

BRS

(Business Requirement Specification)

NORDIC TSO-TSO SETTLEMENT PROCESS

A market model for data exchange

Business process:	Nordic TSO-TSO settlement process
Version:	1.1.C
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1 Introduction

1.1 Background

The Nordic TSOs exchange a range of documents related to the settlement process between the TSOs. The information exchanged includes among others: planned and metered exchange (import and export), unintended power exchange, bought and sold energy in FCR-N and FCR-D markets, agreed supportive power, transmission losses and ramping energy.

1.2 About Nordic Ediel BRSs

The NMEG Ediel Business Requirement Specifications (BRSs) describes business processes where data is exchanged between market participants in the Nordic energy market based on the UN/CEFACT Modelling Methodology (UMM). A BRS is a tool that helps the participants in the Nordic energy market to implement effective and harmonised data-exchange processes. The Ediel BRSs can be seen as a framework designed to improve communication between stakeholders, reduce development time, and minimise errors.

The Nordic Ediel BRSs covers all aspects of a business requirement specification for a specific data-exchange process and purpose, including functional requirements, non-functional requirements (partly), UseCases, and data flows.

NMEG Ediel BRSs will as far as possible be based on already available standards and best practices, such as:

- 1) ENTSO-E Implementation Guides (IGs) based on IEC 62325-451-n standards
- 2) ENTSO-E Implementation Guides (IGs) based on IEC 62325-351 standard
- 3) Other Implementation Guides (IGs) based on IEC 62325-351 standard
- 4) EU Implementation Regulations
- 5) Documents from the DSO Entity and the ENTSO-E and DSO Entity Joint Working Group (JWG)
- 6) Nordic BRSs, IGs, regulations etc.

In addition, the NMEG Ediel BRS will document Nordic extensions and/or restrictions compared with the standards and best practices the BRS is based on.

1.3 Nordic Energy Domain Model

A Nordic Energy market Domain model, giving an overall overview of the structure and processes used in the Nordic Energy market, can be found in [6].

1.4 Project organisation

The document is written by NMEG (Nordic Market Expert Group), see www.ediel.org.

1.5 References

- [1] ENTSO-E implementation guides, see [ENTSO-E Electronic Data Interchange \(EDI\) Library](#)
 - Preview of “IEC 62325-451-4, Framework for energy market communications – Part 451-4: Settlement and reconciliation business process, contextual and assembly models for European market (the full document can be bought at the IEC Webstore).
 - Accounting and Financial Settlement of Kf, ACE and Ramping period (FSKAR) Implementation Guide
- [2] [UN/CEFACT Unified Modelling Methodology \(UMM\)](#)

- [3] [The Harmonised Role Model, ENTSO-E, eBIX® and EFET](#)
- [4] Ediel BRSs for Nordic Balance Settlement (NBS), see <https://ediel.org/nordic-balance-settlement-nbs/>, i.e. NBS BRS and NBS BRS for TSO-MO
- [5] Other Ediel BRSs, such as BRS for Nordic trading system, see <https://ediel.org/common-ediel-documents/>
- [6] Ediel Common Nordic XML rules and recommendations, see <https://ediel.org/common-ediel-documents/>
- [7] Nordic Energy Market Domain Model, see <https://ediel.org/common-ediel-documents/>

1.6 Terms and notations

The term *document* is used instead of *message* when this is applicable. However, when referencing ENTSO-E document names, the ENTSO-E name will be used, e.g., message, report, or document.

Documents are described by a class diagram showing the full set of attributes in the related xml schema. In addition, the usage of the document is described by one or more tables detailing the usage of each attribute. Optional attributes from the class diagram, not used in the specific data exchange, are omitted from the table. In addition the cardinalities, e.g., [0..1], may be stricter in the detailed descriptions than in the original ENTSO-E documents.

