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Title : IEC 62325-451-4:

Framework for energy market communications - Part 451-4: Settlement and reconciliation business process, contextual and assembly models for European market

Introductory note

-

**ATTENTION
IEC – CENELEC
PARALLEL VOTING**

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) for an International Standard is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FRAMEWORK FOR ENERGY MARKET COMMUNICATIONS –

Part 451-4: Settlement and reconciliation business process, contextual and assembly models for European market

FOREWORD

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International Standard IEC 62325-451-4 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) To remove the attributes “quantity” and “secondary quantity” of the class “Point”;
- b) To introduce the class “Quantity” from IEC 62351-351 UML package, with the following attributes “quantity” as mandatory and “quality” as optional, and create two association 1..1 between the class “Quantity” and the class “Point” with the role “In_Quantity” and “Out_Quantity”.

55 c) To introduce the class “Reason” from IEC 62351-351 UML package, with the following
 56 attributes “code” as mandatory and “text” as optional, and create an association 0..* from
 57 the class “Reason” to the class “Point” with the role “Reason”.

58 The text of this standard is based on the following documents:

CDV	Report on voting
57/XXXX/CDV	57/XXXX/RVC

59
 60 Full information on the voting for the approval of this standard can be found in the report on
 61 voting indicated in the above table.

62 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

63 A list of all parts in the IEC 62325 series, published under the general title *Framework for*
 64 *energy market communications*, can be found on the IEC website.

65 The committee has decided that the contents of this publication will remain unchanged until
 66 the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data
 67 related to the specific publication. At this date, the publication will be

- 68 • reconfirmed,
- 69 • withdrawn,
- 70 • replaced by a revised edition, or
- 71 • amended.

72

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

73

74 Document history

75 Any person intervening in the present document is invited to complete the table below before
 76 sending the document elsewhere. The purpose is to allow all actors to see all changes
 77 introduced and the intervening persons.

78 Any important message to IEC editors should also be included in the table below.

Name of intervening person	Document received		Brief description of the changes introduced	Document sent	
	From	Date		To	Date
IEC	Editorial	2016-04-07	Send the original MS Word file of Edition 1	Project team	2016-04-07
Louise Anderson	Project leader	2016-04-07	Following review of the document, draft the CDV version of IEC 62325-451-4 Ed.2	IEC TC57	2016-05-13
M. Noeth	M. Monti	2016-05-13	CDV document	CO	2016-06-14

79

80 This table will be removed by IEC editors before FDIS circulation (in case of IS) or before final
 81 publication (in case of TS or TR).

82

83

84

INTRODUCTION

85 This standard is one of the IEC 62325 series which define protocols for deregulated energy
86 market communications.

87 The principal objective of the IEC 62325 series of standards is to produce standards which
88 facilitate the integration of market application software developed independently by different
89 vendors into a market management system, between market management systems and
90 market participant systems. This is accomplished by defining message exchanges to enable
91 these applications or systems access to public data and exchange information independent of
92 how such information is represented internally.

93 The common information model (CIM) specifies the basis for the semantics for this message
94 exchange.

95 The European style market profile is based on different parts of the CIM IEC standard. The
96 CIM is defined through a series of standards, i.e. IEC 62325-301, IEC 61970-301 and
97 IEC 61968-11 standards.

98 This document provides for the European style market profile the settlement and
99 reconciliation business process that can be used throughout a European style market. This
100 standard was originally based upon the work of the European Transmission System Operators
101 (ETSO) Task Force EDI (Electronic Data Interchange) and then on the work of the European
102 Network of Transmission System Operators (ENTSO-E) Working Group EDI.

103 This document describes the settlement and reconciliation process for wholesale markets; it is
104 brought to the attention of the reader that it is envisaged to initiate work on a combined
105 reconciliation process for retail and wholesale markets.

106

FRAMEWORK FOR ENERGY MARKET COMMUNICATIONS –

Part 451-4: Settlement and reconciliation business process, contextual and assembly models for European market

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114 **1 Scope**

115 Based on the European style market profile (IEC 62325-351), this part of IEC 62325-451
116 specifies a package for the settlement and reconciliation business process and the associated
117 document contextual model, assembly model and XML schema for use within European style
118 markets.

119 The relevant aggregate core components (ACCs) defined in IEC 62325-351 have been
120 contextualised into aggregated business information entities (ABIEs) to satisfy the
121 requirements of this business process. The contextualised ABIEs have been assembled into
122 the relevant document contextual models. Related assembly models and XML schema for the
123 exchange of information between market participants are automatically generated from the
124 assembled document contextual models.

125 This International Standard provides a uniform layout for the transmission of aggregated data
126 in order to settle the electricity market. It is however not the purpose of this International
127 Standard to define the formula to be taken into account to settle or reconcile a market. The
128 purpose of this standard is only to enable the information exchange necessary to carry out the
129 computation of settlement and reconciliation.

130 The settlement process or reconciliation process is the way to compute the final position of
131 each market participant as well as its imbalance amounts.

132 This new edition of IEC 62325-451-4 contains a new optional class and associations required
133 to comply with new business development for European style market. In particular, the
134 following changes have been made:

- 135 • To remove the attributes “quantity” and “secondary quantity” of the class “Point”;
- 136 • To introduce the class “Quantity” from IEC 62351-351 UML package, with the following
137 attributes “quantity” as mandatory and “quality” as optional, and create two association
138 1..1 between the class “Quantity” and the class “Point” with the role “In_Quantity” and
139 “Out_Quantity”.
- 140 • To introduce the class “Reason” from IEC 62351-351 UML package, with the following
141 attributes “code” as mandatory and “text” as optional, and create an association 0..* from
142 the class “Reason” to the class “Point” with the role “Reason”.

143 **2 Normative references**

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

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

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

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

154 IEC 62325-450:2013, *Framework for energy market communications – Part 450: Profile and*
155 *context modelling rules*

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

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

160 IEC 62361-100, *Power systems management and associated information exchange –*
161 *Interoperability in the long term – Part 100: CIM profiles to XML schema mapping*¹

162 **3 Terms and definitions**

163 For the purposes of this document, the terms and definitions of IEC TS 61970-2 apply, as well
164 as the following.

165 NOTE Refer to IEC 60050, *International Electrotechnical Vocabulary*, for general glossary definitions.

166 **3.1** 167 **aggregate business information entity**

168 **ABIE**

169 aggregate business information entity is a re-use of an aggregate core component (ACC) in a
170 specified business

171 [SOURCE: ISO/TS 15000-5:2005, Clause 9, modified (modification of the definition)]

172 **3.2** 173 **aggregate core component**

174 **ACC**

175 collection of related pieces of business information that together convey a distinct business
176 meaning, independent of any specific business context

177 Note 1 to entry: Expressed in modelling terms, this is the representation of an object class, independent of any
178 specific business context.

179 [SOURCE: ISO/TS 15000-5:2005, Clause 9, modified (modification of the definition)]

180 **3.3** 181 **application program interface**

182 **API**

183 set of public functions provided by an executable application component for use by other
184 executable application components

185 **3.4** 186 **assembly model**

187 assembly model is a model that prepares information in a business context for assembly into
188 electronic documents for data interchange

1 To be published.

189 **3.5**
190 **based on or IsBasedOn**
191 use of an artefact that has been restricted according to the requirements of a specific
192 business context

193 [SOURCE: IEC 62325-450:2013, 3.4]

194 **3.6**
195 **business context**
196 formal description of a specific business circumstance as identified by the values of a set of
197 context categories, allowing different business circumstances to be uniquely distinguished

198 [SOURCE: UN/Cefact, Unified Context Methodology Technical Specification]

199 **3.7**
200 **European style market profile**
201 **ESMP**
202 the European style market profile, the object of this International Standard

203 **3.8**
204 **information model**
205 representation of concepts, relationships, constraints, rules, and operations to specify data
206 semantics for a chosen domain of discourse

207 Note 1 to entry: It can provide shareable, stable, and organized structure of information requirements for the
208 domain context.

209 **3.9**
210 **market management system**
211 **MMS**
212 computer system comprised of a software platform providing basic support services and a set
213 of applications providing the functionality needed for the effective management of the
214 electricity market

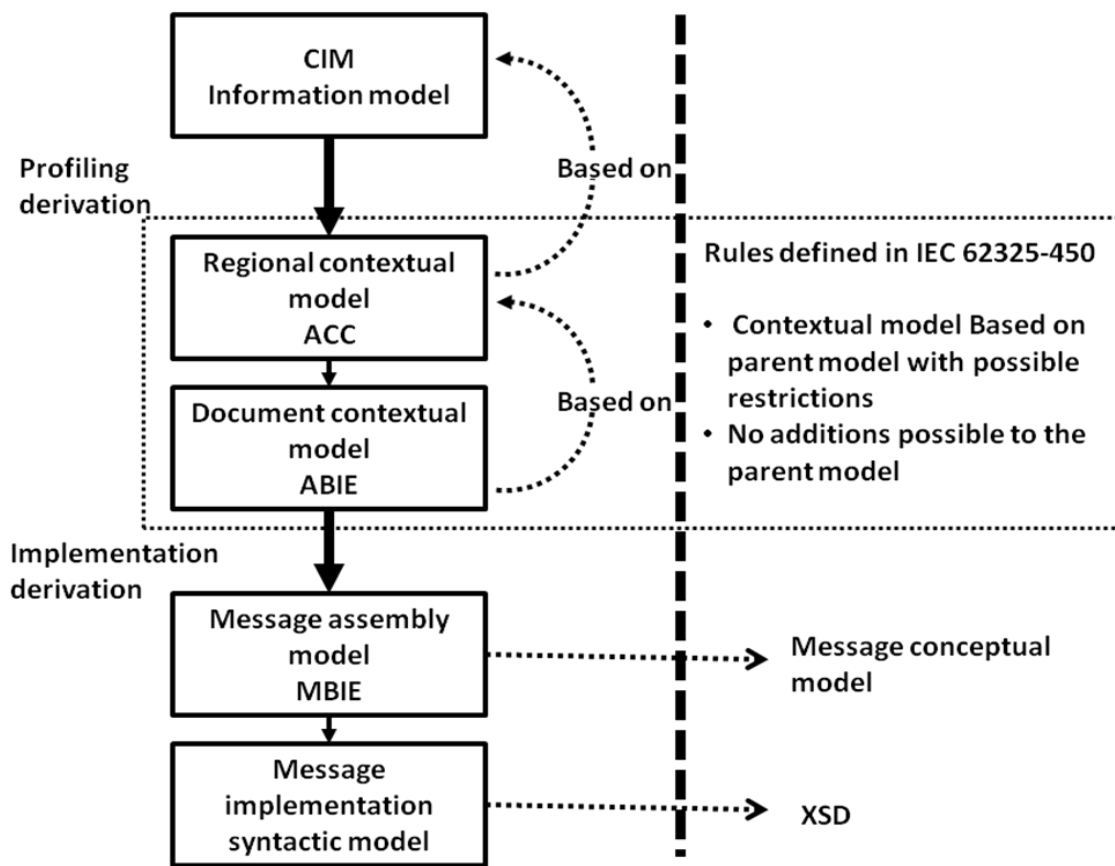
215 Note 1 to entry: These software systems in an electricity market may include support for capacity allocation,
216 scheduling energy, ancillary or other services, real-time operations and settlements.

217 **3.10**
218 **message business information entity**
219 **MBIE**
220 aggregation of a set of ABIEs that respects a define set of assembly rules

221 **4 Document contextual model and message assembly model basic concepts**

222 **4.1 Overview**

223 IEC 62325-450 defines a set of CIM profiles that follows a layered modelling framework as
224 outlined in Figure 1 going from the common information model (CIM, IEC 61968-11,
225 IEC 61970-301 and IEC 62325-301), to different regional contextual models and their
226 subsequent contextualized documents for information exchange; the final step being the
227 message specifications for information interchange.



IEC

Figure 1 – IEC 62325-450 modelling framework

228

229

230 The regional contextual models are the basic core components that are necessary to build
 231 electronic documents for information interchange. This is defined in the European style
 232 market contextual model (IEC 62325-351). These core components are also termed
 233 aggregate core components (ACCs).

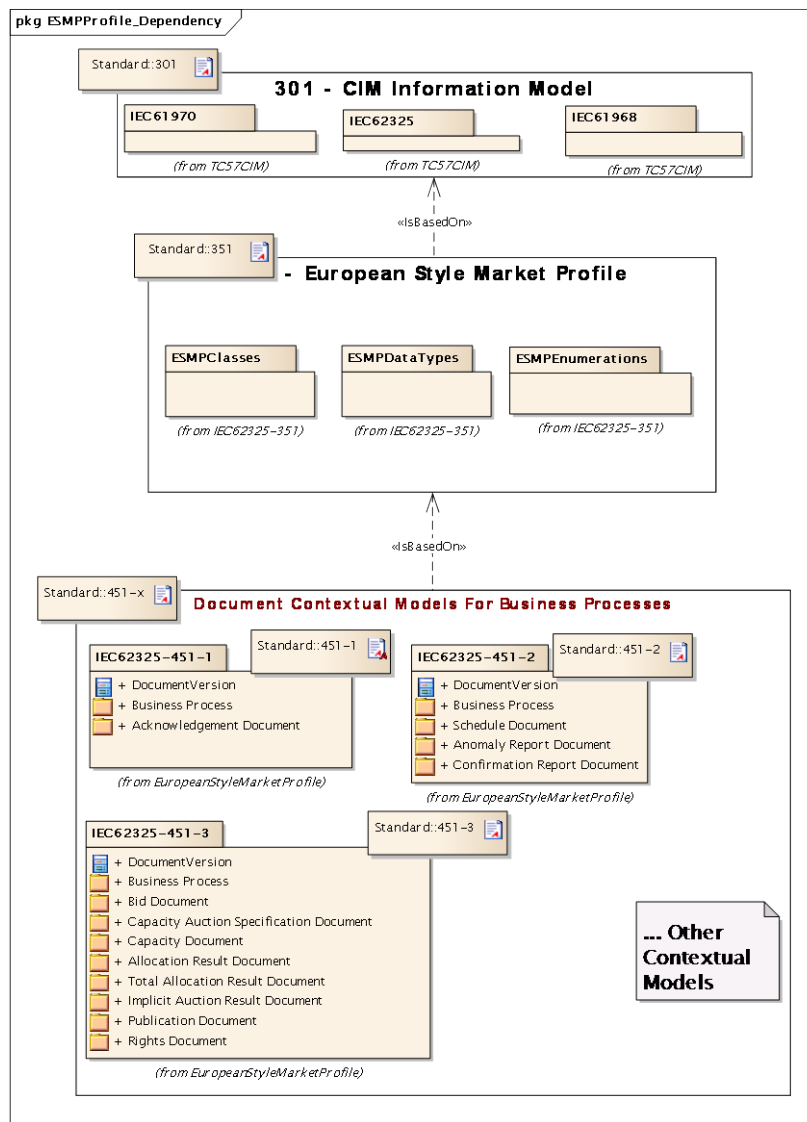
234 A document contextual model is based upon a specific business requirements specification
 235 and is constructed from the contextualisation of the ACCs that can be found in the European
 236 style market contextual model. The contextualised ACCs at this stage are terms aggregate
 237 business information entities (ABIEs) These ABIEs are the constructs that are assembled
 238 together into a specific electronic document to satisfy the information requirements outlined in
 239 the business requirements specification. The transformation from an ACC to an ABIE shall
 240 respect the rules defined in IEC 62325-450.

