European Network of
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for Electricity

ENTSO-E
AUTOMATIC FREQUENCY
RESTORATION RESERVE
PROCESS

IMPLEMENTATION GUIDE

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APPROVED DOCUMENT
VERSION 1.0

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18   **NOTE CONCERNING WORDING USED IN THIS DOCUMENT**

19   The force of the following words is modified by the requirement level of the document in which
20   they are used.

21   -   SHALL: This word, or the terms "REQUIRED" or "MUST", means that the definition is
22   an absolute requirement of the specification.

23   -   SHALL NOT: This phrase, or the phrase "MUST NOT", means that the definition is an
24   absolute prohibition of the specification.

25   -   SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist
26   valid reasons in particular circumstances to ignore a particular item, but the full
27   implications shall be understood and carefully weighed before choosing a different
28   course.

29   -   SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there
30   may exist valid reasons in particular circumstances when the particular behaviour is
31   acceptable or even useful, but the full implications should be understood and the case
32   carefully weighed before implementing any behaviour described with this label.

33   -   MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional.
34   One vendor may choose to include the item because a particular marketplace requires
35   it or because the vendor feels that it enhances the product while another vendor may
36   omit the same item. An implementation which does not include a particular option
37   MUST be prepared to interoperate with another implementation which does include the
38   option, though perhaps with reduced functionality. In the same vein an implementation
39   which does include a particular option MUST be prepared to interoperate with another
40   implementation which does not include the option (except, of course, for the feature
41   the option provides.).

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43   Revision History

Version	Release	Date	Paragraph	Comments
0.1	Draft A	2018-09-10		Initial adaption
0.2	Draft A	2019-04-18		Adaption after MC decisions
1.0				Approved by MC.

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1   Introduction

113 This document was drafted based on IEC 62325 series. In particular, the IEC 62325-450
114 methodology was applied to develop the conceptual and assembly models.

2   Scope of the PICASSO project

116 The "Platform for the International Coordination of Automated Frequency Restoration and
117 Stable System Operation" (PICASSO) is the establishment of a platform for the exchange of
118 balancing energy from aFRR in the context of EBGL implementation. The PICASSO project is
119 selected by All TSOs (in terms of EBGL) to be the reference project for such an establishment
120 of an aFRR platform.

121 The aims of the project are to permit:

- 122 • The reduction of balancing costs through the introduction of an optimization based
  123 aFRR activation;

- 124 • The increase of the available balancing energy for each TSO with positive impact on
  125 the security of supply and on the integration of renewable energy in the electric
  126 systems.

- 127 • A more efficient use of cross border interconnectors after intraday markets.

3   Scope of the IGCC project

129 The "International Grid Control Cooperation" (IGCC) is the establishment of a platform for the
130 process of imbalance netting in the context of EBGL implementation. The IGCC project is
131 selected by All TSOs (in terms of EBGL) to be the reference project for such an establishment
132 of an IN platform.

4   Scope of the Implementation Guide

134 According to real-time operational purposes, the aFRR cross-border activation process and
135 the IN process are selected by All TSOs (in terms of EBGL) to be implemented by one
136 common platform.

137 The aim of the Implementation Guide is to define normative references, dependencies and
138 communication processes for the real-time and non-real-time electronic data interchanges
139 between aFRR platform (including IN process), respective TSOs systems and the external
140 systems (e.g. ENTSO-E central Transparency platform).

141 This document is prepared by all transmission system operators (TSOs) involved in the
142 PICASSO project and this document is only applicable for multilateral TSO-TSO model with
143 common order list to exchange all balancing energy bids from all standard products for
144 frequency restoration reserves with automatic activation in accordance with Article 21 of the
145 EBGL regulation.

5   Normative references

147 The following documents, in whole or in part, are normatively referenced in this document and
148 are indispensable for its application. For dated references, only the edition cited applies. For
149 undated references, the latest edition of the referenced document (including any
150 amendments) applies.

151 IEC TS 61970-2, *Energy management system application program interface (EMS-API) –Part*
152 *2: Glossary*

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153   IEC 62325-301, *Framework for energy market communications – Part 301: Common*
154   *information model (CIM) extensions for markets*

155   IEC 62325-351, *Framework for energy market communications – Part 351: CIM European*
156   *market model exchange profile*

157   IEC 62325-450, *Framework for energy market communications – Part 450: Profile and context*
158   *modeling rules*

159   IEC 62325-451-1, *Framework for energy market communications – Part 451-1:*
160   *Acknowledgement business process and contextual model for CIM European market*

161   *IEC 62325-451-2, Framework for energy market communications – Part 451-2: Scheduling*
162   *business process and contextual model for CIM European market*

163   *IEC 62325-451-3, Framework for energy market communications – Part 451-3: Transmission*
164   *capacity allocation business process (explicit or implicit auction) and contextual model for*
165   *CIM European market*

166   *IEC 62325-451-4, Framework for energy market communications – Part 451-4: Settlement*
167   *and reconciliation business process and contextual model for CIM European market*

168   *IEC 62325-451-6, Framework for energy market communications – Part 451-6: Transparency*
169   *business process and contextual model for CIM European market*

170   IEC 62325-451-7, *Framework for energy market communications – Part 451-7: Reserve*
171   *resource business process and contextual model for CIM European market*

172   *ENTSO-E RG CE scheduling reporting process implementation guide*

173   *ENTSO-E RG CE accounting and settlement process implementation guide*

174   *ENTSO-E Manual of Procedures for central Transparency Platform v3r1*

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6   Terms and definitions

6.1   aFFR
Automatic frequency restoration reserves; the FRR that can be activated by an automatic control device (load-frequency controller) designed to regulate the Frequency Restoration Control Error (FRCE) to zero.

6.2   mFRR
Manual frequency restoration reserves; Manual FRR Full Activation Time means the time period between the set point change and the corresponding activation or deactivation of manual FRR.

6.3   RR
Replacement reserves; the reserves used to restore/support the required level of FRR to be prepared for additional system imbalances. This category includes operating reserves with activation time from Time to Restore Frequency up to hours.