Some abbreviations used:

ACE	Area Control Error
ASP	Agreed Supportive Power
BRS	Business Requirement Specification
FCR	Frequency Containment Reserve
FCR-D	Frequency Containment Reserve for Disturbances
FCR-N	Frequency Containment Reserve for Disturbances
Kf	K-factor of an LFC area or LFC block means a value expressed in megawatts per hertz ('MW/Hz'), which is as close as practical to, or greater than the sum of the auto-control of generation, self-regulation of load and of the contribution of frequency containment reserve relative to the maximum steady-state frequency deviation, ref. Commission Regulation (EU) 2017/1485 (SO GL Art. 3 (45)).
FSKAR	Financial Settlement of Kf, ACE and Ramping period
mFRR	manual Frequency Restoration Reserves
TSO	Transmission System Operator

1.7 Change log

Ver/rel/rev	Changed by	Date	Changes
1.1.C	Ove Nesvik	20241008	Updated the status of the BRS to "Approved by NMEG".
1.1.B	Ove Nesvik	20240927	<ul style="list-style-type: none"> Addition of new Business type code in chapter "5 Financial Settlement Report (FSKAR)": ZA2 Imbalance losses
1.1.A	Ove Nesvik	20240628	<ul style="list-style-type: none"> Reporting of ramping is moved from the ERRP Reserve Allocation Result Document to the Financial Settlement Report Editorial corrections
1.0.C	Ove Nesvik	20240516	<ul style="list-style-type: none"> Update of chapter "1.5 References" Update of chapter "1.6 Terms and notation" Addition of chapter "2.4 Process Areas within the Nordic TSO-TSO settlement process" Addition of "Appendix A Business rules" Editorial corrections
1.0.B	Ove Nesvik	20240313	Addition of xml schema version number to be used for the documents described in the Business Data View (chapter 4).
1.0.A	Ove Nesvik	20240222	This is the first draft version of the Nordic Ediel BRS for TSO-TSO Settlement. It is published as a "Release candidate", i.e. changes are likely to occur.

2 Business Domain View: Business area Settlement

2.1 Settlement in the overall context (Domain model)

The *Domain model* [7] describes the core business areas needed to have a well-functioning energy market. The model is important for having a common and agreed understanding on how the energy market works as a basis for development of common methods for exchange of information.