241 Once a document contextual model has been built that satisfactorily meets the business
 242 requirements, a message assembly model can be automatically generated from it.

243 XML schema then may be automatically generated from the message assembly model. If
 244 necessary specific mapping can take place at this stage to transform the CIM class and
 245 attribute names into more market legacy names.

246 4.2 European style market package structure

247 Figure 2 describes the main package structure of the European style market profile.



248

IEC

249

Figure 2 – Overview of European style market profile dependency

250 For each business process, a business process package is described in an IEC 62325-451-x
 251 (x from 1 to n) standard. A business process package contains:

252 • The document contextual model (ABIE) and the automatically generated message
 253 assembly model (MBIE) for each electronic document required to enable the completion of
 254 the business process. Each document is a sub contextual model derived by restriction
 255 from the European style market profile.

256 • The XML schema of the business document that is automatically generated from the
 257 message assembly model.

258 The European style market profile (ESMP), as defined in IEC 62325-351, provides the core
 259 components permitted for use in an IEC 62325-451-x standard as all ABIEs shall be “based
 260 on” the IEC 62325-351 core components:

261 • ESMPClasses: Defining all the semi-contextual classes of the European style market
 262 profile derived by restriction from the CIM model.

263 • ESMPDataTypes: Defining all the core datatypes used within the ESMP classes.

264 All the core components that are used in every electronic document structure have been
265 harmonized and centralized in the European style market profile. These core components are
266 consequently the basic building blocks from which all electronic document ABIEs are derived.

267 **4.3 From the European style market profile to the document contextual model**

268 The document contextual model for a given business process is constructed by an information
269 analyst who identifies all the information requirements necessary to satisfy the business
270 process.

271 Once the information requirements have been identified the information analyst identifies the
272 related ACCs that are available in the European style market profile and contextualises them
273 to meet the information requirements. This contextualisation step creates a set of aggregate
274 business information entities (ABIEs).

275 In a final step the information analyst assembles together into a specific document contextual
276 model package the ABIEs to form a document model satisfying the business requirements.

277 **4.4 From the document contextual model to the message assembly model**

278 Once the document contextual model has been finalised, the message assembly model may
279 be automatically generated.

280 All document contextual models share the same core components and core datatypes. These
281 are defined in the European style market profile (IEC 62325-351) and are contextualised and
282 refined in all document contextual models (IEC 62325-451-x series) respecting the rules as
283 described in IEC 62325-450.

284 **4.5 From the assembly model to the XML schema**

285 The final modelling step applies a standardized set of criteria in order to generate a uniform
286 XML schema from the assembly model. This transformation process respects the rules
287 defined in IEC 62361-100.

288 **5 The settlement and reconciliation business process**

289 **5.1 Balance responsible party and settlement**

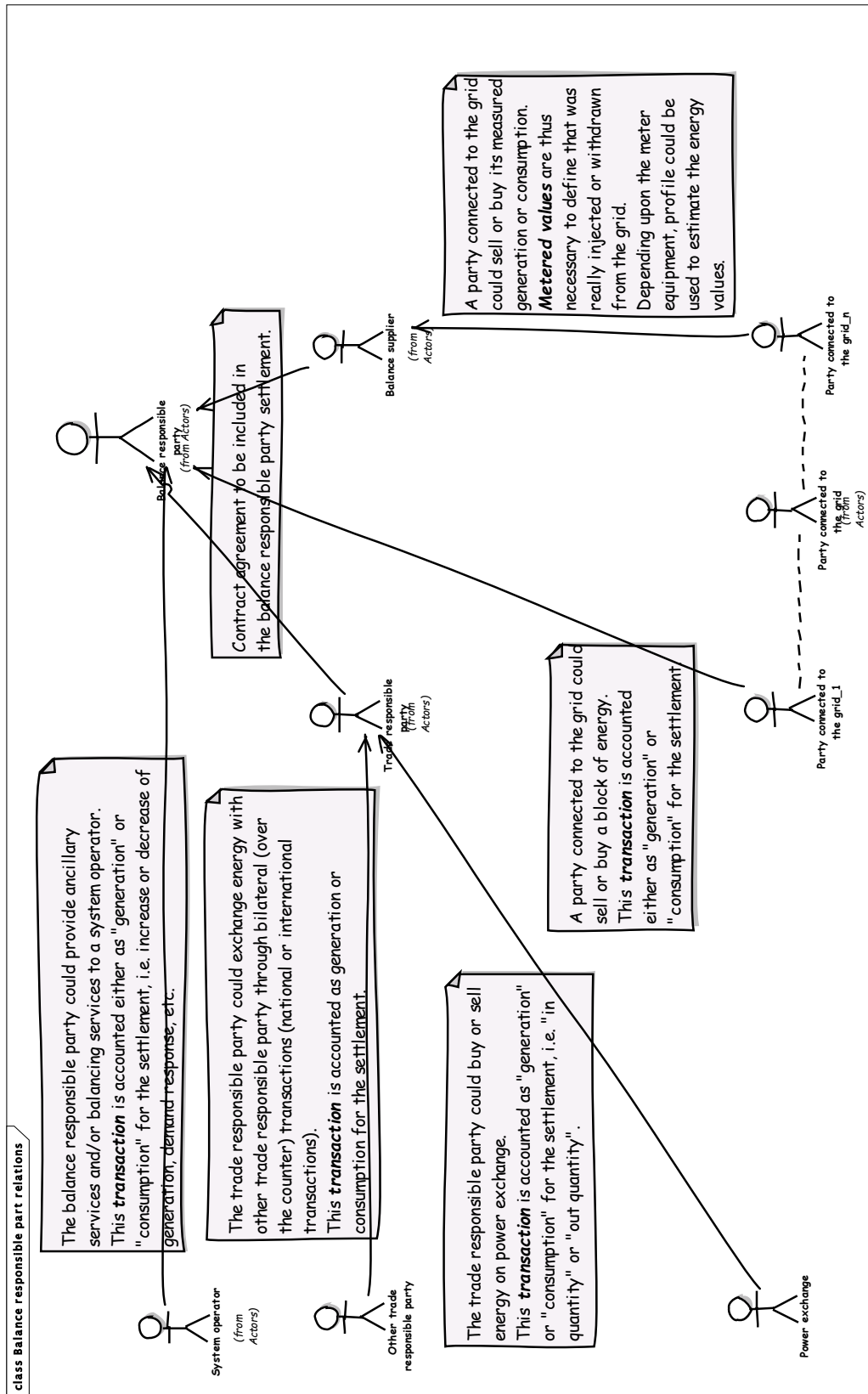
290 As indicated in the IEC 62325-301 "MarketRoleKind enumeration", in the European style
291 electricity market, a balance responsible party could be defined as:

- 292 • A party that has a contract proving financial security and identifying balance responsibility
293 with the imbalance settlement responsible for the market balance area entitling the party
294 to operate in the market. This is the only role allowing a party to nominate energy on a
295 wholesale level.

296 NOTE The meaning of the word "balance" in this context signifies that the quantity contracted to provide or to
297 consume shall be equal to the quantity really provided or consumed.

298 The role of balance responsible party is linked to the role of balance supplier, i.e.

- 299 • A party that markets the difference between actual metered energy consumption and the
300 energy bought with firm energy contracts by the party connected to the grid. In addition
301 the balance supplier markets any difference with the firm energy contract (of the party
302 connected to the grid) and the metered production. There is one balance supplier for each
303 accounting point.



304

305

Figure 3 – Balance responsible party relations

306

A party connected to the grid could be defined as:

307

- A party that contracts for the right to consume or produce electricity at an accounting point.

308

309 Figure 3 describes the different transactions of a balance responsible party that could have to
310 be considered when carrying out a settlement or a reconciliation process:

311 The settlement process enables thus to reconcile all the “commercial transactions” with the
312 actual measured values either from meters, estimated values or profiles.

313 The main purpose is thus to assess, after the fact, that the balance responsible party was
314 balanced and if not to compute the deviations and to settle them.

315 **5.2 Overall business context**

316 Within an electricity market, actors are buying/selling energy between them as well as selling
317 energy to end users or buying energy from generating units. These activities are carried out
318 from the time of early planning and trading, until the intraday processes.

319 When the market business processes as well as the operational processes (real-time
320 operation) are closed, then comes the time to settle or reconcile the market, i.e. to compute
321 for each balance responsible party what he has injected in a market area and what he has
322 withdrawn from this market area.

323 For proper operation of an European style electricity market, each balance responsible party
324 shall be balanced, i.e. he should have the sufficient “generation” (physical inputs or buying
325 transactions) to cover its “consumption” (physical outputs or selling transactions) at each
326 time.

327 The settlement process is the basic process to compute an imbalance deviation based on
328 commercial transactions and accounting energy values. It should be pointed out that the
329 accounting energy values could be energy meter readings, estimated energy meter readings
330 or profiles (derived from an index value and not based upon a load/generation curve).

331 Settlement and reconciliation processes are often carried out several times, i.e. typically there
332 are one or more re runs of the processes based on more accurate accounting energy values.
333 Typically, the reconciliation process is spread over the period until all metering values have
334 been read.

335 Depending upon local regulation, additional information could be used to compute the kinds of
336 imbalance, or deviation between the planned and the realized schedules.

337 It is not the purpose of this part of IEC 62325-451 to state how to collect the energy meter
338 readings, the index values, etc. Only aggregated values per balance responsible party are
339 used for the settlement process; the way to aggregate the data from the energy meter
340 readings is not within the scope of this document.

341 **5.3 Use cases**

342 The settlement or reconciliation process takes place once the market and operation
343 processes have been completed from the long term planning down to the intraday market and
344 through the day ahead market as well as the real time operations of the bulk power system.

345 The settlement or reconciliation process is composed of three basic activities.

- 346 • The first activity is the computation and aggregation per balance responsible party of all
347 agreed transactions including over the counter transactions, cross-border transactions,
348 power exchange transactions, and balancing transactions.
- 349 • The second activity is the computation and aggregation per balance responsible party of
350 all the accounting energy values, measured, estimated, or profiled for its physical injection
351 or withdrawal.

- 352 • The third activity is the settlement or reconciliation of these values, i.e. computes the
353 imbalances and establishes the imbalance settlement amounts.

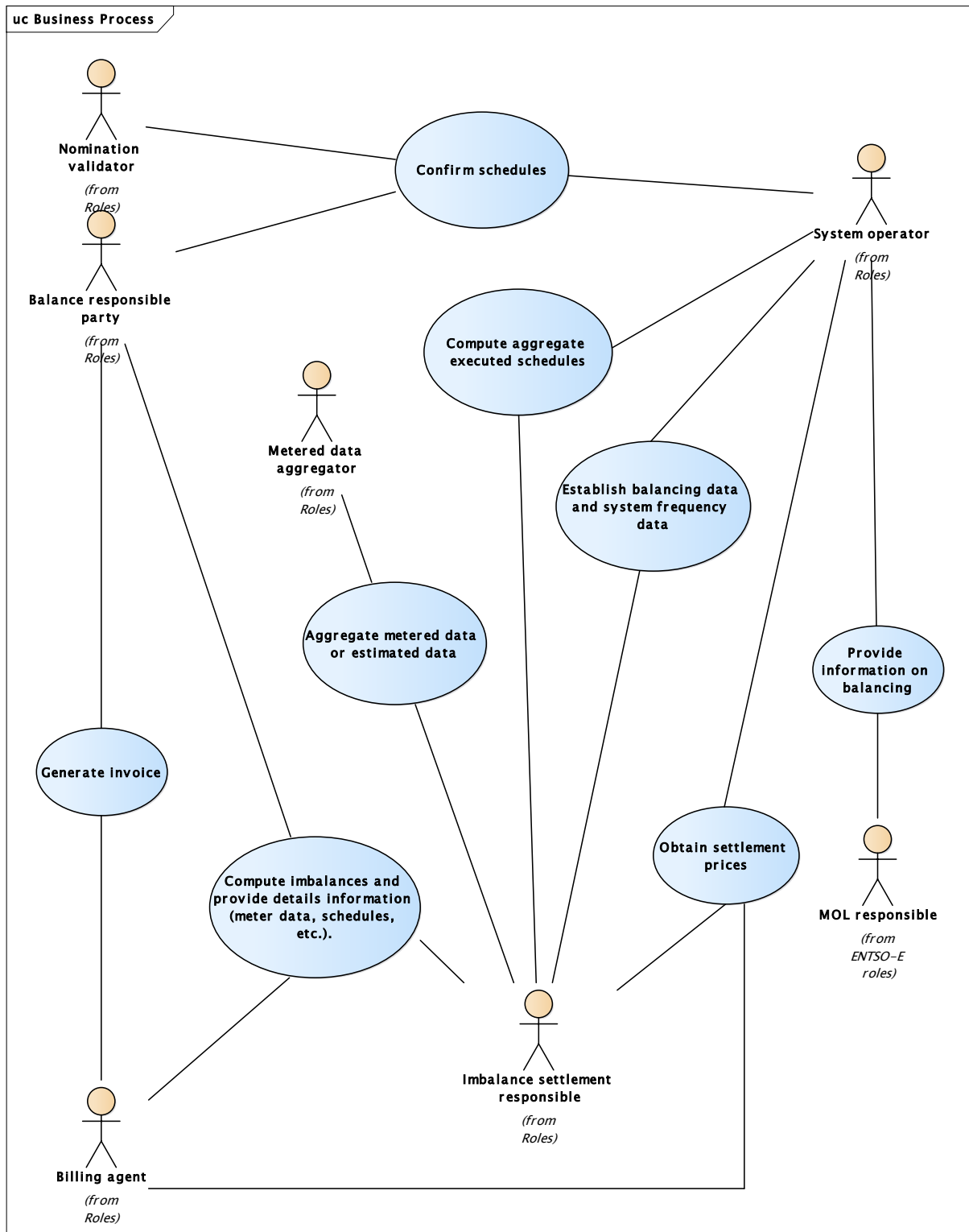
354 Figure 4 describes the actors and main use cases of the settlement or reconciliation process.

355 The roles that take parts in the settlement or reconciliation process are, for example:

- 356 • Balance responsible party, who receives the settlement information.
357 • Nomination validator, who provides the cross-border transactions.
358 • Merit order list (MOL) responsible, who provides the balancing transactions.
359 • System operator, who provides the aggregated schedules, balancing and system
360 frequency data.
361 • Metered data aggregator, who provides the aggregated metered information. The metered
362 data aggregator may have local metered data aggregators that provide initial aggregated
363 input for consolidation and validation before being sent to the imbalance settlement
364 responsible.
365 • Imbalance settlement responsible, who establishes the imbalances (quantities and
366 amounts).
367 • Billing agent, who invoices the balance responsible party.

368 The information necessary to run the settlement or reconciliation process for a given market
369 area is the following:

- 370 • Aggregated executed schedules per balance responsible party that originate at the last
371 stage of the scheduling process; these schedules could be day ahead, or intraday
372 transactions and could originate from a nomination validator for cross border transactions.
373 • Aggregated metered data or estimated data per balance responsible party.
374 • Balancing and system frequency data that originate from the merit order list responsible
375 and from ancillary services activation by the system operator.
376 • Settlement pricing information. This is outside the scope of this document and is
377 dependent on local market rules.