6.4   IN
Imbalance netting; the IN is a real-time process of netting of aFRR Demands between the TSO in order to avoid aFRR activation in opposite direction in each LFC area.

7   The automatic frequency restoration reserve business process for standard products

7.1   General overview
The aFRR platform has a number of operational phases that are carried out throughout the day. Figure 1 gives an overview on the operational phases
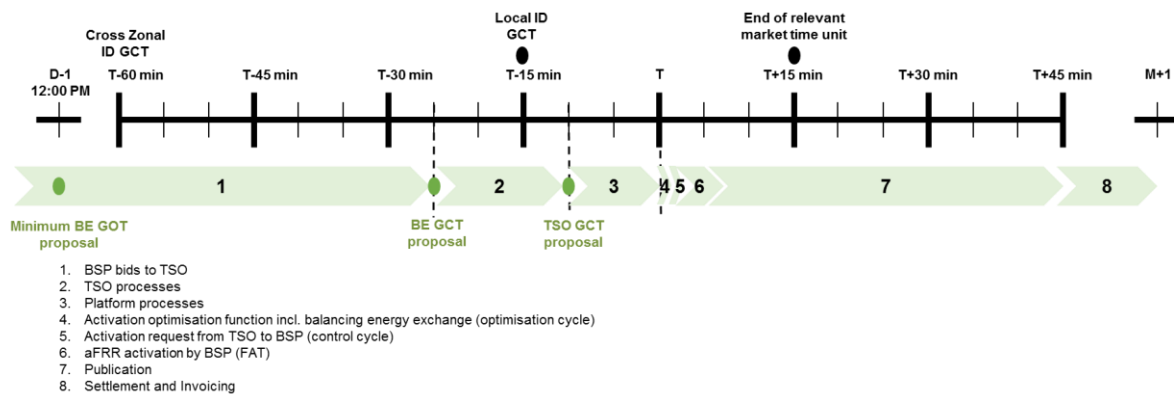
Figure 1: Automatic frequency restoration reserve process overview

The minimum balancing energy gate opening time (BEGOT) is at 12:00 pm the day before delivery (D-1). From this time on balancing service providers (BSP) may submit offers of balancing energy from aFRR to their local TSO. The TSO may define locally a BEGOT earlier than this time, according to local terms and conditions.

Cross Zonal ID GCT corresponds to the gate closure time of the Intraday cross-border market.

BSPs can submit bids to their local TSOs until the balancing energy gate closure for BSPs (BSP GCT), which is 25 minutes before delivery (t-25 min) time. Note that in case of central dispatch system BSP-GCT could be earlier. After the BSP GCT each TSO creates a local merit order list (MOL) for each of its LFC areas. From this local MOL the respective TSO can flag bids for operational security reasons or for conditional aFRR bids depending on the state of activation of previous balancing processes. Each TSO submits at the TSO energy bid

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212 submission gate closure time (TSO GCT) for each of their LFC area the corresponding local
213 MOL to the aFRR platform. The local MOL sent to the aFRR platform contains all the bids with
214 their availability status (available or unavailable). The local MOL might be sent in anticipation
215 and updated by the connecting TSO several times before the TSO GCT. In case of BSP
216 failure or conditional bids, the local TSO may still modify the bid of its local MOL (volume,
217 price, availability status of the bids) after the TSO GCT up to real time. In such a case, the
218 complete local MOL is resubmitted to the aFRR platform. By sending a complete local MOL it
219 is ensured that the local MOL used in the load-frequency controller matches the bids used in
220 the common merit order list. Together with the local MOL, the local TSO may submit
221 additional information to the aFRR platform about commonly procured, shared or exchanged
222 volume with other LFC areas or geographical region with whom the local TSO may have such
223 procurement process in place. This additional information is needed by the aFRR platform to
224 allocate appropriate priority to the bids.

225 Each TSO sends in real-time for each of the aFRR balancing borders the TSO is responsible
226 for, the corresponding aFRR cross-border capacity limit (through a capacity management
227 module when implemented). Additionally, each TSO sends in real-time for each control cycle
228 the aFRR demand for each of its LFC areas, the sum of effective aFRR activation and/or the
229 original FRCE without influence of aFRR and IN interchanges. By this the aFRR platform can
230 deduce one of the three values in case the value is not available.

231 For operational security issue, other type of limits may be provided to the aFRR platform such
232 as Profile limits or Flow monitoring limits. For Flow monitoring limits, a PTDF matrix is
233 determined and submitted to the aFRR platform in advance.

234 Before delivery the aFRR platform reads in the local MOLs for each LFC area and merges the
235 local MOLs to a common merit order list (CMOL). The CMOL can be updated even after the
236 beginning of the relevant market time unit due to modification of bids over the validity period.

237 Once merged and each time the CMOL is updated the aFRR platform sends back to local
238 TSO the CMOL for local consistency check with LMOL.

239 In real-time the aFRR platform optimizes sequentially the aFRR process and then the IN
240 process. Firstly, the distribution of the aFRR demand is optimized based on the CMOL, and
241 the aFRR cross-border capacity limits as well as profile limits and flow monitoring limits. The
242 result of the optimization is the automatic frequency restoration power interchange for each
243 aFRR balancing border and one price for each LFC area. Secondly, the corrected aFRR
244 demand is netted with the aFRR demands of the TSOs participating only to IN process, based
245 on remaining cross-border capacity limits as well as profile limits and flow monitoring limits.
246 The result of the optimization is then the imbalance netting power interchange for each IN
247 balancing border.

248 The aFRR platform also provides on each optimisation cycle the resulting FRCE and the
249 aFRR activation for local purpose for each LFC area (also called adjusted FRCE and adjusted
250 aFRR), based on the distribution of aFRR demand and effective aFRR activation for each LFC
251 area.

252 The aFRR platform sends each optimization cycle[1] a correction value for aFRR Process and a
253 correction value for IN process to each load frequency controller of the participating TSOs.