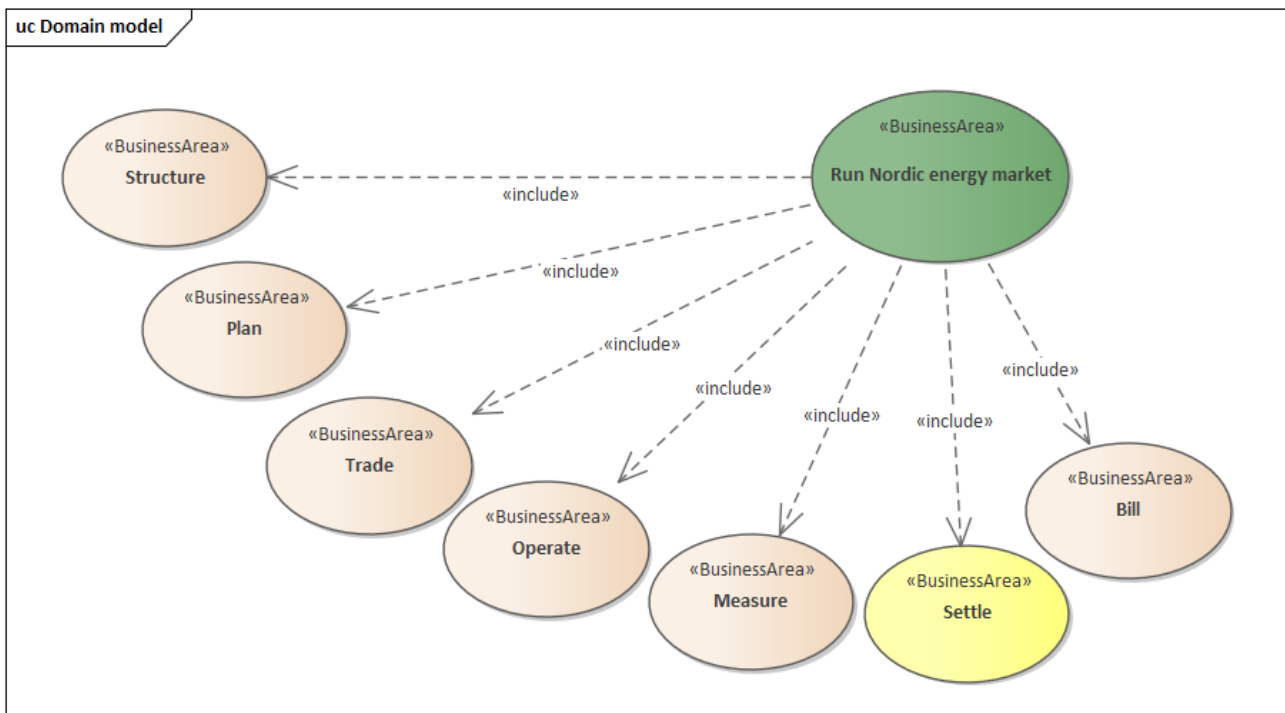


Figure 1: UseCase diagram: Domain model

The domain model of the energy market covers all stages from the structuring of the market until the settlement and billing of consumption and transport of energy, with a focus on the exchange of information:

- **Structure:** Exchange of master data including the Change of Supplier processes
- **Plan:** Planning of production, consumption, exchange, and transport
- **Trade:** Trade on different markets, including ancillary services, bilateral trade, etc.
- **Operate:** Operation
- **Measure:** Measuring of production, consumption, exchange, and transport
- **Settle:** Settlement
- **Bill:** Billing

The Nordic TSO-TSO settlement process is a part of the business area Settle.

For a more elaborated description of the process include in the domain model, see [7].

2.2 Breakdown of the business area Settle

In the rest of this document the process area (UseCase) Nordic TSO-TSO settlement from the business area Settle is further elaborated.