378 •

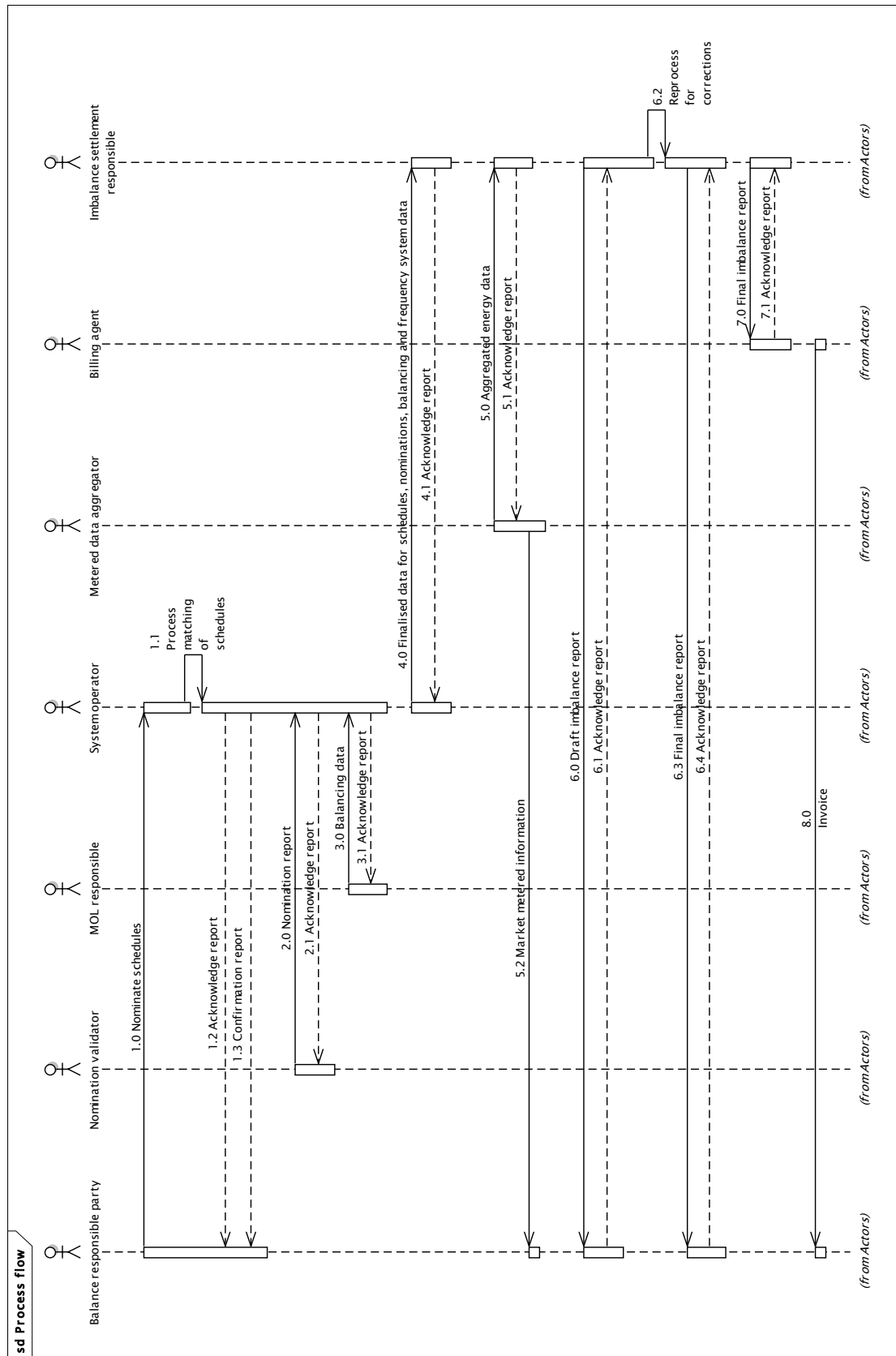
379

Figure 4 – Settlement/reconciliation use case

380 The settlement or reconciliation cycle could be daily, weekly, monthly or yearly.

381 **5.4 Process flow**

382 The sequence diagram in Figure 5 outlines the information that is exchanged between the
383 different actors in the settlement or reconciliation process.



384

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385

Figure 5 – Sequence diagram of the information flow

386
387

NOTE In some markets, bilateral trades between balance responsible parties are sent directly to the imbalance settlement responsible.

388 As concerns the flow 4.0, the market operator may also send the trades on their platform to
389 the imbalance settlement responsible.

390 The following flows are handled through electronic document described in other IEC
391 documents, mainly IEC 62325-451-1 and IEC 62325-451-2.

- 392 • Flows 1.0 to 1.3 are related to over the counter transactions, i.e. mainly bilateral
393 exchanges between balance responsible parties.
- 394 • Flows 2.0 and 2.1 are related to cross-border transactions.
- 395 • Flows 3.0 and 3.1 are related to the balancing data.

396 Once the system operator has received this information, aggregation per balance responsible
397 party of the finalised data could be carried out.

398 Flow 4.0 could include several energy account reports for the various kind of information to be
399 provided by the system operator to the imbalance settlement responsible; these data being
400 the aggregated schedules, the balancing data, the frequency system data, etc.

401 In a similar way, the involved metered data aggregators provide for their respective areas the
402 aggregated information per party, e.g. balance responsible party or balance supplier, flow 5.0,
403 to the imbalance settlement responsible party using the energy account report. This information may be
404 also provided to each balance responsible party, flow 5.2, for verification.

405 Based on these inputs as well as pricing information (that may be provided by different actors
406 depending upon the market design), the imbalance settlement responsible computes the draft
407 imbalance report per balance responsible party. The draft imbalance report, flow 6, contains
408 the values calculated by the imbalance settlement responsible on the basis of aggregated
409 metered data, finalised schedules and regulation data.

410 The energy account report is the document to be used for the exchanges (flows 6.0, 6.3, and
411 7.0) together with the acknowledgement document.

412 Each balance responsible party could check its imbalance deviation and acknowledge or not
413 the settlement.

414 There may be a number of iteration, loop 6.2, of the draft imbalance report up to the final
415 settlement.

416 The final imbalance report is sent to each balance responsible party, flow 6.3, but also to the
417 billing agent, flow 7.0. The docStatus attribute shall have the value "Final". The
418 marketParticipant.mRID attribute in the TimeSeries class shall identify the party to be
419 invoiced.

420 Then, the billing agent issues the invoice to the balance responsible party (flow 8.0).

421 The reconciliation process involves that the metered data aggregators provide a new set of
422 aggregated data when the accounting energy values are available in a better quality (profiling
423 and reading of index). Thus the operation 5.0 to 7.0 could be iterated a number of times
424 depending upon the local market rules.

425 **5.5 Business rules for the settlement and reconciliation process**

426 **5.5.1 General**

427 All the business rules described in IEC 62325-351 are also valid for this standard. Additional
428 rules are provided hereafter.

429 As shown in Figure 5, an acknowledgement document, as defined in IEC 62325-451-1, should
430 be generated either accepting the received document or rejecting it.

431 A received document, for which a positive acknowledgement document was issued, and
432 having a revisionNumber greater than the previous received document shall completely
433 replace it.

434 **5.5.2 Attributes area_Domain.mRID and domain.mRID and quantity**

435 The in_Quantity.quantity and out_Quantity.quantity attributes are related to the
436 area_Domain.mRID.

437 The value of the in_Quantity.quantity attribute indicates the amount of product that enters the
438 area identified by the area_Domain.mRID; the value of the out_Quantity.quantity attribute is
439 the amount of product that leaves the area identified by the area_Domain.mRID. The value of
440 each of these attributes shall be positive.

441 The area_Domain.mRID could be either the area of the settlement or a “subarea”.

442 As an example, in a market area composed of several distribution areas each one with a
443 different metered data aggregator, each metered data aggregator should provide for its own
444 area_Domain.mRID the in_Quantity.quantity and out_Quantity.quantity of each balance
445 responsible party active on its own area. In such a case, the domain_mRID should identify the
446 market area.

447 **5.5.3 Dependency matrix for type, processType and businessType**

448 Table 1 provides the recommended categorization for the type of document, the process type
449 and the associated business type.

450 Depending upon the implementation and the way the settlement is computed additional types
451 of processes or businesses could be added.

452

Table 1 – Dependency table for type, processType and businessType

type (Document)	processType	businessType (TimeSeries)
A09 – Finalised schedule	A04 – System operation closure	A02 – Internal trade A03 – External trade explicit capacity A06 – External trade without explicit capacity A09 – Independent power producer
A10 – Regulation data report	A04 – System operation closure	A10 – Tertiary control A11 – Primary control A12 – Secondary control
A11 – Aggregated energy data report	A05 – Metered data aggregation	A13 – Load profile A14 – Aggregated energy data A15 – Losses A16 – Transits
A12 – Imbalance report	A06 – Imbalance settlement	A02 – Internal trade A03- External trade explicit capacity A06 – External trade without explicit capacity A09 – Independent power producer A10 – Tertiary control A11 – Primary control A12 – Secondary control A13 – Load profile A14 – Aggregated energy data A15 – Losses A16 – Transits A17 – Settlement deviation A18 – Technical constraint deviation A19 – Balance energy deviation A20 – Imbalance volume A21 – Inadvertent deviation A22 – Frequency control A23 – Balance management A24 – Total trade A30 – Internal inter-area trade

453

454 **5.5.4 Dependency of attributes of the TimeSeries**

455 There are four attributes of the TimeSeries class that are dependent. The conditions for use
456 of these depending attributes are provided in Table 2.

457 **Table 2 – Dependency table for TimeSeries attributes**

Dependent attribute	Set of conditions to use the depending attribute
marketParticipant.mRID	The process_classificationType attribute shall be "Detail". The objectAggregation attribute shall be "Party".
marketAgreement.mRID	The type attribute shall have one of the following values "A09 – Finalised schedule", "A11 – Aggregated energy data", or "A12 – Imbalance report". The process.processType shall have one of the following values "A04 – System operation closure", "A05 – Metered data aggregation", or "A06 – Imbalance settlement". The process_classificationType attribute shall be "Detail". The businessType attribute shall have one of the following values "A02 – Internal trade", "A03 – External trade", "A06 – External trade without explicit capacity" "A09 – Independent power producer", "A10 – Tertiary control", or "A16 – Transits".
currency_Unit.name	The type attribute shall be "A12 – Imbalance report". The process.processType attribute shall be "A06 – Imbalance settlement". The businessType attribute shall have one of the following values "A17 – Settlement deviation", "A18 – technical constraint deviation", "A19 – Balance energy deviation", or "A20 – Imbalance volume".
marketEvaluationPoint.mRID	The type attribute shall have one of the following values "A11 – Aggregated energy data", or "A12 – Imbalance report". The process.processType shall have one of the following values "A05 – Metered data aggregation", or "A06 – Imbalance settlement". The process_classificationType attribute shall be "Detail". The objectAggregation attribute shall be "Party".

458
459 Depending upon the local market rules, additional values can be included in this set of
460 conditions.

461 **5.5.5 Rules governing the Point class**

462 The Point class contains the relative position within a time interval period, as defined in the
463 timeInterval attribute, the quantities associated with that position, in_Quantity.quantity and
464 out_Quantity.quantity attributes, and eventually the total monetary amount of the cost of any
465 eventual imbalance, price.amount.

466 **5.5.6 Attribute price.amount**

467 The price.amount attribute could have positive or negative values (see Table 17).

468 The price.amount attribute is dependent. The conditions to use these depending attributes are
469 provided in Table 17.

470 **Table 3 – Dependency table for price.amount attribute**

Dependent attribute	Set of conditions to use the depending attribute
Price.amount	<p>The type attribute shall have the following value “A12 – Imbalance report”.</p> <p>The process.processType shall have the following value “A06 – Imbalance settlement”.</p> <p>The businessType attribute shall have one of the following values “A17 – Settlement deviation”, “A18 – Technical constraint deviation”, “A19 – Balance energy deviation” or “A20 – Imbalance volume”.</p>

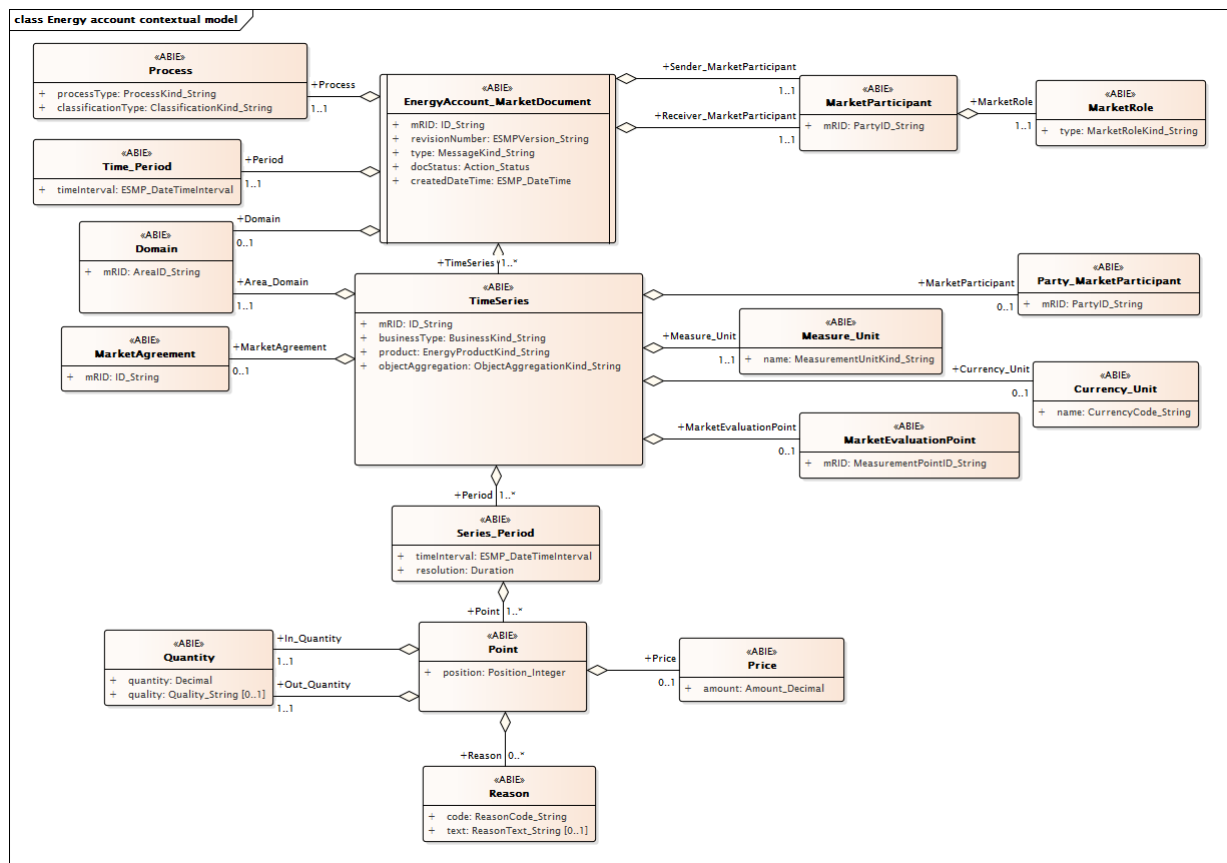
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472 **6 Contextual and assembly models**

473 **6.1 Energy account contextual model**

474 **6.1.1 Overview of the model**

475 Figure 6 shows the model.



476

477 **Figure 6 - Energy account contextual model**

478 **1.1.1 IsBasedOn relationships from the European style market profile**

479 Table 4 shows the traceability dependency of the classes used in this package towards the
480 upper level.

481

Table 4 - IsBasedOn dependency

Name	Complete IsBasedOn Path
Currency_Unit	TC57CIM::IEC62325::MarketManagement::Unit
Domain	TC57CIM::IEC62325::MarketManagement::Domain
EnergyAccount_MarketDocument	TC57CIM::IEC62325::MarketManagement::MarketDocument
MarketAgreement	TC57CIM::IEC62325::MarketManagement::MarketAgreement
MarketEvaluationPoint	TC57CIM::IEC62325::MarketManagement::MarketEvaluationPoint
MarketParticipant	TC57CIM::IEC62325::MarketCommon::MarketParticipant
MarketRole	TC57CIM::IEC62325::MarketCommon::MarketRole
Measure_Unit	TC57CIM::IEC62325::MarketManagement::Unit
Party_MarketParticipant	TC57CIM::IEC62325::MarketCommon::MarketParticipant
Point	TC57CIM::IEC62325::MarketManagement::Point
Price	TC57CIM::IEC62325::MarketManagement::Price
Process	TC57CIM::IEC62325::MarketManagement::Process
Quantity	TC57CIM::IEC62325::MarketManagement::Quantity
Reason	TC57CIM::IEC62325::MarketManagement::Reason
Series_Period	TC57CIM::IEC62325::MarketManagement::Period
Time_Period	TC57CIM::IEC62325::MarketManagement::Period
TimeSeries	TC57CIM::IEC62325::MarketManagement::TimeSeries

482

483 **1.1.2 Detailed Energy account contextual model**

484 **1.1.2.1 EnergyAccount_MarketDocument root class**

485 An energy account report for a given set of time series and a given accounting period
 486 Time_Period class, period.timeInterval attribute) shall have a unique identification assigned
 487 by the sender of the document for all transmissions to the receiver.

