit,  $u$ , Under Test in Imbalance Settlement Period,  $\gamma$ , as set out in the schedule of Testing Tariffs.

F.13.2.2 The Market Operator shall calculate the Testing Charge ( $C_{TEST_{uy}}$ ) for each Interconnector Error Unit,  $u$ , in each Imbalance Settlement Period,  $\gamma$ , for which it is Under Test as follows:

*If  $Q_{MLF_{uy}} > 0$  then*

$$C_{TEST_{uy}} = - \text{Max}(Q_{MLF_{uy}}, 0) \times P_{TESTTARIFF_{uy}}$$

else

$$C_{TEST_{uy}} = Q_{MLF_{uy}} \times P_{TESTTARIFF_{uy}}$$

where:

- (a)  $Q_{MLF_{uy}}$  is the Loss-Adjusted Metered Quantity for Interconnector Error Unit, u, Under Test in Imbalance Settlement Period,  $\gamma$ ; and
- (b)  $P_{TESTTARIFF_{uy}}$  is the Testing Tariff Price for Generator Unit, u, Under Test in Imbalance Settlement Period,  $\gamma$ , as set out in the schedule of Testing Tariffs.

F.13.2.3 The Market Operator shall calculate the Testing Charge ( $C_{TEST_{uy}}$ ) for each Dispatchable Demand Unit, u, in each Imbalance Settlement Period,  $\gamma$ , for which it is Under Test as follows:

$$C_{TEST_{uy}} = - \text{Min}(Q_{MLF_{uy}}, 0) \times P_{TESTTARIFF_{uy}}$$

where:

- (a)  $Q_{MLF_{uy}}$  is the Loss-Adjusted Metered Quantity for Generator Unit, u, Under Test in Imbalance Settlement Period,  $\gamma$ ; and
- (b)  $P_{TESTTARIFF_{uy}}$  is the Testing Tariff Price for Generator Unit, u, Under Test in Imbalance Settlement Period,  $\gamma$ , as set out in the schedule of Testing Tariffs.