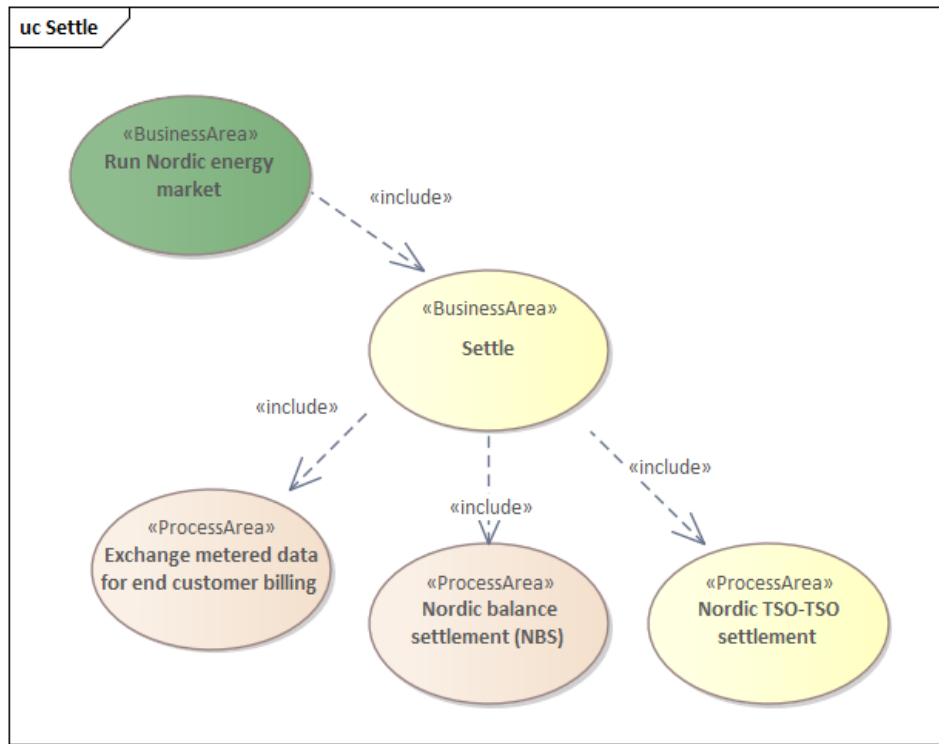


Figure 2: UseCase diagram: The Nordic TSO-TSO settlement process

The business area Settle, outlined in **Figure 2**, concerns both the Nordic downstream market and upstream market. The Nordic balance settlement (NBS) process is documented in a separate BRS, see [4]. The process area Exchange metered data for end customer billing is documented on a national basis.

The TSO-TSO settlement concerns principally settlement of cross border exchange of energy between the Transmission System Operators in the Nordic countries. The settlement is done between National Areas or Bidding Zones.

In the rest of this document the process area Nordic TSO-TSO settlement is further elaborated.