254 Each LFC automatically activates locally the aFRR taking into account the received correction
255 values.

256 At 30 minutes after the relevant market time unit, all the information required for transparency
257 reporting purposes is provided by the aFRR platform.

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[1] Optimisation cycle is defined for the aFRR Platform and shall be defined between 1 and 10 seconds

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258 **7.2   Overall business context**

259   This Implementation Guide provides the means of exchanging between all concerned parties
260   the information necessary to satisfy automatic frequency restoration reserve requirements as
261   outlined in paragraph 7.1. Figure 2 shows the sequence diagram of the PICASSO platform
262   including the linked agents (e.g. BSPs). The diagram represents the current status of
263   discussion (e.g. with the usage of a capacity management module to be implemented), other
264   options (e.g. centralized settlement agent) are possible.

265
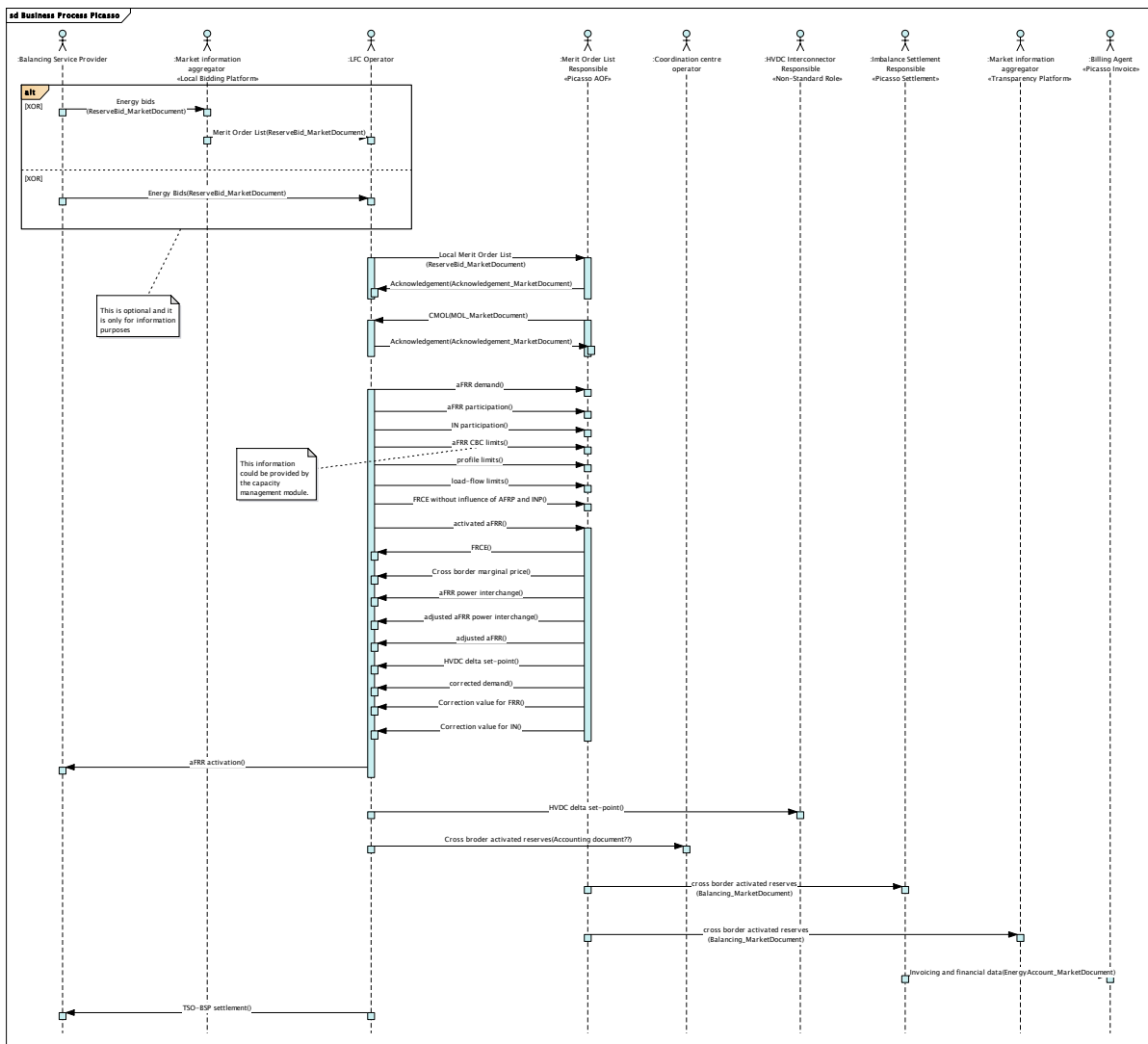
266

267   **Figure 2: The automatic frequency restoration reserve process sequence diagram**

268   The information flows are outlined in the following paragraphs.

269   **7.2.1   aFRR participation status**

270   The participating TSOs provide in real-time (on each change of state) to the aFRR platform
271   the aFRR participation status as a message. This information will be used in each
272   optimization cycle to determine which of the TSOs will be considered in the optimisation step
273   for aFRR.

274   Note: in return the aFRR Platform provides the status of online service of aFRR Process.

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275 **7.2.2   Imbalance netting participation status**

276   The participating TSOs provide in real-time (on each change of state) to the aFRR platform
277   the imbalance netting participation status as a message. This information will be used in each
278   optimization cycle to determine which of the TSOs will be considered in the optimisation step
279   for aFRR.

280   Note: in return the aFRR Platform provides the status of online service of IN Process.

281

282   **7.2.3   aFRR cross-border capacity limits**

283   The participating TSOs provide in real-time (each control cycle[2]) (through a capacity
284   management module when implemented) to the aFRR platform the aFRR cross-border
285   capacity limits for each of the aFRR balancing border the TSO is responsible for, as the
286   export and the import limit. For each limit one data point. The range of values is [0 ... inf].
287   This information will be used in each optimization cycle for the calculation of the automatic
288   frequency restoration power interchange. aFRR balancing borders are defined positive in
289   either North-South- or East-West-direction depending on geographical orientation. The default
290   aFRR cross-border capacity limit for each border is given by the IT limitation, which is set by
291   the IT system.