488 All additions, modifications, or suppressions for the time series and accounting period shall
 489 use the same identification.

490 An electronic document containing the information necessary to satisfy the requirements of a
 491 given business process.

492 Table 5 shows all attributes of EnergyAccount_MarketDocument.

493 **Table 5 - Attributes of Energy account contextual**
 494 **model::EnergyAccount_MarketDocument**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID ID_String	The unique identification of the document being exchanged within a business process flow.
1	[1..1]	revisionNumber ESMPVersion_String	The identification of the version that distinguishes one evolution of a document from another.

Order	mult.	Attribute name / Attribute type	Description
2	[1..1]	type MessageKind_String	The coded type of a document. The document type describes the principal characteristic of the document.
3	[1..1]	docStatus Action_Status	The identification of the condition or position of the document with regard to its standing.
7	[1..1]	createdDateTime ESMP_DateTime	The date and time of the creation of the document.

495

496 Table 6 shows all association ends of EnergyAccount_MarketDocument with other classes.

497

Table 6 - Association ends of Energy account contextual model::EnergyAccount_MarketDocument with other classes

498

Order	mult.	Class name / Role	Description
4	[1..1]	Process Process	Association Based On: ESMPClasses::MarketDocument.[] ----- ESMPClasses::Process.Process[0..*]
5	[1..1]	MarketParticipant Sender_MarketParticipant	Document owner. Association Based On: ESMPClasses::MarketDocument.[] ----- ESMPClasses::MarketParticipant.MarketParticipant[0..*]
6	[1..1]	MarketParticipant Receiver_MarketParticipant	Document recipient. Association Based On: ESMPClasses::MarketDocument.[] ----- ESMPClasses::MarketParticipant.MarketParticipant[0..*]
8	[1..1]	Time_Period Period	This information provides the start and end date and time of the accounting period. The receiver shall completely reject documents with any time intervals outside the accounting period. Association Based On: ESMPClasses::MarketDocument.[] ----- ESMPClasses::Time_Period.Period[0..*]
9	[0..1]	Domain Domain	The identification of the domain that is covered in the energy account report. This will frequently be the market balance area that is the subject of the report. However, other domains may also be used as defined by local market rules to enable the particular balancing markets to be identified. Association Based On: ESMPClasses::MarketDocument.[] ----- ESMPClasses::Domain.Domain[0..1]
10	[1..*]	TimeSeries TimeSeries	Association Based On: ESMPClasses::MarketDocument.[] ----- ESMPClasses::TimeSeries.TimeSeries[0..*]

499

500 **1.1.2.2 Currency_Unit**

501 The code specifying a monetary unit.

502 Table 7 shows all attributes of Currency_Unit.

503 **Table 7 - Attributes of Energy account contextual model::Currency_Unit**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	name CurrencyCode_String	The identification of the formal code for a currency (ISO 4217).

504

505 **1.1.2.3 Domain**

506 A domain covering a number of related objects, such as market balance area, grid area,
507 borders etc.

508 Table 8 shows all attributes of Domain.

509 **Table 8 - Attributes of Energy account contextual model::Domain**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID AreaID_String	The unique identification of the domain.

510

511 **1.1.2.4 MarketAgreement**

512 A formal agreement between two parties defining the terms and conditions for a set of
513 services. The specifics of the services are, in turn, defined via one or more service
514 agreements.

515 Table 9 shows all attributes of MarketAgreement.

516 **Table 9 - Attributes of Energy account contextual model::MarketAgreement**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID ID_String	The unique identification of the agreement.

517

518 **1.1.2.5 MarketEvaluationPoint**

519 The location where one or more products are measured. This may be a physical or virtual
520 location.

521 Table 10 shows all attributes of MarketEvaluationPoint.

522 **Table 10 - Attributes of Energy account contextual model::MarketEvaluationPoint**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID MeasurementPointID_String	A unique identification of the measurement point.

523

524 **1.1.2.6 MarketParticipant**

525 The identification of the party participating in energy market business processes.

526 Table 11 shows all attributes of MarketParticipant.

527 **Table 11 - Attributes of Energy account contextual model::MarketParticipant**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID PartyID_String	The identification of a party in the energy market.

528

529 Table 12 shows all association ends of MarketParticipant with other classes.

530 **Table 12 - Association ends of Energy account contextual model::MarketParticipant**
531 **with other classes**

Order	mult.	Class name / Role	Description
1	[1..1]	MarketRole MarketRole	Association Based On: ESMPClasses::MarketParticipant.[] ----- ESMPClasses::MarketRole.MarketRole[0..1]

532

533 **1.1.2.7 MarketRole**534 The identification of the intended behaviour of a market participant played within a given
535 business process.

536 Table 13 shows all attributes of MarketRole.

537 **Table 13 - Attributes of Energy account contextual model::MarketRole**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	type MarketRoleKind_String	The identification of the role played by a market player.

538

539 **1.1.2.8 Measure_Unit**540 A particular quantity, defined and adopted by convention, with which other quantities of the
541 same kind are compared in order to express their magnitudes relative to that quantity.

542 Table 14 shows all attributes of Measure_Unit.

543 **Table 14 - Attributes of Energy account contextual model::Measure_Unit**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	name MeasurementUnitKind_String	The identification of the formal code for a measurement unit (UN/ECE Recommendation 20).

544

545 **1.1.2.9 Party_MarketParticipant**

546 The identification of the party participating in energy market business processes.

547 Table 15 shows all attributes of Party_MarketParticipant.

548 **Table 15 - Attributes of Energy account contextual model::Party_MarketParticipant**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID PartyID_String	The identification of a party in the energy market.

549

550 **1.1.2.10 Point**

551 The identification of the values being addressed within a specific interval of time.

552 Table 16 shows all attributes of Point.

553 **Table 16 - Attributes of Energy account contextual model::Point**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	position Position_Integer	A sequential value representing the relative position within a given time interval.

554

555 Table 17 shows all association ends of Point with other classes.

556 **Table 17 - Association ends of Energy account contextual model::Point with other classes**

557

Order	mult.	Class name / Role	Description
1	[1..1]	Quantity In_Quantity	The quantity that is flowing into the Area_Domain.mRID. Association Based On: ESMPClasses::Quantity.Quantity[0..*] ----- ESMPClasses::Point.[]
2	[1..1]	Quantity Out_Quantity	The quantity that is going out of the Area_Domain.mRID. Association Based On: ESMPClasses::Quantity.Quantity[0..*] ----- ESMPClasses::Point.[]
3	[0..1]	Price Price	The amount due for the account interval in question. This information defines the settlement amount taking into consideration the in and out quantities and the pricing scheme based on local market rules. A negative value indicates that the settlement amount is due by the party in question (party to be debited). If the amount is positive it is due by the imbalance settlement responsible (party to be credited). Association Based On: ESMPClasses::Point.[] ----- ESMPClasses::Price.Price[0..*]

Order	mult.	Class name / Role	Description
4	[0..*]	Reason Reason	Association Based On: ESMPClasses::Point.[] ----- ESMPClasses::Reason.Reason[0..*]

558

559 **1.1.2.11 Price**

560 The cost corresponding to a specific entity expressed in a currency.

561 Table 18 shows all attributes of Price.

562 **Table 18 - Attributes of Energy account contextual model::Price**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	amount Amount_Decimal	A number of monetary units specified in a unit of currency.

563

564 **1.1.2.12 Process**

565 The formal identification of the business process in which a flow of information is exchanged.

566 Table 19 shows all attributes of Process.

567 **Table 19 - Attributes of Energy account contextual model::Process**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	processType ProcessKind_String	The identification of the nature of process that the document addresses.
1	[1..1]	classificationType ClassificationKind_String	The classification mechanism used to group a set of objects together within a business process. The grouping may be of a detailed or a summary nature.

568

569 **1.1.2.13 Quantity**

570 Description of quantities needed in the data exchange.

571 The type of the quantity is described either by the role of the association or the quantityType
572 attribute.573 The quality attribute provides the information about the quality of the quantity (measured,
574 estimated, etc.).

575 Table 20 shows all attributes of Quantity.

576

Table 20 - Attributes of Energy account contextual model::Quantity

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	quantity Decimal	The quantity value. The association role provides the information about what is expressed.
1	[0..1]	quality Quality_String	The description of the quality of the quantity.

577

578 **1.1.2.14 Reason**

579 The motivation of an act.

580 Table 21 shows all attributes of Reason.

581

Table 21 - Attributes of Energy account contextual model::Reason

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	code ReasonCode_String	The motivation of an act in coded form.
1	[0..1]	text ReasonText_String	The textual explanation corresponding to the reason code.

582

583 **1.1.2.15 Series_Period**

584 The identification of the period of time corresponding to a given time interval and resolution.

585 Table 22 shows all attributes of Series_Period.

586

Table 22 - Attributes of Energy account contextual model::Series_Period

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	timeInterval ESMP_DateTimeInterval	The start and end time of the period.
1	[1..1]	resolution Duration	The definition of the number of units of time that compose an individual step within a period.

587

588 Table 23 shows all association ends of Series_Period with other classes.

589 **Table 23 - Association ends of Energy account contextual model::Series_Period with**
 590 **other classes**

Order	mult.	Class name / Role	Description
2	[1..*]	Point Point	Association Based On: ESMPClasses::Series_Period.[] ----- ESMPClasses::Point.Point[1..*]

591

592 1.1.2.16 Time_Period

593 The identification of the accounting period.

594 The identification of a time interval.

595 Table 24 shows all attributes of Time_Period.

596 **Table 24 - Attributes of Energy account contextual model::Time_Period**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	timeInterval ESMP_DateTimeInterval	The start and end date and time for a given interval.

597

598 1.1.2.17 TimeSeries

599 A set of time-ordered quantities being exchanged in relation to a product.

600 Table 25 shows all attributes of TimeSeries.

601 **Table 25 - Attributes of Energy account contextual model::TimeSeries**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID ID_String	A unique identification of the time series.
1	[1..1]	businessType BusinessKind_String	The identification of the nature of the time series.
2	[1..1]	product EnergyProductKind_String	The identification of the nature of an energy product such as power, energy, reactive power, etc.
3	[1..1]	objectAggregation ObjectAggregationKind_String	The identification of the domain that is the common denominator used to aggregate a time series.

602

603 Table 26 shows all association ends of TimeSeries with other classes.

604
605

Table 26 - Association ends of Energy account contextual model::TimeSeries with other classes

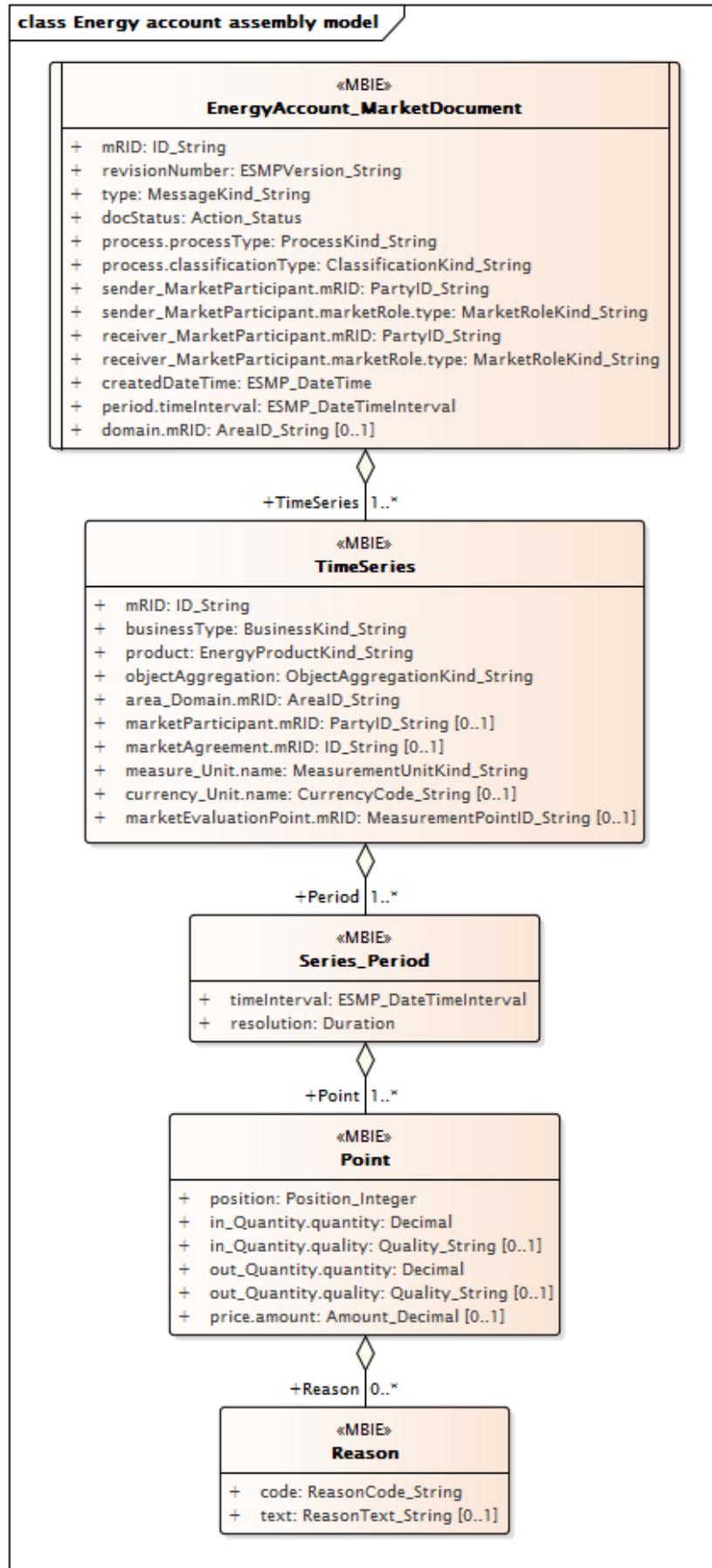
Order	mult.	Class name / Role	Description
4	[1..1]	Domain Area_Domain	The area of concern for the imbalance settlement responsible that the time series addresses. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::Domain.Domain[0..*]
5	[0..1]	Party_MarketParticipant MarketParticipant	The identification of the party of concern for the time series. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::MarketParticipant.MarketParticipant[0..*]
6	[0..1]	MarketAgreement MarketAgreement	This provides the identification of the agreement, such as a capacity agreement, that is relative to the time series. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::MarketAgreement.MarketAgreement[0..*]
7	[1..1]	Measure_Unit Measure_Unit	The unit if measurement is used for the quantities expressed within the time series. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::Measure_Unit.Measurement_Unit[0..*]
8	[0..1]	Currency_Unit Currency_Unit	The currency used for the monetary amount expressed within the time series. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::Currency_Unit.Currency_Unit[0..1]
9	[0..1]	MarketEvaluationPoint MarketEvaluationPoint	The identification of the accounting point where the settlement information has been aggregated. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::MarketEvaluationPoint.MarketEvaluationPoint[0..1]
10	[1..*]	Series_Period Period	The receiver shall completely reject documents with any time intervals outside the accounting period. Association Based On: ESMPClasses::TimeSeries.[] ----- ESMPClasses::Series_Period.Period[0..*]