2.3 Overview of the Nordic TSO-TSO settlement process

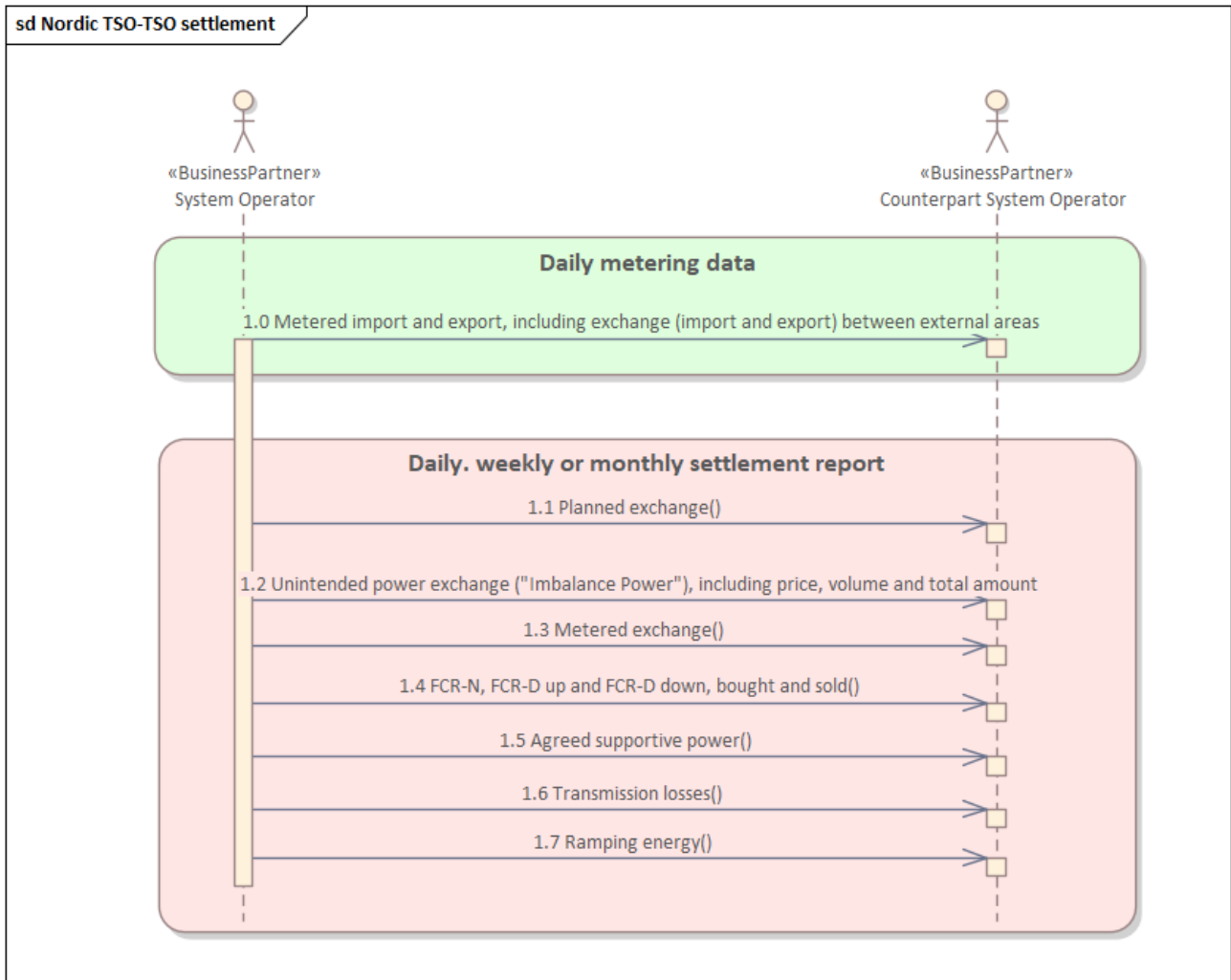


Figure 3: Sequence diagram: Information exchange overview for “Nordic TSO-TSO settlement”

Process area	Arrow	Content	Where to find detailed description
Daily metering data	1.0	Metered import and export, including exchange (import and export) between external areas	Metering Data Document (FSKAR) based on IEC62325-351, see chapter 4.1
Daily, weekly or monthly settlement report	1.1	Planned exchange	Financial Settlement Report (FSKAR) based on IEC62325-351, see chapter 5
	1.2	Unintended power exchange ("Imbalance Power"), including price, volume and total amount	Financial Settlement Report (FSKAR) based on IEC62325-351, see chapter 5
	1.3	Metered exchange	Financial Settlement Report (FSKAR) based on IEC62325-351, see chapter 5
	1.4	FCR-N, FCR-D up and FCR-D down, bought and sold	ERRP Reserve Allocation Result Document based on IEC62325-351, see chapter 5.2

Process area	Arrow	Content	Where to find detailed description
	1.5	Agreed supportive power	Financial Settlement Report (FSKAR) based on IEC62325-351, see chapter 5
	1.6	Transmission losses	Financial Settlement Report (FSKAR) based on IEC62325-351, see chapter 5
	1.7	Ramping energy	Financial Settlement Report (FSKAR) based on IEC62325-351, see chapter 5