292   **7.2.4   Profile limits**

293   In real-time (each control cycle) each TSO provides the profile limits for import and export for
294   each of their LFC area(s) to the aFRR platform as a data point. The range of the profile limit is
295   [0...inf].

296   **7.2.5   Load-flow limits**

297   In real-time (each control cycle) each TSO provides for each of its defined corridors the
298   relevant lower and upper load-flow limits to the aFRR platform. One data point for the lower
299   load-flow limit and one data point for the upper load-flow limit. The range of the lower load-
300   flow limit is [0...inf]. The range of the upper load-flow limit is [0...inf]. aFRR load-flow corridors
301   are defined positive in either North-South- or East-West-direction depending on geographical
302   orientation.

303   **7.2.6   Local MOLs**

304   Before TSO GCT the TSO provide for each of their LFC area(s) a local MOL to the aFRR
305   platform. The local MOL might be updated after the TSO-GCT due to operational security
306   reasons or conditional bids. The local MOL may contain additional information to the aFRR
307   platform about commonly procured, shared or exchanged volume with other LFC areas or
308   geographical region for which the local TSO may have such procurement process in place.
309   This additional information is needed by the aFRR platform to guarantee prior access to local
310   reserves.

311   **7.2.7   Power transfer distribution factor (PTDF)**

312   Before each validity period PTDF tool provides the PTDF to the aFRR platform

313   **7.2.8   aFRR demand**

314   In real-time (each local control cycle) each TSO provides the aFRR demand of each of their
315   LFC area(s) to the aFRR platform as a data point. The aFRR demand is defined as the sum of
316   the already activated aFRR and the FRCE without the influence of the intended exchange of
317   balancing energy resulting from the cross-border aFRP or INP. The sign convention for aFRR
318   demand is: negative value where the LFC area is in power surplus and indicates that
319   downward aFRR balancing energy needs to be activated; and positive value where the LFC
320   area is in power deficit and indicates that upward aFRR balancing energy needs to be

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[2] Control cycle may differ from optimization cycle

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321 activated. For avoidance of doubt, all aFRR demands are aFRR inelastic demands. The range
322 for the aFRR demand is [-inf...inf].

7.2.9 Activated aFRR

324 In real-time (each local control cycle) each TSO provides the activated aFRR of each of their
325 LFC area(s) to the aFRR platform as a data point. The sign convention for activated aFRR is:
326 negative value where the LFC area activates downward aFRR, positive value where the LFC
327 area activates upward aFRR.

328 Alternatively, the FRCE without the influence of cross-border aFRP and INP shall be provided
329 in real-time (each local control cycle) by TSO for their LFC area(s) as a data point.

7.2.10 Correction values

331 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
332 participating TSO one correction value for aFRR and one correction value for IN of the
333 respective LFC area. The sign convention for the correction values is: negative value where
334 the LFC area imports power from the platform, positive value where the LFC area exports
335 power to the platform.

336 Note; the aFRR platform may also send the position component of the aFRR correction value
337 split into 4 positions between upward and downward, import and export of aFRR.

7.2.11 XBMP

339 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
340 participating TSO the cross-border marginal price applicable for the respective LFC area(s).
341 The XBMP is used to remunerate the BSP for activating aFRR.

342 The XBMP is also used for TSO-TSO settlement purpose.

7.2.12 Automatic frequency restoration power interchange

344 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
345 participating TSO the automatic frequency restoration power interchanges of the aFRR
346 balancing borders adjacent to the respective LFC area. The sign convention is: negative value
347 where the aFRR power interchange is in the opposite of the defined direction of the respective
348 aFRR balancing border, positive value where the flow is in the same direction as the defined
349 direction of the respective aFRR balancing border.

7.2.13 Imbalance netting power interchange

351 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
352 participating TSO to the IN process the imbalance netting power interchanges of the IN
353 balancing borders adjacent to the respective LFC area. The sign convention is: negative value
354 where the IN power interchange is in the opposite of the defined direction of the respective IN
355 balancing border, positive value where the flow is in the same direction as the defined
356 direction of the respective IN balancing border.

357

7.2.14 Adjusted aFRR power interchange

359 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
360 participating TSO the adjusted and netted aFRR power interchange to the respective LFC
361 area as a data point. The adjusted aFRR power interchange is the estimation of actual import
362 or export for the respective LFC area based on the activated aFRR. The sign convention is:
363 negative value where the LFC area imports power from the platform, positive value where the
364 LFC area exports power to the platform.

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365 ### 7.2.15 Adjusted aFRR for local purpose

366 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
367 participating TSO the adjusted aFRR corresponding to the aFRR activation for local purpose
368 of the LFC area(s). The sign convention is: positive value where upward aFRR is activated for
369 local purpose, negative value where downward aFRR is activated for local purpose.

370 ### 7.2.16 FRCE

371 The aFRR platform sends in real-time (each optimization cycle) to each LFC area of the
372 participating TSO the FRCE to the respective LFC area as a data point. The sign convention
373 is: positive value where the LFC area is in power surplus and indicates that downward aFRR
374 balancing energy needs to be activated; and negative value where the LFC area is in power
375 deficit and indicates that upward aFRR balancing energy needs to be activated.

376 ### 7.2.17 Corrected demand

377 The aFRR platform provides in real-time (each optimization cycle) the respective corrected
378 demand to the corresponding LFC area. The sign convention is: negative value where the
379 LFC area is in power surplus and indicates that downward aFRR balancing energy needs to
380 be activated; and positive value where the LFC area is in power deficit and indicates that
381 upward aFRR balancing energy needs to be activated. The corrected demand might be used
382 in local TSO system for dynamic limitation of the LFC output.