606

607 **1.2 Energy account assembly model**

608 **1.2.1 Overview of the model**

609 Figure 7 shows the model.



610

611

Figure 7 - Energy account assembly model

612 **1.2.2 IsBasedOn relationships from the European style market profile**

613 Table 27 shows the traceability dependency of the classes used in this package towards the
614 upper level.

615 **Table 27 - IsBasedOn dependency**

Name	Complete IsBasedOn Path
EnergyAccount_MarketDocument	TC57CIM::IEC62325::MarketManagement::MarketDocument
Point	TC57CIM::IEC62325::MarketManagement::Point
Reason	TC57CIM::IEC62325::MarketManagement::Reason
Series_Period	TC57CIM::IEC62325::MarketManagement::Period
TimeSeries	TC57CIM::IEC62325::MarketManagement::TimeSeries

616

617 **1.2.3 Detailed Energy account assembly model**

618 **1.2.3.1 EnergyAccount_MarketDocument root class**

619 An energy account report for a given set of time series and a given accounting period
620 Time_Period class, period.timeInterval attribute) shall have a unique identification assigned
621 by the sender of the document for all transmissions to the receiver.

622 All additions, modifications, or suppressions for the time series and accounting period shall
623 use the same identification.

624 An electronic document containing the information necessary to satisfy the requirements of a
625 given business process.

626 Table 28 shows all attributes of EnergyAccount_MarketDocument.

627 **Table 28 - Attributes of Energy account assembly
628 model::EnergyAccount_MarketDocument**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID ID_String	The unique identification of the document being exchanged within a business process flow.
1	[1..1]	revisionNumber ESMPVersion_String	The identification of the version that distinguishes one evolution of a document from another.
2	[1..1]	type MessageKind_String	The coded type of a document. The document type describes the principal characteristic of the document.
3	[1..1]	docStatus Action_Status	The identification of the condition or position of the document with regard to its standing.
4	[1..1]	process.processType ProcessKind_String	The identification of the nature of process that the document addresses.
5	[1..1]	process.classificationType ClassificationKind_String	The classification mechanism used to group a set of objects together within a business process. The grouping may be of a detailed or a summary nature.
6	[1..1]	sender_MarketParticipant.mRID PartyID_String	The identification of a party in the energy market. --- Document owner.

Order	mult.	Attribute name / Attribute type	Description
7	[1..1]	sender_MarketParticipant.marketRole.type MarketRoleKind_String	The identification of the role played by a market player. --- Document owner.
8	[1..1]	receiver_MarketParticipant.mRID PartyID_String	The identification of a party in the energy market. --- Document recipient.
9	[1..1]	receiver_MarketParticipant.marketRole.type MarketRoleKind_String	The identification of the role played by a market player. --- Document recipient.
10	[1..1]	createdDateTime ESMP_DateTime	The date and time of the creation of the document.
11	[1..1]	period.timeInterval ESMP_DateTimeInterval	The start and end date and time for a given interval. --- This information provides the start and end date and time of the accounting period. The receiver shall completely reject documents with any time intervals outside the accounting period.
12	[0..1]	domain.mRID AreaID_String	The unique identification of the domain. --- The identification of the domain that is covered in the energy account report. This will frequently be the market balance area that is the subject of the report. However, other domains may also be used as defined by local market rules to enable the particular balancing markets to be identified.

629

630 Table 29 shows all association ends of EnergyAccount_MarketDocument with other classes.

631

632

Table 29 - Association ends of Energy account assembly model::EnergyAccount_MarketDocument with other classes

Order	mult.	Class name / Role	Description
13	[1..*]	TimeSeries TimeSeries	Association Based On: Energy account contextual model::TimeSeries.TimeSeries[1..*] ----- Energy account contextual model::EnergyAccount_MarketDocument.[]

633

634 1.2.3.2 Point

635 The identification of the values being addressed within a specific interval of time.

636 Table 30 shows all attributes of Point.

637

Table 30 - Attributes of Energy account assembly model::Point

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	position Position_Integer	A sequential value representing the relative position within a given time interval.
1	[1..1]	in_Quantity.quantity Decimal	The quantity value. The association role provides the information about what is expressed. --- The quantity that is flowing into the Area_Domain.mRID.
2	[0..1]	in_Quantity.quality Quality_String	The description of the quality of the quantity. --- The quantity that is flowing into the Area_Domain.mRID.

Order	mult.	Attribute name / Attribute type	Description
3	[1..1]	out_Quantity.quantity Decimal	The quantity value. The association role provides the information about what is expressed. --- The quantity that is going out of the Area_Domain.mRID.
4	[0..1]	out_Quantity.quality Quality_String	The description of the quality of the quantity. --- The quantity that is going out of the Area_Domain.mRID.
5	[0..1]	price.amount Amount_Decimal	A number of monetary units specified in a unit of currency. --- The amount due for the account interval in question. This information defines the settlement amount taking into consideration the in and out quantities and the pricing scheme based on local market rules. A negative value indicates that the settlement amount is due by the party in question (party to be debited). If the amount is positive it is due by the imbalance settlement responsible (party to be credited).

638

639 Table 31 shows all association ends of Point with other classes.

640 **Table 31 - Association ends of Energy account assembly model::Point with other**
641 **classes**

Order	mult.	Class name / Role	Description
6	[0..*]	Reason Reason	Association Based On: Energy account contextual model::Reason.Reason[0..*] ----- Energy account contextual model::Point.[]

642

643 **1.2.3.3 Reason**

644 The motivation of an act.

645 Table 32 shows all attributes of Reason.

646 **Table 32 - Attributes of Energy account assembly model::Reason**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	code ReasonCode_String	The motivation of an act in coded form.
1	[0..1]	text ReasonText_String	The textual explanation corresponding to the reason code.

647

648 **1.2.3.4 Series_Period**

649 The identification of the period of time corresponding to a given time interval and resolution.

650 Table 33 shows all attributes of Series_Period.

651 **Table 33 - Attributes of Energy account assembly model::Series_Period**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	timeInterval ESMP_DateTimeInterval	The start and end time of the period.
1	[1..1]	resolution Duration	The definition of the number of units of time that compose an individual step within a period.

652

653 Table 34 shows all association ends of Series_Period with other classes.

654 **Table 34 - Association ends of Energy account assembly model::Series_Period with**
655 **other classes**

Order	mult.	Class name / Role	Description
2	[1..*]	Point Point	Association Based On: Energy account contextual model::Point.Point[1..*] ----- Energy account contextual model::Series_Period.[]

656

657 **1.2.3.5 TimeSeries**

658 A set of time-ordered quantities being exchanged in relation to a product.

659 Table 35 shows all attributes of TimeSeries.

660 **Table 35 - Attributes of Energy account assembly model::TimeSeries**

Order	mult.	Attribute name / Attribute type	Description
0	[1..1]	mRID ID_String	A unique identification of the time series.
1	[1..1]	businessType BusinessKind_String	The identification of the nature of the time series.
2	[1..1]	product EnergyProductKind_String	The identification of the nature of an energy product such as power, energy, reactive power, etc.
3	[1..1]	objectAggregation ObjectAggregationKind_String	The identification of the domain that is the common denominator used to aggregate a time series.
4	[1..1]	area_Domain.mRID AreaID_String	The unique identification of the domain. --- The area of concern for the imbalance settlement responsible that the time series addresses.
5	[0..1]	marketParticipant.mRID PartyID_String	The identification of a party in the energy market. --- The identification of the party of concern for the time series.
6	[0..1]	marketAgreement.mRID ID_String	The unique identification of the agreement. --- This provides the identification of the agreement, such as a capacity agreement, that is relative to the time series.

Order	mult.	Attribute name / Attribute type	Description
7	[1..1]	measure_Unit.name MeasurementUnitKind_String	The identification of the formal code for a measurement unit (UN/ECE Recommendation 20). --- The unit if measurement is used for the quantities expressed within the time series.
8	[0..1]	currency_Unit.name CurrencyCode_String	The identification of the formal code for a currency (ISO 4217). --- The currency used for the monetary amount expressed within the time series.
9	[0..1]	marketEvaluationPoint.mRID MeasurementPointID_String	A unique identification of the measurement point. --- The identification of the accounting point where the settlement information has been aggregated.

661

662 Table 36 shows all association ends of TimeSeries with other classes.

663 **Table 36 - Association ends of Energy account assembly model::TimeSeries with other**
664 **classes**

Order	mult.	Class name / Role	Description
10	[1..*]	Series_Period Period	The receiver shall completely reject documents with any time intervals outside the accounting period. Association Based On: Energy account contextual model::Series_Period.Period[1..*] ----- Energy account contextual model::TimeSeries.[]

665

666 1.2.4 Primitives

667 1.2.4.1 DateTime primitive

668 Date and time as "YYYY-MM-DDThh:mm:ss.sssZ", which conforms with ISO 8601 UTC time
669 zone.

670 **Note:** the time within ESMP is expressed in UTC.

671 1.2.4.2 Decimal primitive

672 Decimal is the base-10 notational system for representing real numbers.

673 1.2.4.3 Duration primitive

674 Duration as "PnYnMnDTnHnMnS" which conforms to ISO 8601, where nY expresses a
675 number of years, nM a number of months, nD a number of days. The letter T separates the
676 date expression from the time expression and, after it, nH identifies a number of hours, nM a
677 number of minutes and nS a number of seconds. The number of seconds could be expressed
678 as a decimal number, but all other numbers are integers.

679 1.2.4.4 Integer primitive

680 An integer number. The range is unspecified and not limited.

681 1.2.4.5 String primitive

682 A string consisting of a sequence of 8 bit characters. The character encoding is UTF-8. The
683 string length is unspecified and unlimited.

684 **1.2.5 Datatypes**

685 The list of datatypes used for the Energy account assembly model is as follows:

686 **1.2.5.1 Action_Status compound**

687 The coded identification of the status of an object.

688 Table 37 shows all attributes of Action_Status.

689 **Table 37 - Attributes of ESMPDataTypes::Action_Status**

mult.	Attribute name / Attribute type	Description
[1..1]	value Status_String	Main Core value Space.

690

691 **1.2.5.2 ESMP_DateTimeInterval compound**692 This datatype enables to express the start date and time, and the end date and time of a time
693 interval with a specific pattern. This pattern is the YYYY-MM-DDThh:mmZ.

694 Table 38 shows all attributes of ESMP_DateTimeInterval.

695 **Table 38 - Attributes of ESMPDataTypes::ESMP_DateTimeInterval**

mult.	Attribute name / Attribute type	Description
[1..1]	start YMDHM_DateTime	The start date and time of the interval with a minute resolution.
[1..1]	end YMDHM_DateTime	The end date and time of the interval with a minute resolution.

696

697 **1.2.5.3 Amount_Decimal datatype**

698 The coded identification of a monetary value.

699 Table 39 shows all attributes of Amount_Decimal.

700 **Table 39 - Attributes of ESMPDataTypes::Amount_Decimal**

mult.	Attribute name / Attribute type	Description
[1..1]	value Decimal	Main Core value Space.

701

702 Table 40 shows all restrictions applied to the attributes of Amount_Decimal.

703 **Table 40 - Restrictions of attributes for ESMPDataTypes::Amount_Decimal**

Name	Constraint	Type	Expression of constraint
value	totalDigits	OCL	inv: self->TotalDigits(17)

704

705 **1.2.5.4 AreaID_String datatype**

706 The coded identification of a domain, i.e. balance area, grid area, etc.

707 In the ESMP context, it is an authorized issuing office that provides an agreed identification
708 coding scheme for domain identification.

709 Table 41 shows all attributes of AreaID_String.

710 **Table 41 - Attributes of ESMPDataTypes::AreaID_String**

mult.	Attribute name / Attribute type	Description
[1..1]	codingScheme CodingSchemeTypeList	DomainQualification.
[1..1]	value String	Main Core value Space.

711

712 Table 42 shows all restrictions applied to the attributes of AreaID_String.

713 **Table 42 - Restrictions of attributes for ESMPDataTypes::AreaID_String**

Name	Constraint	Type	Expression of constraint
value	maxLength	OCL	inv: self->MaxLength(18)

714

715 **1.2.5.5 BusinessKind_String datatype**

716 The coded identification of the business type.

717 Table 43 shows all attributes of BusinessKind_String.

718 **Table 43 - Attributes of ESMPDataTypes::BusinessKind_String**

mult.	Attribute name / Attribute type	Description
[1..1]	value BusinessTypeList	Main Core value Space.

719

720 **1.2.5.6 ClassificationKind_String datatype**

721 The coded identification of the classification mechanism used to group a set of objects
722 together. The grouping may be of a detailed or a summary nature.

723 Table 44 shows all attributes of ClassificationKind_String.

724

Table 44 - Attributes of ESMPDataTypes::ClassificationKind_String

mult.	Attribute name / Attribute type	Description
[1..1]	value ClassificationTypeList	Main Core value Space.

725

1.2.5.7 CurrencyCode_String datatype

726 The coded identification of legal tender using ISO 4217 3 alpha codes.

727 Table 45 shows all attributes of CurrencyCode_String.

728

Table 45 - Attributes of ESMPDataTypes::CurrencyCode_String

mult.	Attribute name / Attribute type	Description
[1..1]	value CurrencyTypeList	Main Core value Space.

729

1.2.5.8 EnergyProductKind_String datatype

730 The identification of the nature of an energy product such as power, energy, reactive power,
731 etc.

732 Table 46 shows all attributes of EnergyProductKind_String.

733

Table 46 - Attributes of ESMPDataTypes::EnergyProductKind_String

mult.	Attribute name / Attribute type	Description
[1..1]	value EnergyProductTypeList	Main Core value Space.