Table 1: ENTSO-E documents used in the Nordic TSO-TSO settlement process

2.4 Process Areas within the Nordic TSO-TSO settlement process

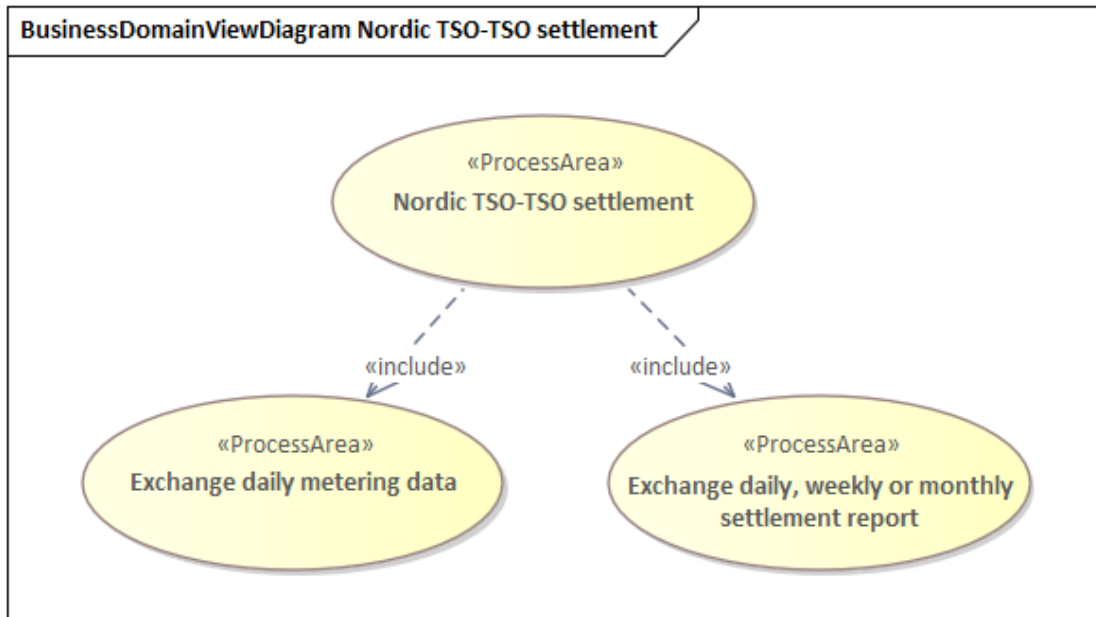


Figure 4: UseCase diagram: Nordic TSO-TSO settlement

2.4.1 Process area: Exchange daily metering data

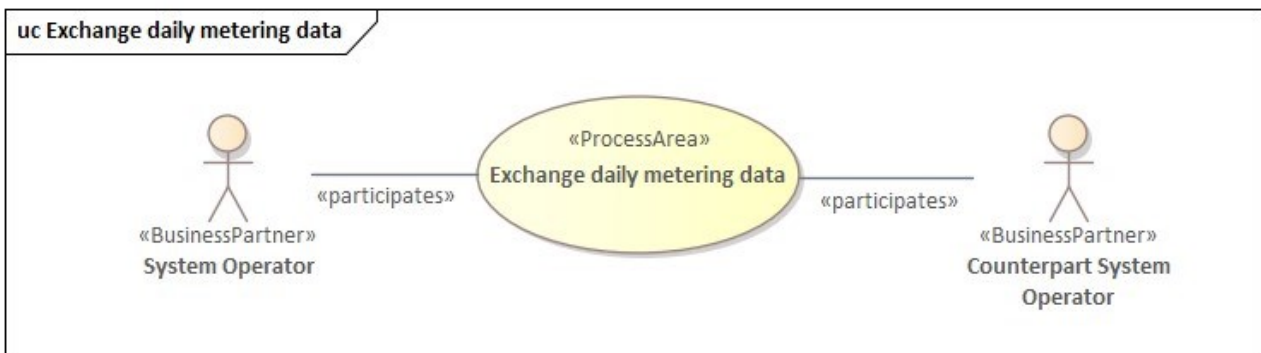


Figure 5: UseCase diagram: Exchange daily metering data

The TSO that is the originator of the information, is responsible for reporting the information to the other counter TSO. This means that information from Country-A (export and import) will be reported by TSO-A and information from Country-B (export and import) will be reported by TSO-B. The TSO that is sell a product shall report his_claim to the obliged TSO. The reporting TSO is responsible of reporting metering data from both jointly owned links and non-jointly owned links.