383 ### 7.2.18 HVDC delta set-point

384 The aFRR platform send in real-time (each optimization cycle) a HVDC delta set-point for
385 each HVDC to the responsible participating TSOs as a data point. The sign convention is:
386 negative value where the aFRR power interchange is in the opposite of the defined direction
387 of the respective aFRR balancing border, positive value where the flow is in the same
388 direction as the defined direction of the respective aFRR balancing border.

389 ### 7.2.19 aFRR cross-border activated reserves

390 The correction values for aFRR and for IN are directly used by the TSO to determine intended
391 aFRR cross-border exchanges through the usage of virtual tie lines. aFRR energy exchanges
392 are matched according to common standard accounting and settlement process. Once
393 matched intended aFRR exchanges are sent by the TSO to their Coordination Center.

394 ### 7.2.20 Invoicing and financial data

395 The aFRR platform provides the relevant information for financial settlement to the TSO-TSO
396 settlement function that will carry out financial settlement between the TSOs for aFRR
397 process and IN process.

398 ### 7.2.21 Transparency reporting

399 The aFRR platform submits clearing prices, all energy balancing bids and an aggregation of
400 all energy balancing bids to the ENTSO-E central transparency platform for publication.

401 ## 7.3 Business rules – Non-real-time

402 ### 7.3.1 General rules

403 For each electronic data interchange defined in this document, an acknowledgement
404 document, as defined in IEC 62325-451-1, should be generated either accepting the whole
405 received document or rejecting it completely.

406 ### 7.3.2 Dependencies governing the reserve bid document

407 The reserve bid document is used to provide the local merit order of each TSO to the
408 platform. For each validity period a new common MOL document is then created as a merge
409 of the individual local TSO reserve bid documents of the same validity period. Table 1
410 provides the dependencies for the MOL document.

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411   **Table 1 - Local MOL export interface description**

		OFFER	XSD requirements
ReserveBid_MarketDocument			
mRID	Unique identification of the Bid Document	Used	Mandatory
revisionNumber	Initial transmission shall equal "1"	Used	Mandatory
type	A37 = Reserve Bid document	Used	Mandatory
process.processType	A51 = automatic frequency restoration reserves (aFRR)	Used	Conditional
sender_MarketParticipant.mRID	EIC of the transmitting TSO	Used	Mandatory
sender_MarketParticipant.marketRole.type	A04 = System Operator	Used	Mandatory
receiver_MarketParticipant.mRID	EIC of common platform operator	Used	Mandatory
receiver_MarketParticipant.marketRole.type	A35 = MOL responsible	Used	Mandatory
createdDateTime	Date and time of document creation	Used	Mandatory
reserveBid_Period.timeInterval	Validity period start time & validity period end time. The duration of the delivery period (initially 15 minutes)	Used	Mandatory
domain.mRID	EIC of PICASSO region	Used	Mandatory
subject_MarketParticipant.mRID	EIC of the transmitting TSO	Used	Mandatory
subject_MarketParticipant.marketRole.type	A04 = System Operator	Used	Mandatory

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BidTimeSeries		Offer	Shared or exchanged volume	
mRID	Unique identification of the bid assigned by the transmitting TSO	Used	Used	Mandatory
businessType	B74 = Offer BXX = Shared volume BYY = Exchanged volume	B74 = Offer	BXX = Shared volume BYY = Exchanged volume	Mandatory
divisible	A01 = quantity may be reduced to the minimum activation quantity by increments of the StepIncrementQuantity A02 = No reduction possible on the quantity	A01	A01	Mandatory
linkedBidsIdentification	The identification used to associate bids that are to be linked together. If one bid is accepted then all others with the same identification must also be accepted. If the bid is not linked then the attribute is not used.	Not used	Not used	Conditional
multipartBidIdentification	The identification used to associate multipart bids. If bid with flowDirection.direction=A01 (Up) is accepted then all associated bids with inferior price must also be accepted. If bid with flowDirection.direction=A02 (Down) is accepted then all associated bids with superior price must also be accepted. If the bid is not multipart then the attribute is not used.	Not used	Not used	Conditional
exclusiveBidsIdentification	The identification used to associate exclusive bids. If bid is accepted then all others with same	Not used	Not used	Conditional

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	identification shall be ignored. If the bid is not exclusive then the attribute is not used.			
blockBid	Not used. Redundant due to the existence of Divisible attribute.	Not used	Not used	Optional
status	A06 = Available A11 = No longer available Associated multipart, linked and exclusive bids must have the same status.	Used	Not used	Conditional
priority	A sequential number indicating the priority of the bid in relation to other bids	Not used	Not used	Conditional
stepIncrementQuantity	Not used. For divisible offers the input step increment has been harmonised to 1 MW.	Not used	Not used	Conditional
energyPrice_Measure_Unit.name	MWH = Megawatt hours	MWH	Not used	Conditional
connecting_Domain.mRID	For offers it corresponds to the EIC identification of the sending TSO's LFC area providing the reserves. For shared/exchanged volume it corresponds to EIC identification of the TSO's LFC area or the region the reserved volume is shared/exchanged to.	Used	Used	Mandatory
price_Measure_Unit.name	MWH = Megawatt hours. This unit of measure is only provided in the case of a need where there is a price in the point class. Otherwise it is not used	Not Used	Not used	Conditional
minimum_ConstraintDuration.duration	Not used	Not used	Not used	Conditional
currency_Unit.name	EUR = Euro. This currency is only	Used	Not used	Conditional