734

1.2.5.9 ESMP_DateTime datatype

735 In ESMP, the dateTime shall be expressed in UTC as YYYY-MM-DDThh:mm:ssZ.

736 Table 47 shows all attributes of ESMP_DateTime.

737

Table 47 - Attributes of ESMPDataTypes::ESMP_DateTime

mult.	Attribute name / Attribute type	Description
[1..1]	value DateTime	Main Core value Space.

738

739 Table 48 shows all restrictions applied to the attributes of ESMP_DateTime.

743 **Table 48 - Restrictions of attributes for ESMPDataTypes::ESMP_DateTime**

Name	Constraint	Type	Expression of constraint
value	pattern	OCL	inv: self->Pattern((((([0-9]{4})[\-](0[13578] 1[02])[\-](0[1-9] 12 [0-9]3[01]) ([0-9]{4})[\-]((0[469]) (11))[\-](0[1-9] 12 [0-9]30))T(((01 [0-9]2[0-3]):[0-5][0-9]:[0-5][0-9])Z) (((13579 [26][02468][048]) [13579][01345789](0)[48] 13579 [01345789][2468][048] 02468 [048][02468][048] 02468 [1235679](0)[48] 02468 [1235679][2468][048] [0-9][0-9][13579][26])[\-](02)[\-](0[1-9] 1[0-9]2[0-9])T(((01 [0-9]2[0-3]):[0-5][0-9]:[0-5][0-9])Z) (((13579 [26][02468][1235679] 13579 [01345789](0)[01235679] 13579 [01345789][2468][1235679] 02468 [048][02468][1235679] 02468 [1235679](0)[01235679] 02468 [1235679][2468][1235679] [0-9][0-9][13579][01345789])[\-](02)[\-](0[1-9] 1[0-9]2[0-8])T(((01 [0-9]2[0-3]):[0-5][0-9]:[0-5][0-9])Z))

744

745 **1.2.5.10 ESMPVersion_String datatype**

746 In ESMP, the coded value is restricted to digits.

747 A code that distinguishes one evolution of an identified object from another. Information about
748 a specific object may be sent several times, each transmission being identified by a different
749 version number.

750 Table 49 shows all attributes of ESMPVersion_String.

751 **Table 49 - Attributes of ESMPDataTypes::ESMPVersion_String**

mult.	Attribute name / Attribute type	Description
[1..1]	value String	Main Core value Space.

752

753 Table 50 shows all restrictions applied to the attributes of ESMPVersion_String.

754 **Table 50 - Restrictions of attributes for ESMPDataTypes::ESMPVersion_String**

Name	Constraint	Type	Expression of constraint
value	pattern	OCL	inv: self->Pattern([1-9]([0-9]){0,2})

755

756 **1.2.5.11 ID_String datatype**

757 A code to uniquely distinguish one occurrence of an entity from another.

758 In the ESMP context, the code is defined either by:

759 - an emitting company that provides an agreed identification unique within a business context
760 such as capacity auction identification, market agreement identification, etc.

761 - a party (originator of the exchange) that provides a unique identification in the framework of
762 a business exchange such as document identification, time series identification, bid
763 identification, ...

764 Table 51 shows all attributes of ID_String.

765

Table 51 - Attributes of ESMPDataTypes::ID_String

mult.	Attribute name / Attribute type	Description
[1..1]	value String	Main Core value Space.

766

767 Table 52 shows all restrictions applied to the attributes of ID_String.

768

Table 52 - Restrictions of attributes for ESMPDataTypes::ID_String

Name	Constraint	Type	Expression of constraint
value	maxLength	OCL	inv: self->MaxLength(35)

769

770 **1.2.5.12 MarketRoleKind_String datatype**

771 The identification of the role played by a party.

772 Table 53 shows all attributes of MarketRoleKind_String.

773

Table 53 - Attributes of ESMPDataTypes::MarketRoleKind_String

mult.	Attribute name / Attribute type	Description
[1..1]	value RoleTypeList	Main Core value Space.

774

775 **1.2.5.13 MeasurementPointID_String datatype**776 The coded identification of a domain covering a number of related objects, such as metering
777 point, accounting point, etc.778 In the ESMP context, it is an authorized issuing office that provides an agreed identification
779 coding scheme for measurement point identification.

780 Table 54 shows all attributes of MeasurementPointID_String.

781

Table 54 - Attributes of ESMPDataTypes::MeasurementPointID_String

mult.	Attribute name / Attribute type	Description
[1..1]	codingScheme CodingSchemeTypeList	DomainQualification.
[1..1]	value String	Main Core value Space.

782

783 Table 55 shows all restrictions applied to the attributes of MeasurementPointID_String.

784 **Table 55 - Restrictions of attributes for ESMPDataTypes::MeasurementPointID_String**

Name	Constraint	Type	Expression of constraint
value	maxLength	OCL	inv: self->MaxLength(35)

785

786 **1.2.5.14 MeasurementUnitKind_String datatype**

787 The coded identification of a unit of measure that is applied to a quantity. The measurement
788 units shall be in compliance with UN/ECE Recommendation 20.

789 Table 56 shows all attributes of MeasurementUnitKind_String.

790 **Table 56 - Attributes of ESMPDataTypes::MeasurementUnitKind_String**

mult.	Attribute name / Attribute type	Description
[1..1]	value UnitOfMeasureTypeList	Main Core value Space.

791

792 **1.2.5.15 MessageKind_String datatype**

793 The coded type of a document.

794 Table 57 shows all attributes of MessageKind_String.

795 **Table 57 - Attributes of ESMPDataTypes::MessageKind_String**

mult.	Attribute name / Attribute type	Description
[1..1]	value MessageTypeList	Main Core value Space.

796

797 **1.2.5.16 ObjectAggregationKind_String datatype**

798 The coded identification of the aggregation object.

799 Table 58 shows all attributes of ObjectAggregationKind_String.

800 **Table 58 - Attributes of ESMPDataTypes::ObjectAggregationKind_String**

mult.	Attribute name / Attribute type	Description
[1..1]	value ObjectAggregationTypeList	Main Core value Space.

801

802 **1.2.5.17 PartyID_String datatype**

803 The identification of an actor in the energy market.

804 In the ESMP context, it is an authorized issuing office that provides an agreed identification
805 coding scheme for market participant identification.

806 Table 59 shows all attributes of PartyID_String.

807 **Table 59 - Attributes of ESMPDataTypes::PartyID_String**

mult.	Attribute name / Attribute type	Description
[1..1]	codingScheme CodingSchemeTypeList	DomainQualification.
[1..1]	value String	Main Core value Space.

808

809 Table 60 shows all restrictions applied to the attributes of PartyID_String.

810 **Table 60 - Restrictions of attributes for ESMPDataTypes::PartyID_String**

Name	Constraint	Type	Expression of constraint
value	maxLength	OCL	inv: self->MaxLength(16)

811

812 **1.2.5.18 Position_Integer datatype**

813 An integer value, this value is used as a sequential value representing the relative position of
814 an entity within a space such as a time interval.

815 Table 61 shows all attributes of Position_Integer.

816 **Table 61 - Attributes of ESMPDataTypes::Position_Integer**

mult.	Attribute name / Attribute type	Description
[1..1]	value Integer	Main Core value Space.

817

818 Table 62 shows all restrictions applied to the attributes of Position_Integer.

819 **Table 62 - Restrictions of attributes for ESMPDataTypes::Position_Integer**

Name	Constraint	Type	Expression of constraint
value	maxInclusive	OCL	inv: self->maxInclusive(999999)
value	minInclusive	OCL	inv: self->minInclusive(1)

820

821 **1.2.5.19 ProcessKind_String datatype**

822 The coded identification of the nature of process.

823 Table 63 shows all attributes of ProcessKind_String.

824

Table 63 - Attributes of ESMPDataTypes::ProcessKind_String

mult.	Attribute name / Attribute type	Description
[1..1]	value ProcessTypeList	Main Core value Space.

825

1.2.5.20 Quality_String datatype

827 The coded identification of the quality of the information.

828 Table 64 shows all attributes of Quality_String.

829

Table 64 - Attributes of ESMPDataTypes::Quality_String

mult.	Attribute name / Attribute type	Description
[1..1]	value QualityTypeList	Main Core value Space.

830

1.2.5.21 ReasonCode_String datatype

832 The coded motivation of an act.

833 Table 65 shows all attributes of ReasonCode_String.

834

Table 65 - Attributes of ESMPDataTypes::ReasonCode_String

mult.	Attribute name / Attribute type	Description
[1..1]	value ReasonCodeTypeList	Main Core value Space.

835

1.2.5.22 ReasonText_String datatype

837 The textual explanation of an act as a string of characters.

838 Table 66 shows all attributes of ReasonText_String.

839

Table 66 - Attributes of ESMPDataTypes::ReasonText_String

mult.	Attribute name / Attribute type	Description
[1..1]	value String	Main Core value Space.

840

841 Table 67 shows all restrictions applied to the attributes of ReasonText_String.

842 **Table 67 - Restrictions of attributes for ESMPDataTypes::ReasonText_String**

Name	Constraint	Type	Expression of constraint
value	maxLength	OCL	inv: self->MaxLength(512)

843

844 **1.2.5.23 Status_String datatype**

845 The identification of the status of an object.

846 Table 68 shows all attributes of Status_String.

847 **Table 68 - Attributes of ESMPDataTypes::Status_String**

mult.	Attribute name / Attribute type	Description
[1..1]	value StatusTypeList	Main Core value Space.

848

849 **1.2.5.24 YMDHM_DateTime datatype**850 In ESMP, the date and time is expressed as "YYYY-MM-DDThh:mmZ", which conforms with
851 ISO 8601 UTC time zone. This date and time is without the seconds.

852 Table 69 shows all attributes of YMDHM_DateTime.

853 **Table 69 - Attributes of ESMPDataTypes::YMDHM_DateTime**

mult.	Attribute name / Attribute type	Description
[1..1]	value DateTime	The date and time as "YYYY-MM-DDThh:mmZ", which conforms with the ISO 8601 UTC time zone.

854

855 Table 70 shows all restrictions applied to the attributes of YMDHM_DateTime.

856 **Table 70 - Restrictions of attributes for ESMPDataTypes::YMDHM_DateTime**

Name	Constraint	Type	Expression of constraint
value	pattern	OCL	inv: self->Pattern((((([0-9]{4})[\\-](0[13578] 1[02])\\-([0-9]{12} [0-9]{30}) ([0-9]{4})[\\-]([0469])(11)[\\-](0[1-9] 12)[0-9]30))T((([01][0-9] 2[0-3]):[0-5][0-9])Z) ((([13579][26][02468][048] 13579][01345789](0)[48] 13579][01345789][2468][048] 02468][048][02468][1235679](0)[48] 02468][1235679][2468][048][0-9][0-9][13579][26])\\-)(02)[\\-](0[1-9] 1[0-9] 2[0-9])T((([01][0-9] 2[0-3]):[0-5][0-9])Z) ((([13579][26][02468][1235679] 13579][01345789](0)[01235679] 13579][01345789][2468][1235679] 02468][048][02468][1235679] 02468][1235679](0)[01235679] 02468][1235679][2468][1235679][0-9][0-9][13579][01345789])\\-)(02)[\\-](0[1-9] 1[0-9] 2[0-8])T((([01][0-9] 2[0-3]):[0-5][0-9])Z))
value	TruncationOrReduced	INV	choice=gYearMonthDayHourMinute

857

858 **1.2.6 Enumerations**

859 The list of enumerations used for the Energy account assembly model is as follows:

- 860 • BusinessTypeList
- 861 • ClassificationTypeList
- 862 • CodingSchemeTypeList
- 863 • CurrencyTypeList
- 864 • EnergyProductTypeList
- 865 • MessageTypeList
- 866 • ObjectAggregationTypeList
- 867 • ProcessTypeList
- 868 • QualityTypeList
- 869 • ReasonCodeTypeList
- 870 • RoleTypeList
- 871 • StatusTypeList
- 872 • UnitOfMeasureTypeList

873 7 XML schema

874 7.1 XML schema URN namespace rules

875 In order to provide a generic and stable means of declaring a URN for the European style
876 market profile XML schemas, the namespace will be composed in the following manner:

877 **urn:iec62325.351:tc57wg16:<process>:<document>:<version>:<release>**

878 where:

- 879 • iec62325.351 shall be the stem of all European style market profile XML schema
880 namespaces.
- 881 • tc57wg16 identifies the organisation or group of organisations within IEC that owns the
882 object being referenced. In the case of TC57 this shall be the WG16.
- 883 • <process> identifies the specific process where the object is situated, e.g. the part of the
884 IEC 62325 standards in which the XML schema is defined, e.g. 451-1, 451-2, 451-3, etc.
- 885 • <document> identifies the electronic document schema.
- 886 • <version> identifies the version of the document schema.
- 887 • <release> identifies the release of the document schema.

888 Every XML schema representing an electronic document shall have a default namespace
889 corresponding to the namespace that identifies the document and respects the above URI
890 namespace construction.

891 Every XML schema representing an electronic document shall have a targetNamespace
892 corresponding to the default namespace.

893 Every XML schema shall have an elementFormDefault as “qualified”.

894 Every XML schema shall have an attributeFormDefault as “unqualified”.

895 7.2 Code list URN namespace rules

896 In the case of the codelist library that shall be used for the European style market profile the
897 URN shall be as follows **urn:entsoe.eu:wgedi:codelists**.

898 7.3 URI rules for model documentation

899 7.3.1 Datatype

900 All the datatypes are documented in IEC 62325-351.

901 In the case of the base datatype library that shall be used for the European style market
902 profile, the URI shall use the sawsdl:modelReference as follows:

903 **`http://iec.ch/TC57/<CIM-version-year>/CIM-schema-<cimxx>#[datatype-name]`**

904 where:

- 905 • <CIM-version-year> is the year of the released CIM version used for generating market
906 profile.
- 907 • <cimxx> is the CIM version name.
- 908 • [datatype-name] is the name of the CIM datatype or primitive.