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	provided in the case of a need where there is a price in the point class. Otherwise it is not used.			
marketAgreement.type	The type of the market agreement	Not used	Not used	Conditional
marketAgreement.mRID	Identification of the agreement with the resource provider	Not used	Not used	Conditional
marketAgreement.createdDateTime	Time stamp used to identify the date and time that a specific offer was received.	Not used	Not used	Conditional
provider_MarketParticipant.mRID	The balance service provider (BSP) identification.	May be used	Not used	Conditional
acquiring_Domain.mRID	For offers it corresponds to the EIC identification of the region. For needs it corresponds to the EIC identification of the sending TSO's scheduling area or control area. For offers it corresponds to the EIC identification of the PICASSO region. For shared/exchanged volume it corresponds to EIC identification of the sending TSO's LFC area or region the reserve volume is shared/exchanged to.	region	TSO's LFC area, or LFC Block or common exchanged or shared region	Mandatory
quantity_Measure_Unit.name	MAW = Megawatts	Used	Used	Mandatory
resting_ConstraintDuration.duration	Not used	Not used	Not used	Conditional
maximum_ConstraintDuration.duration	Not used	Not used	Not used	Conditional
registeredResource.mRID	The identification of the resource used to provide the reserves	Not used	Not used	Conditional
activation_ConstraintDuration.duration	Not used	Not used	Not used	Conditional

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flowDirection.direction	A01 = UP A02 = DOWN Refer to the price payment table for use in relation to price.	Used	Used	Mandatory
Auction.mRID	Constant value of "AUCTION-aFRR". It identifies that the bid refers to the auction specifications for an aFRR tender. Other values may be added as the aFRR process further evolves.	Used	Used	Mandatory
validity_Period.timeInterval	The period when the bid can be activated	Not used	Not used	Optional
standard_MarketProduct.marketProductType	Used when the bid refers to a standard product or a specific product that has been converted into a standard product: A01 = Standard product	Used	Not used	Conditional
original_MarketProduct.marketProductType	Used when the bid refers to a specific product or a specific product that has been converted into a standard product: A02 = Specific product A03 = Integrated scheduling process	May be used	Not used	Conditional

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Period				
timeInterval	A time interval within the validity period.	Used	Used	Mandatory
resolution	PT15M	Used	Used	Mandatory

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Point				
position	Position within the time interval	Used	Used	Mandatory
quantity.quantity	Quantity offered or needed with 1 MW precision.	Quantity offered	Quantity shared or exchanged	Mandatory
minimum_Quantity.quantity	Required if divisible = A01. Precision is 1 MW.	Not used	Not used	Conditional
price.amount	Not used	Not used	Not used	Conditional
Energy_Price.amount	The price of the activated energy product. Precision is 0.01. Note: Refer to the Price payment table for establishing who is paid.	Used	Not used	Conditional

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420 **Table 2 - CMOL export interface description**

		OFFER	XSD requirements
MeritOrderList_MarketDocument			
mRID	Unique identification of the MOL Document	Used	Mandatory
revisionNumber	Initial transmission shall equal "1"	Used	Mandatory
Type	A43 = MOL document (used for the CMOL submitted by the connecting TSO) A66 = Final MOL (used for CMOL provided by TSO once delivery period is closed)	Used	Mandatory
process.processType	A48 = Automatic frequency restoration reserves (mFRR)	Used	Conditional
sender_MarketParticipant.mRID	EIC of the common Operator	Used	Mandatory
sender_MarketParticipant.marketRole.type	A04 = System operator A35 = MOL responsible	Used	Mandatory
receiver_MarketParticipant.mRID	EIC of the Transmission System Operator	Used	Mandatory
receiver_MarketParticipant.marketRole.type	A04 = System operator A35 = MOL responsible	Used	Mandatory
createdDateTime	Date and time of document creation	Used	Mandatory
Period.timeInterval	The duration of the delivery period (15 minutes)	Used	Mandatory
domain.mRID	EIC of the region (PICASSO region has to be created)	Used	Conditional

421

BidTimeSeries			
marketAgreement.mRID	Identification of the offer or the need as defined in the receiving TSO submission.	Used	Mandatory
MarketAgreement_createdDateTime	The timestamp of when the bid was received	Not used	Conditional
priority	A sequential number indicating the priority of the bid in relation to other bids.	Not used	Conditional
resourceProvider_MarketParticipant.mRID	The balance service provider (BSP) identification.	May be used	Conditional

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registeredResource.mRID	The identification of the resource used to provide the reserves.	May be used	Conditional
acquiring_Domain.mRID	For offers it corresponds to the EIC identification of the region. For needs it corresponds to the EIC identification of the receiving TSO's control area or scheduling area.	region	Mandatory
connecting_Domain.mRID	for offers it corresponds to the EIC identification of the receiving TSO's scheduling area providing the reserves. for needs it corresponds to the EIC identification of the region providing the reserves	Receiving TSO's bidding zone	Mandatory
auction.mRID	Identification of auction as defined in the reserve bid document.	Used	Mandatory
businessType	B74 = Offer	B74 = Offer	Mandatory
bid_Period.timeInterval	The duration of the delivery period (15 minutes)	Used	Mandatory
quantity_Measure_Unit.name	MAW = Megawatts	Used	Mandatory
currency_Unit.name	EUR = Euro	Used	Conditional
price_Measurement_Unit.name	MWH = Megawatt hours	Used	Conditional
energyPrice_Measurement_Unit.name	MWH = Megawatt hours	Not used	Conditional
direction	A01 = UP A02 = DOWN Refer to the price payment table for use in relation to price.	Used	Mandatory

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minimumActivation_Quantity.quantity	The minimum quantity that can be activated	Not used	Conditional
stepIncrement_Quantity.quantity	Not used. the output step increment has been harmonised to 0.1 MW.	Not used	Conditional
marketObjectStatus.status	A06 = available (the offer has not been required) AXX = unavailable or restricted or filtered shall be created	A06 = available AX = unavailabl e	Mandatory

422
423

Period			
timeInterval	A time interval of the length of the delivery period (initially 1 hour)	Used	Mandatory
resolution	PT15M	Used	Mandatory

424
425

Point			
position	Position within the time interval	Used	Mandatory
quantity.quantity	Quantity offered or needed	Quantity offered	Mandatory
price.amount	The price for activating the product	Not used	Conditional
Energy_Price.amount	The price of energy	Used when offer accepted	Conditional
activated_Quantity.quantity	Quantity activated	Not used	Conditional

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Reason (associated with time series)		May be used	Conditional
code	A95 = Complementary information	Used	
text	Textual information provided by the TSO	May be used	

428

7.3.3   PTDF Import

430   The PTDF files are csv-files with the following structure

431

432   Validity period; version number;
433   # Nr; # From; # To; # Name; # LFC name 1; # LFC name 2; # LFC name n;
434   ;;;;LFC name 1;LFC name 2;LFC name n;
435   1;LFC name 1;LFC name 2;name of corridor 1;PTDF 1_1; PTDF 1_2; PTDF 1_n
436   2;LFC name 1;LFC name n;name of corridor 2;PTDF 2_1; PTDF 2_2; PTDF 2_n
437   m;LFC name 2;LFC name n;name of corridor m;PTDF m_1; PTDF m_2; PTDF m_n

438

439   New PTDF files can be imported every 15 minutes.

440

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442 **7.3.4   Dependencies governing the Balancing_MarketDocument**

443 The balancing market document covers requirements for transmission of the clearing prices
444 from the common platform to TSOs and the ENTSO-E transparency platform per imbalance
445 settlement period. The same document will also be used for transmitting to the ENTSO-E
446 transparency platform the aggregated balancing energy bids.

447 Table 3 provides the dependencies for the balancing market document when the common
448 platform sends clearing prices to the ENTSO-E transparency platform.

449 **Table 3 - Balancing market document dependency table (submission of clearing prices**
450 **to transparency platform)**

		Use	XSD requirements
Balancing_MarketDocument			
mRID	Unique identification of the balancing market Document	Used	Mandatory
revisionNumber	Initial transmission shall equal "1"	Used	Mandatory
type	A84 = activated balancing price	Used	Mandatory
process.processType	A16 = Realised	Used	Mandatory
sender_MarketParticipant.mRID	EIC of the PICASSO Operator	Used	Mandatory
sender_MarketParticipant.marketRole.type	A35 = MOL responsible	Used	Mandatory
receiver_MarketParticipant.mRID	10X1001A1001A450 = EIC of the ENTSO-E transparency platform	Used	Mandatory
receiver_MarketParticipant.marketRole.type	A32 = Market information aggregator	Used	Mandatory
createdDateTime	Date and time of document creation	Used	Mandatory
docStatus	A01 = Intermediate A02 = Final	Not used	Conditional
controlArea.Domain.mRID	Scheduling area described by the document	Used	Conditional
Period.timeInterval	The duration of the delivery period covered by the document.	Used	Mandatory
allocationDecision_DateAndOrTime	Date and time when the decision on allocation was made	Not used	Optional

		Use	XSD requirements
TimeSeries			
mRID	Unique identification of the time series	Used	Mandatory
businessType	A12 = secondary control	Used	Mandatory
curveType	A01 = Sequential fixed block	Used	Conditional
cancelledTS	If the data for a time series has been cancelled this attribute shall be specified with A02 = Yes	Not used	Conditional
quantity_Measure_Unit.name	MAW = Megawatts	Not used	Conditional
mktPSRType.psrType	Identification of the source type of the reserve	Not used	Conditional
acquiring_Domain.mRID		Not used	Conditional
price_Measure_Unit.name	MWH= Megawatt hours	Used	Conditional
connecting_Domain.mRID		Not used	Conditional
currency_Unit.name	EUR = Euro	Used	Conditional
flowDirection.direction	A01 = Up A02 = Down	Used	Conditional

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type_MarketAgreement.type	Identification of the procurement time unit.	Not used	Conditional
standard_MarketProduct.marketProductType	Used when the reported quantities refer to standard products: A01 = Standard product	Used	Conditional
original_MarketProduct.marketProductType	Used when the reported quantities refer to specific products: A02 = Specific product	Not used	Conditional

451

Series_Period			
timeInterval	A time interval equivalent to the delivery period	Used	Mandatory
resolution	PT15M or PT1M (or PT1S if optimisation cycle data shall be provided)	Used	Mandatory

Point			
position	Position within the time interval	Used	Mandatory
quantity	The accepted offer quantity identified for a point.	Not used	Conditional
secondaryQuantity	The activated quantity	Not used	Conditional
activation_Price.amount	The activation price for the quantity of reserve.	Used	Conditional
procurement_Price.amount	The procurement price for the quantity of reserve.	Not used	Conditional
min_Price.amount	The minimum price for the reserve	Not used	Conditional
max_Price.amount	The maximum price for the reserve	Not used	Conditional
imbalance_Price.amount	The imbalance price for the quantity of reserve.	Not used	Conditional
imbalance_Price.category	Identification whether the imbalance price is due to excess or insufficient balance.	Not used	Conditional
flowDirection.direction	A01 = Up A02 = Down	Not used	Conditional
unavailable_Quantity	The unavailable quantity	Not used	Conditional

Financial_Price (associated with Point)		Not used	Conditional
amount		Not used	Mandatory
Direction		Not used	Conditional

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454 **7.3.5   Dependencies governing the EnergyAccount_MarketDocument**

455 The energy account document is used by the common platform to provide the invoicing
456 financial information for the reserves that have been replaced. The document is used in two
457 cases:

458   1. To provide the financial settlement of the net positions and/or for the aFRR balancing
459   borders;

460   2. To provide the congestion income;

461 Table 4 provides the dependencies for the energy account market document.

462 **Table 4 - Energy account market document dependency table**

		Use	**XSD requirements**
EnergyAccount_MarketDocument			
mRID	Unique identification of the Energy Account market Document	Used	Mandatory
revisionNumber	Initial transmission shall equal "1"	Used	Mandatory
Type	A12 = Imbalance report	Used	Mandatory
docStatus	A02 = Final	Used	Mandatory
process.processType	A06 = Imbalance settlement	Used	Mandatory
process.ClassificationType	A01 = Detail type	Used	Mandatory
sender_MarketParticipant.mRID	EIC of the common platform Operator	Used	Mandatory
sender_MarketParticipant.marketRole.type	A35 = MOL responsible	Used	Mandatory
receiver_MarketParticipant.mRID	EIC of the settlement billing agent	Used	Mandatory
receiver_MarketParticipant.marketRole.type	A10 = Billing agent	Used	Mandatory
createdDateTime	Date and time of document creation	Used	Mandatory
Period.timeInterval	The duration of the settlement period	Used	Mandatory
domain.mRID	EIC of the region	Used	Conditional