909 Examples:

910 `http://iec.ch/TC57/2012/CIM-schema-cim16#String`

911 `http://iec.ch/TC57/2012/CIM-schema-cim16#Money`

912 **7.3.2 Class**

913 In the case of the base class library that shall be used for the European style market profile,
914 the URI shall use the sawsdl:modelReference as follows:

915 **`http://iec.ch/TC57/<CIM-version-year>/CIM-schema-<cimxx>#[class-name]`**

916 where:

- 917 • <CIM-version-year> is the year of the released CIM version used for generating market
918 profile
- 919 • <cimxx> is the CIM version name
- 920 • [class-name] is the name of the CIM class

921 Example: `http://iec.ch/TC57/2012/CIM-schema-cim16#TimeSeries`

922 **7.3.3 Attribute**

923 In the case of the base attribute library that shall be used for the European style market
924 profile, the URI shall use the sawsdl:modelReference as follows:

925 **`http://iec.ch/TC57/<CIM-version-year>/CIM-schema-<cimxx>#[class-name].[attribute-`**
926 **`name]`**

927 where:

- 928 • <CIM-version-year> is the year of the released CIM version used for generating market
929 profile
- 930 • <cimxx> is the CIM version name
- 931 • [class-name] is the name of the CIM class
- 932 • [attribute-name] is the name of a class attribute

933 Example: `http://iec.ch/TC57/2012/CIM-schema-cim16#TimeSeries.product`

934 **7.3.4 Association end role name**

935 In the case of the base association library that shall be used for the European style market
936 profile, the URI shall use the sawsdl:modelReference as follows:

937 **`http://iec.ch/TC57/<CIM-version-year>/CIM-schema-<cimxx>#[class-name].[association-`**
938 **`end-role-name]`**

939 where:

- 940 • <CIM-version-year> is the year of the released CIM version used for generating market
941 profile
- 942 • <cimxx> is the CIM version name
- 943 • [class-name] is the name of the CIM class
- 944 • [association-end-role-name]

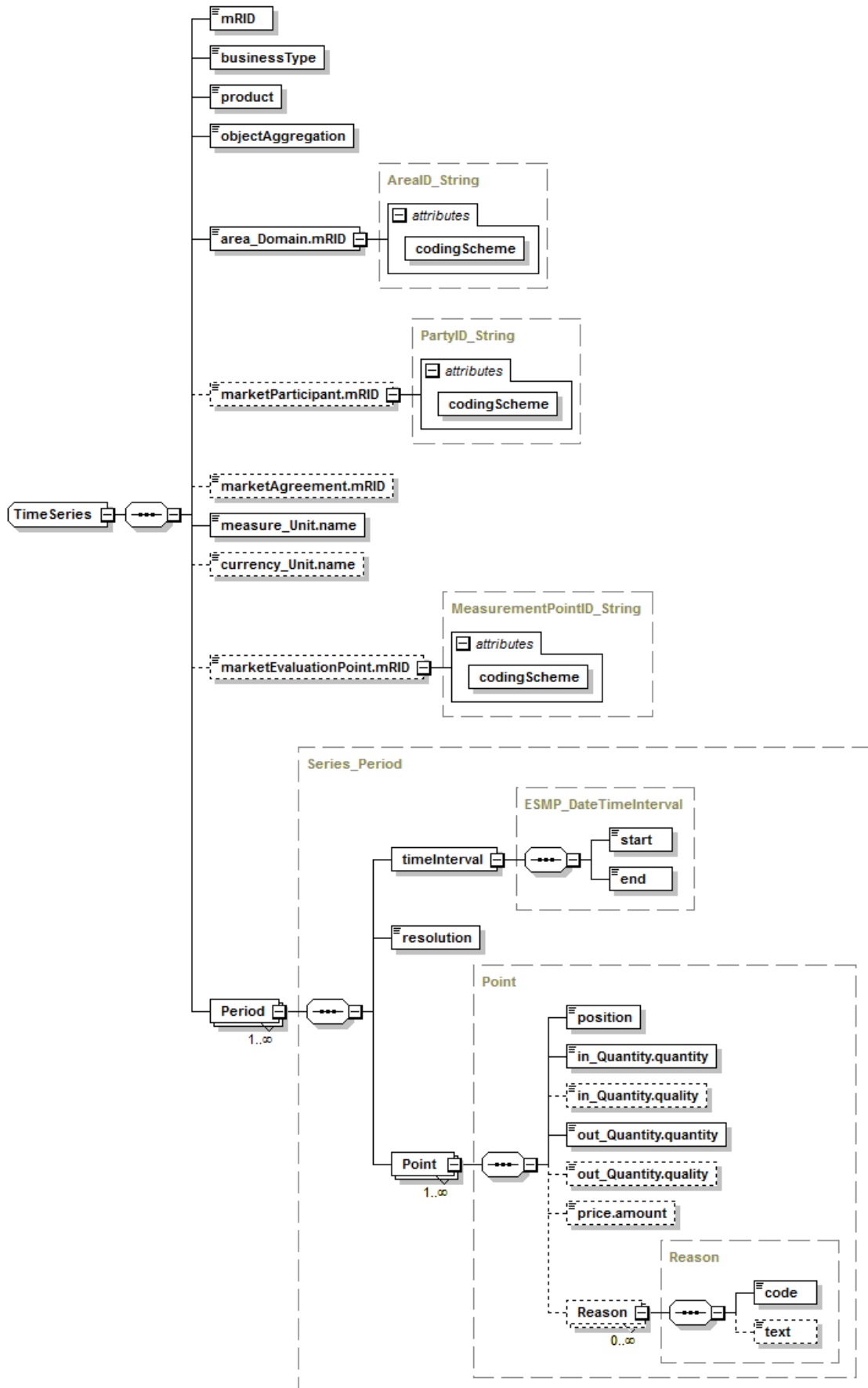
945 Example: <http://iec.ch/TC57/2012/CIM-schema-cim16#MarketDocument.TimeSeries>

946 **7.4 EnergyAccount_MarketDocument schema**

947 **7.4.1 Schema Structure**

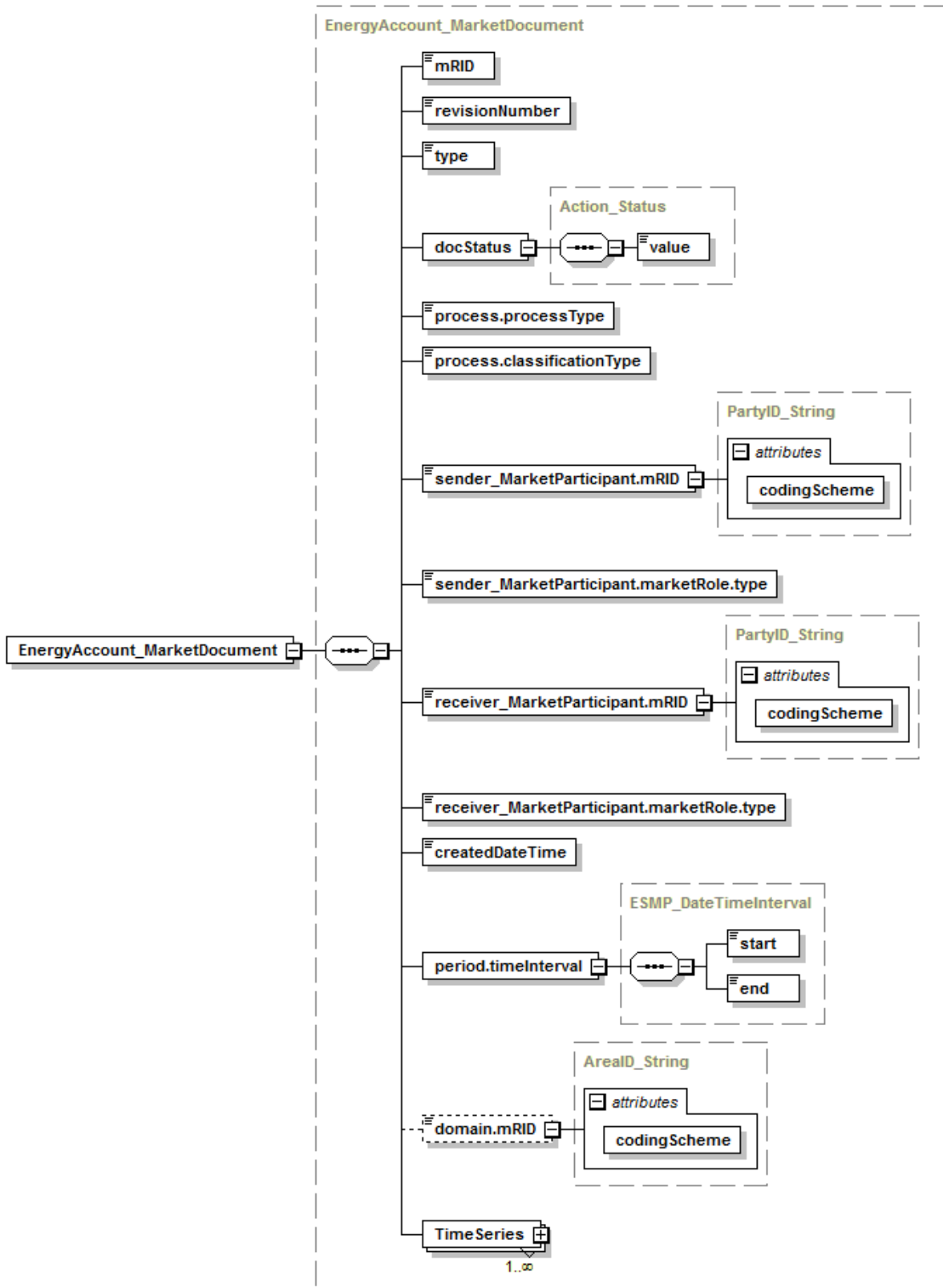
948

Figure 8 and



949

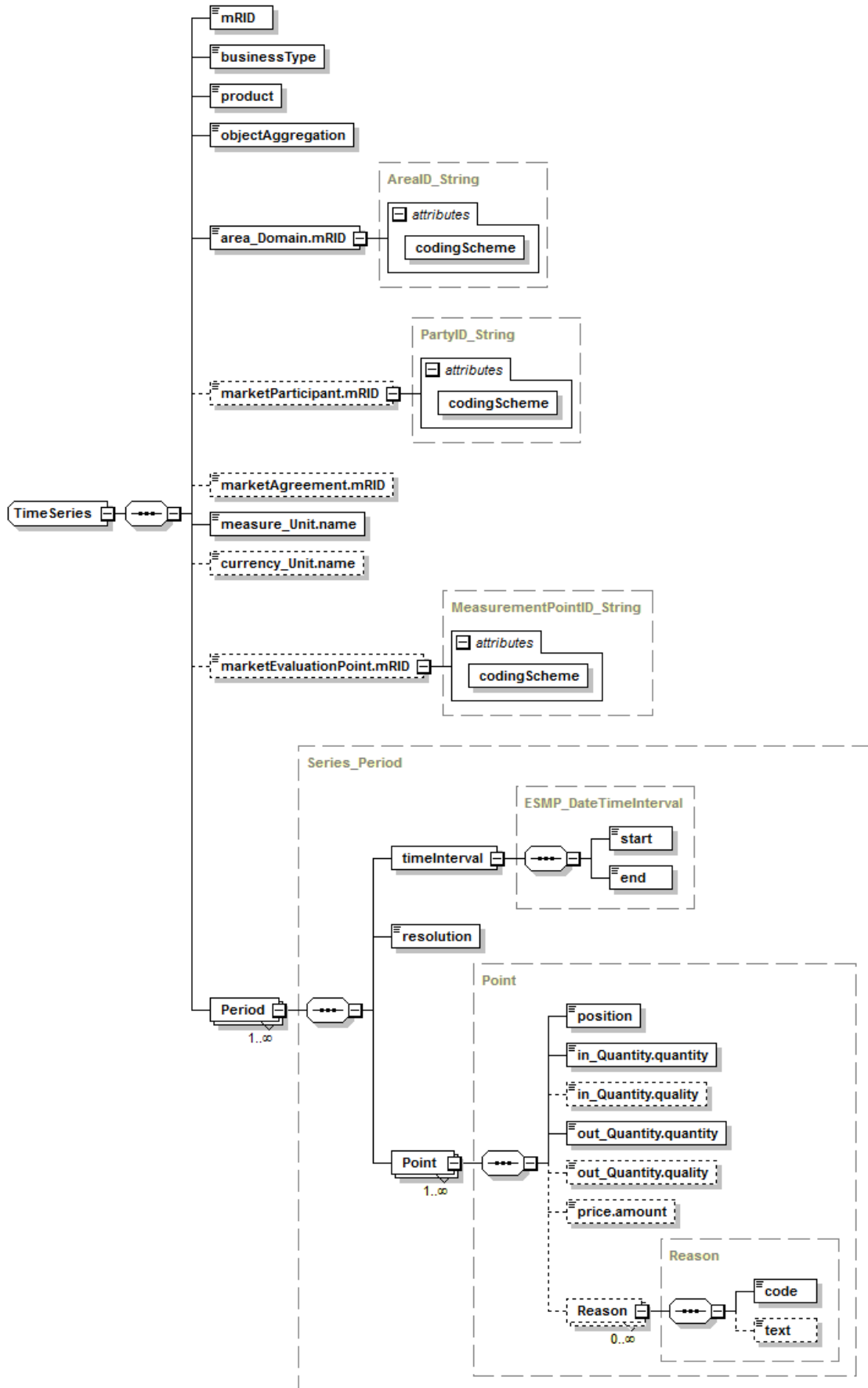
950 Figure 9 provide the structure of the schema.



951

952

Figure 8 – EnergyAccount_MarketDocument XML schema structure 1/2



953

954

Figure 9 – EnergyAccount_MarketDocument XML schema structure 2/2

955 **7.4.2 Schema description**

```

956 <?xml version="1.0" encoding="utf-8"?>
957 <xs:schema xmlns:cl="urn:entsoe.eu:wgedi:codelists"
958 xmlns:sawSDL="http://www.w3.org/ns/sawSDL" xmlns="urn:iec62325.351:tc57wg16:451-
959 4:energyaccountdocument:4:0" xmlns:cimp="http://www.iec.ch/cimprofile"
960 attributeFormDefault="unqualified" elementFormDefault="qualified"
961 targetNamespace="urn:iec62325.351:tc57wg16:451-4:energyaccountdocument:4:0"
962 xmlns:xs="http://www.w3.org/2001/XMLSchema">
963   <xs:import schemaLocation="urn-entsoe-eu-wgedi-codelists.xsd"
964   namespace="urn:entsoe.eu:wgedi:codelists" />
965   <xs:element name="EnergyAccount_MarketDocument" type="EnergyAccount_MarketDocument"
966   />
967   <xs:simpleType name="ID_String" sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-
968   schema-cim16#String">
969     <xs:restriction base="xs:string">
970       <xs:maxLength value="35" />
971     </xs:restriction>
972   </xs:simpleType>
973   <xs:simpleType name="ESMPVersion_String"
974   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
975     <xs:restriction base="xs:string">
976       <xs:pattern value="[1-9]([0-9]){0,2}" />
977     </xs:restriction>
978   </xs:simpleType>
979   <xs:simpleType name="MessageKind_String"
980   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
981     <xs:restriction base="cl:MessageTypeList" />
982   </xs:simpleType>
983   <xs:simpleType name="ProcessKind_String"
984   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
985     <xs:restriction base="cl:ProcessTypeList" />
986   </xs:simpleType>
987   <xs:simpleType name="ClassificationKind_String"
988   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
989     <xs:restriction base="cl:ClassificationTypeList" />
990   </xs:simpleType>
991   <xs:simpleType name="PartyID_String-base"
992   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
993     <xs:restriction base="xs:string">
994       <xs:maxLength value="16" />
995     </xs:restriction>
996   </xs:simpleType>
997   <xs:complexType name="PartyID_String"
998   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
999     <xs:simpleContent>
1000       <xs:extension base="PartyID_String-base">
1001         <xs:attribute name="codingScheme" type="cl:CodingSchemeTypeList"
1002         use="required" />
1003       </xs:extension>
1004     </xs:simpleContent>
1005   </xs:complexType>
1006   <xs:simpleType name="MarketRoleKind_String"
1007   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1008     <xs:restriction base="cl:RoleTypeList" />
1009   </xs:simpleType>
1010   <xs:simpleType name="ESMP_DateTime"
1011   sawSDL:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#DateTime">
1012     <xs:restriction base="xs:dateTime">
1013       <xs:pattern value="((( [0-9]{4} ) [ - ] ( 0 [13578] | 1 [02] ) [ - ] ( 0 [1-9] | [12] [0-
1014 9] | 3 [01] ) | ( [0-9]{4} ) [ - ] ( ( 0 [469] ) | ( 11 ) ) [ - ] ( 0 [1-9] | [12] [0-9] | 30 ) ) T ( ( [01] [0-9] | 2 [0-
1015 3] ) : [0-5] [0-9] : [0-5] [0-
1016 9] ) Z ) | ( ( [13579] [26] [02468] [048] | [13579] [01345789] ( 0 ) [48] | [13579] [01345789] [2468] [048]
1017 | [02468] [048] [02468] [048] | [02468] [1235679] ( 0 ) [48] | [02468] [1235679] [2468] [048] | [0-
1018 9] [0-9] [13579] [26] ) [ - ] ( 02 ) [ - ] ( 0 [1-9] | 1 [0-9] | 2 [0-9] ) ) T ( ( [01] [0-9] | 2 [0-3] ) : [0-5] [0-
1019 9] : [0-5] [0-
1020 9] ) Z ) | ( ( [13579] [26] [02468] [1235679] | [13579] [01345789] ( 0 ) [01235679] | [13579] [01345789] [
1021 2468] [1235679] | [02468] [048] [02468] [1235679] | [02468] [1235679] ( 0 ) [01235679] | [02468] [123