463

TimeSeries			
mRID	Unique identification of the time series	Used	Mandatory
businessType	A24 Total trade where the time series covers financial values; B10 = Congestion income; C03 = price divergence; B76 = Opportunity costs or benefits (settlement of inelastic need netting); B77 = Financial compensation or penalties	Used	Mandatory
product	8716867000016 = Active power	Used	Mandatory
objectAggregation	A01 = Area	Used	Mandatory
area_Domain.mRID	EIC identification of the control area	Used	Mandatory
MarketParticipant.mRID	identification of TSO responsible for the area	Used	Conditional
marketAgreement.mRID	Identification of the reserve contract	Not used	Conditional
measure_Unit.name	MWH = Megawatts hours	Used	Mandatory
currency_Unit.name	EUR = Euro	Used	Conditional

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marketEvaluationPoint.mRID	Identification of an accounting point	Not used	Conditional

464

Series_Period			
timeInterval	A time interval of the settlement period	Used	Mandatory
resolution	PT15M	Used	Mandatory

Point			
position	Position within the time interval	Used	Mandatory
In_Quantity.quantity	Quantity going into an area	Used	Mandatory
In_Quantity.quality	The quality of the quantity	Not used	Conditional
out_Quantity.quantity	Quantity going out of an area	Used	Mandatory
Out_Quantity.quality	The quality of the quantity	Not used	conditional
price.amount	settlement amount. This represents the total financial value for the point in respect to the time series businessType. The value may be negative.	Used	Conditionel

465 Note: The in quantity and out quantity represent a netted value consequently one of the
466 values must always be equal to zero.

Reason (associated with Point)		Not used	**Conditional**

467 ### 7.3.6   Financial amount table

468 Table 5 indicates the domain owner that should pay the amount indicated.

469   **Table 5 - Financial amount table**

Price.amount	Settlement amount	>0	<0
Which party pays		TSO	common platform

470 ### 7.4   Business rules – Real-time

471 Real-time communication is done via dedicated communication lines. Each TSO has to build
472 at least two independent lines. One to the main site and one hot standby to the backup site.

473 Real-time communication via COMO network is being to be investigated.

474 The communication speed is at least 9600 bit/s.

475 The platform supports the following protocols:

476 • IEC 60870-5-101

477 • IEC 60870-5-104

478 • IEC 60870-6 TASE.2

479 The TSO may choose only one of those three protocol for exchanging information with the
480 aFRR platform.

481 ### 7.4.1   Process Data Exchange via IEC 60870-6 TASE.2

482 The system must support the TASE.2 conformance blocks listed in Table 3:

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483 **Table 1 – TASE.2 conformance blocks**

Conformance block	Description
Block 1	Basic services DataValue, DataSet and DataSet-TransferSet-items
Block 2	Enhanced status monitoring Allows sending of data points from the server to the client on change ('Report-by-Exception')
Block 4	Messages Sends freely definable data blocks from the server to the client This block is not needed for exchanges of data between TSO and aFRR Platform. This block might be used for internal operation of the Platform.
Block 5	Device control General interface for setting commands and set point specification (e.g. device occupancy with timeout monitoring 'Select-before-Operate') This block might be needed for HVDC operations.
Block 8	Plans, matrices Tables as data type, special types for delivery scheduling, transmission links etc. This block is not needed for exchanges of data between TSO and aFRR Platform. This block might be used for internal operation of the Platform.

484 It is possible to determine whether the system works as master or slave for each partner
485 control centre.

486 The partner control centres are redundantly connected via both system locations.

487 Connection to redundant structures of the partner control centre must be possible.

488 For direct file exchange, the platform allows the transfer of larger amounts of information
489 using block 4 (splitting and joining).

490 The parametrisation of the data to be exchanged via this interface takes place at a central
491 point.

492 Secured communication in accordance with IEC 62351 must be possible for the IEC 60870-6
493 TASE.2 protocol.

494 **7.4.2   Process Data Exchange via IEC 60870-5-101**

495 The system supports the IEC 60870-5-101 slave protocol, which allows the reception of data
496 from IEC 60870-5-101 substations or external systems via a dedicated serial line.

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497 The system supports the IEC 60870-5-101 master protocol, which allows data to be sent to
498 external systems via a dedicated serial line.

499 The system supports the IEC 60870-5-101 dual mode, which allows data to be sent to and the
500 reception of data via the same serial line.

501 ### 7.4.3   Process Data Exchange via IEC 60870-5-104

502 The system supports the IEC 60870-5-104 slave protocol, which allows the reception of data
503 from IEC 60870-5-101 substations or external systems via a dedicated serial line.

504 The system supports the IEC 60870-5-104 master protocol, which allows data to be sent to
505 external systems via a dedicated serial line.

506 For incoming telegrams, it is checked whether the telemetry address matches the IP address
507 of the sending components or the sending system. Otherwise, the telegram is discarded and a
508 message generated.

509 Secured communication in accordance with IEC 62351 for the IEC 60870-5-104 protocol is
510 used.

511

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8   Contextual and assembly models

8.1   Reserve bid document

The contextual and assembly models for the reserve bid document shall be based on the equivalent models as defined in urn:iec62325.351:tc57wg16:451-7:reservebiddocument:7:1.

8.2   Energy account market document

The contextual and assembly models for the energy account market document shall be based on the equivalent models as defined in urn:iec62325.351:tc57wg16:451-4:energyaccountdocument:4:0.

8.3   Balancing market document

The contextual and assembly models for the balancing market document shall be based on the equivalent models as defined in urn:iec62325.351:tc57wg16:451-6:balancingdocument:4:0.

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524 **9 XML schema**

525 All XML schemas for the automated frequency restoration reserve process are available for
526 download from the ENTSO-E website.

527