```

```

1022 5679] [2468] [1235679] | [0-9] [0-9] [13579] [01345789] [\ -] (02) [\ -] (0 [1-9] | 1 [0-9] | 2 [0-
1023 8]) T (( [01] [0-9] | 2 [0-3] ) : [0-5] [0-9] : [0-5] [0-9] ) Z " />
1024 </xs:restriction>
1025 </xs:simpleType>
1026 <xs:simpleType name="AreaID_String-base"
1027 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1028 <xs:restriction base="xs:string">
1029 <xs:maxLength value="18" />
1030 </xs:restriction>
1031 </xs:simpleType>
1032 <xs:complexType name="AreaID_String"
1033 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1034 <xs:simpleContent>
1035 <xs:extension base="AreaID_String-base">
1036 <xs:attribute name="codingScheme" type="cl:CodingSchemeTypeList"
1037 use="required" />
1038 </xs:extension>
1039 </xs:simpleContent>
1040 </xs:complexType>
1041 <xs:simpleType name="Status_String"
1042 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1043 <xs:restriction base="cl:StatusTypeList" />
1044 </xs:simpleType>
1045 <xs:complexType name="Action_Status"
1046 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Status">
1047 <xs:sequence>
1048 <xs:element minOccurs="1" maxOccurs="1" name="value" type="Status_String"
1049 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Status.value">
1050 </xs:element>
1051 </xs:sequence>
1052 </xs:complexType>
1053 <xs:simpleType name="YMDHM_DateTime"
1054 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#DateTime">
1055 <xs:restriction base="xs:string">
1056 <xs:pattern value="((( [0-9] {4} ) [\ -] (0 [13578] | 1 [02] ) [\ -] (0 [1-9] | [12] [0-
1057 9] | 3 [01] ) | ( [0-9] {4} ) [\ -] ( (0 [469] ) | (11) ) [\ -] (0 [1-9] | [12] [0-9] | 30) ) T (( [01] [0-9] | 2 [0-
1058 3] ) : [0-5] [0-
1059 9] ) Z) | ( ([13579] [26] [02468] [048] | [13579] [01345789] (0) [48] | [13579] [01345789] [2468] [048]
1060 | [02468] [048] [02468] [048] | [02468] [1235679] (0) [48] | [02468] [1235679] [2468] [048] | [0-
1061 9] [0-9] [13579] [26] ) [\ -] (02) [\ -] (0 [1-9] | 1 [0-9] | 2 [0-9] ) T (( [01] [0-9] | 2 [0-3] ) : [0-5] [0-
1062 9] ) Z) | ( ([13579] [26] [02468] [1235679] | [13579] [01345789] (0) [01235679] | [13579] [01345789] [
1063 2468] [1235679] | [02468] [048] [02468] [1235679] | [02468] [1235679] (0) [01235679] | [02468] [123
1064 5679] [2468] [1235679] | [0-9] [0-9] [13579] [01345789] ) [\ -] (02) [\ -] (0 [1-9] | 1 [0-9] | 2 [0-
1065 8] ) T (( [01] [0-9] | 2 [0-3] ) : [0-5] [0-9] ) Z " />
1066 </xs:restriction>
1067 </xs:simpleType>
1068 <xs:complexType name="ESMP_DateTimeInterval"
1069 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#DateTimeInterval">
1070 <xs:sequence>
1071 <xs:element minOccurs="1" maxOccurs="1" name="start" type="YMDHM_DateTime"
1072 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1073 cim16#DateTimeInterval.start">
1074 </xs:element>
1075 <xs:element minOccurs="1" maxOccurs="1" name="end" type="YMDHM_DateTime"
1076 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1077 cim16#DateTimeInterval.end">
1078 </xs:element>
1079 </xs:sequence>
1080 </xs:complexType>
1081 <xs:complexType name="EnergyAccount_MarketDocument"
1082 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#MarketDocument">
1083 <xs:sequence>
1084 <xs:element minOccurs="1" maxOccurs="1" name="mRID" type="ID_String"
1085 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1086 cim16#IdentifiedObject.mRID">
1087 </xs:element>
1088 <xs:element minOccurs="1" maxOccurs="1" name="revisionNumber"
1089 type="ESMPVersion_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1090 cim16#Document.revisionNumber">
1091 </xs:element>

```

```
1092     <xs:element minOccurs="1" maxOccurs="1" name="type" type="MessageKind_String"
1093 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Document.type">
1094     </xs:element>
1095     <xs:element minOccurs="1" maxOccurs="1" name="docStatus" type="Action_Status"
1096 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Document.docStatus">
1097     </xs:element>
1098     <xs:element minOccurs="1" maxOccurs="1" name="process.processType"
1099 type="ProcessKind_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1100 cim16#Process.processType">
1101     </xs:element>
1102     <xs:element minOccurs="1" maxOccurs="1" name="process.classificationType"
1103 type="ClassificationKind_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1104 schema-cim16#Process.classificationType">
1105     </xs:element>
1106     <xs:element minOccurs="1" maxOccurs="1" name="sender_MarketParticipant.mRID"
1107 type="PartyID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1108 cim16#IdentifiedObject.mRID">
1109     </xs:element>
1110     <xs:element minOccurs="1" maxOccurs="1"
1111 name="sender_MarketParticipant.marketRole.type" type="MarketRoleKind_String"
1112 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#MarketRole.type">
1113     </xs:element>
1114     <xs:element minOccurs="1" maxOccurs="1" name="receiver_MarketParticipant.mRID"
1115 type="PartyID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1116 cim16#IdentifiedObject.mRID">
1117     </xs:element>
1118     <xs:element minOccurs="1" maxOccurs="1"
1119 name="receiver_MarketParticipant.marketRole.type" type="MarketRoleKind_String"
1120 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#MarketRole.type">
1121     </xs:element>
1122     <xs:element minOccurs="1" maxOccurs="1" name="createdDateTime"
1123 type="ESMP_DateTime" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1124 cim16#Document.createdDateTime">
1125     </xs:element>
1126     <xs:element minOccurs="1" maxOccurs="1" name="period.timeInterval"
1127 type="ESMP_DateTimeInterval" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1128 schema-cim16#Period.timeInterval">
1129     </xs:element>
1130     <xs:element minOccurs="0" maxOccurs="1" name="domain.mRID" type="AreaID_String"
1131 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1132 cim16#IdentifiedObject.mRID">
1133     </xs:element>
1134     <xs:element minOccurs="1" maxOccurs="unbounded" name="TimeSeries"
1135 type="TimeSeries" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1136 cim16#MarketDocument.TimeSeries">
1137     </xs:element>
1138   </xs:sequence>
1139 </xs:complexType>
1140 <xs:simpleType name="Position_Integer"
1141 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Integer">
1142   <xs:restriction base="xs:integer">
1143     <xs:maxInclusive value="999999" />
1144     <xs:minInclusive value="1" />
1145   </xs:restriction>
1146 </xs:simpleType>
1147 <xs:simpleType name="Quality_String"
1148 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1149   <xs:restriction base="cl:QualityTypeList" />
1150 </xs:simpleType>
1151 <xs:simpleType name="Amount_Decimal"
1152 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Decimal">
1153   <xs:restriction base="xs:decimal">
1154     <xs:totalDigits value="17" />
1155   </xs:restriction>
1156 </xs:simpleType>
1157 <xs:complexType name="Point" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1158 schema-cim16#Point">
1159   <xs:sequence>
1160     <xs:element minOccurs="1" maxOccurs="1" name="position" type="Position_Integer"
1161 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Point.position">
```

```

1162     </xs:element>
1163     <xs:element minOccurs="1" maxOccurs="1" name="in_Quantity.quantity"
1164 type="xs:decimal" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1165 cim16#Quantity.quantity">
1166     </xs:element>
1167     <xs:element minOccurs="0" maxOccurs="1" name="in_Quantity.quality"
1168 type="Quality_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1169 cim16#Quantity.quality">
1170     </xs:element>
1171     <xs:element minOccurs="1" maxOccurs="1" name="out_Quantity.quantity"
1172 type="xs:decimal" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1173 cim16#Quantity.quantity">
1174     </xs:element>
1175     <xs:element minOccurs="0" maxOccurs="1" name="out_Quantity.quality"
1176 type="Quality_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1177 cim16#Quantity.quality">
1178     </xs:element>
1179     <xs:element minOccurs="0" maxOccurs="1" name="price.amount"
1180 type="Amount_Decimal" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1181 cim16#Price.amount">
1182     </xs:element>
1183     <xs:element minOccurs="0" maxOccurs="unbounded" name="Reason" type="Reason"
1184 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Point.Reason">
1185     </xs:element>
1186   </xs:sequence>
1187 </xs:complexType>
1188 <xs:simpleType name="ReasonCode_String"
1189 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1190   <xs:restriction base="cl:ReasonCodeTypeList" />
1191 </xs:simpleType>
1192 <xs:simpleType name="ReasonText_String"
1193 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1194   <xs:restriction base="xs:string">
1195     <xs:maxLength value="512" />
1196   </xs:restriction>
1197 </xs:simpleType>
1198 <xs:complexType name="Reason" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1199 schema-cim16#Reason">
1200   <xs:sequence>
1201     <xs:element minOccurs="1" maxOccurs="1" name="code" type="ReasonCode_String"
1202 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Reason.code">
1203     </xs:element>
1204     <xs:element minOccurs="0" maxOccurs="1" name="text" type="ReasonText_String"
1205 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Reason.text">
1206     </xs:element>
1207   </xs:sequence>
1208 </xs:complexType>
1209 <xs:complexType name="Series_Period"
1210 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Period">
1211   <xs:sequence>
1212     <xs:element minOccurs="1" maxOccurs="1" name="timeInterval"
1213 type="ESMP_DateTimeInterval" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1214 schema-cim16#Period.timeInterval">
1215     </xs:element>
1216     <xs:element minOccurs="1" maxOccurs="1" name="resolution" type="xs:duration"
1217 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Period.resolution">
1218     </xs:element>
1219     <xs:element minOccurs="1" maxOccurs="unbounded" name="Point" type="Point"
1220 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#Period.Point">
1221     </xs:element>
1222   </xs:sequence>
1223 </xs:complexType>
1224 <xs:simpleType name="BusinessKind_String"
1225 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1226   <xs:restriction base="cl:BusinessTypeList" />
1227 </xs:simpleType>
1228 <xs:simpleType name="EnergyProductKind_String"
1229 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1230   <xs:restriction base="cl:EnergyProductTypeList" />
1231 </xs:simpleType>

```

```
1232     <xs:simpleType name="ObjectAggregationKind_String"
1233 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1234     <xs:restriction base="cl:ObjectAggregationTypeList" />
1235     </xs:simpleType>
1236     <xs:simpleType name="MeasurementUnitKind_String"
1237 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1238     <xs:restriction base="cl:UnitOfMeasureTypeList" />
1239     </xs:simpleType>
1240     <xs:simpleType name="CurrencyCode_String"
1241 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1242     <xs:restriction base="cl:CurrencyTypeList" />
1243     </xs:simpleType>
1244     <xs:simpleType name="MeasurementPointID_String-base"
1245 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1246     <xs:restriction base="xs:string">
1247     <xs:maxLength value="35" />
1248     </xs:restriction>
1249     </xs:simpleType>
1250     <xs:complexType name="MeasurementPointID_String"
1251 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#String">
1252     <xs:simpleContent>
1253     <xs:extension base="MeasurementPointID_String-base">
1254     <xs:attribute name="codingScheme" type="cl:CodingSchemeTypeList"
1255 use="required" />
1256     </xs:extension>
1257     </xs:simpleContent>
1258     </xs:complexType>
1259     <xs:complexType name="TimeSeries"
1260 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim16#TimeSeries">
1261     <xs:sequence>
1262     <xs:element minOccurs="1" maxOccurs="1" name="mRID" type="ID_String"
1263 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1264 cim16#IdentifiedObject.mRID">
1265     </xs:element>
1266     <xs:element minOccurs="1" maxOccurs="1" name="businessType"
1267 type="BusinessKind_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1268 cim16#TimeSeries.businessType">
1269     </xs:element>
1270     <xs:element minOccurs="1" maxOccurs="1" name="product"
1271 type="EnergyProductKind_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1272 schema-cim16#TimeSeries.product">
1273     </xs:element>
1274     <xs:element minOccurs="1" maxOccurs="1" name="objectAggregation"
1275 type="ObjectAggregationKind_String"
1276 sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1277 cim16#TimeSeries.objectAggregation">
1278     </xs:element>
1279     <xs:element minOccurs="1" maxOccurs="1" name="area_Domain.mRID"
1280 type="AreaID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1281 cim16#IdentifiedObject.mRID">
1282     </xs:element>
1283     <xs:element minOccurs="0" maxOccurs="1" name="marketParticipant.mRID"
1284 type="PartyID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1285 cim16#IdentifiedObject.mRID">
1286     </xs:element>
1287     <xs:element minOccurs="0" maxOccurs="1" name="marketAgreement.mRID"
1288 type="ID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1289 cim16#IdentifiedObject.mRID">
1290     </xs:element>
1291     <xs:element minOccurs="1" maxOccurs="1" name="measure_Unit.name"
1292 type="MeasurementUnitKind_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1293 schema-cim16#Unit.name">
1294     </xs:element>
1295     <xs:element minOccurs="0" maxOccurs="1" name="currency_Unit.name"
1296 type="CurrencyCode_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1297 cim16#Unit.name">
1298     </xs:element>
1299     <xs:element minOccurs="0" maxOccurs="1" name="marketEvaluationPoint.mRID"
1300 type="MeasurementPointID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-
1301 schema-cim16#IdentifiedObject.mRID">
```

```
1302         </xs:element>
1303         <xs:element minOccurs="1" maxOccurs="unbounded" name="Period"
1304 type="Series_Period" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-
1305 cim16#TimeSeries.Period">
1306         </xs:element>
1307         </xs:sequence>
1308     </xs:complexType>
1309 </xs:schema>
```

1310

Bibliography

1311 IEC 61968-11, *Application integration at electric utilities – System interfaces for distribution management – Part 11: Common information model (CIM) extensions for distribution*

1313 IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

1315 ISO/TS 15000-5:2005, *Electronic Business Extensible Markup Language (ebXML) – Part 5: ebXML Core Components Technical Specification, Version 2.01 (ebCCTS)*

1317 UN/ECE Recommendation 20, *CODES FOR UNITS OF MEASURE USED IN INTERNATIONAL TRADE*

1319 UN/CEFACT, *Unified Context Methodology Technical Specification*

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