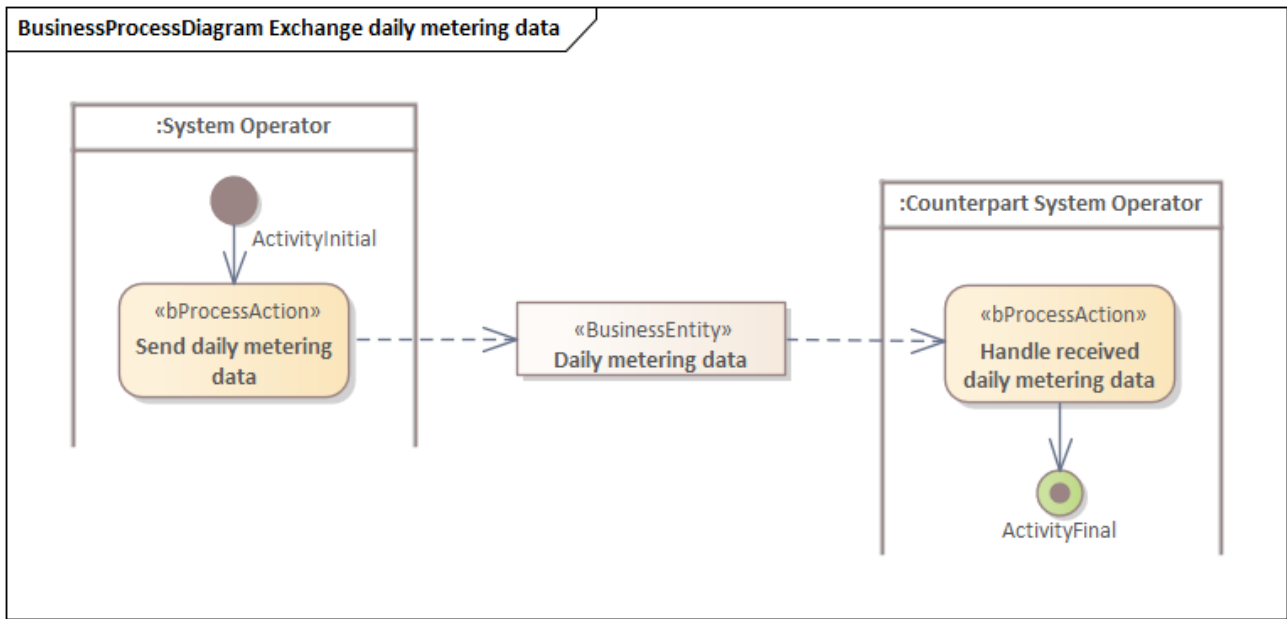


Figure 6: Activity diagram: Exchange daily metering data

2.4.2 Process area: Exchange daily, weekly and monthly settlement report

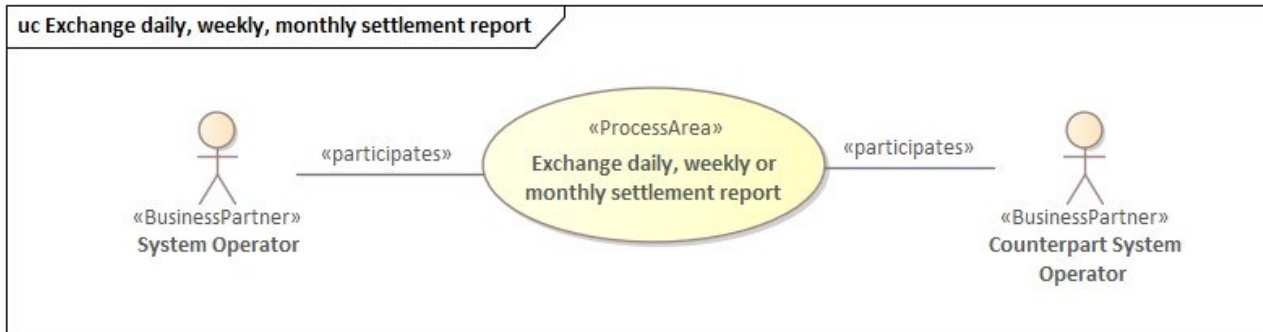


Figure 7: UseCase diagram: Exchange daily, weekly and monthly settlement report

The daily, weekly and monthly Financial Settlement Report shall include:

- Sold Transmission Losses
- Sold Unintended Exchange of Energy
- Sold Supportive Power

The daily, weekly and monthly ERRP Reserve Allocation Result shall include:

- Sold System Services

In addition there are daily Financial Settlement Report including:

- Metered Transmission for each exchange between two bidding areas
- Intended Exchange of Energy between two bidding areas

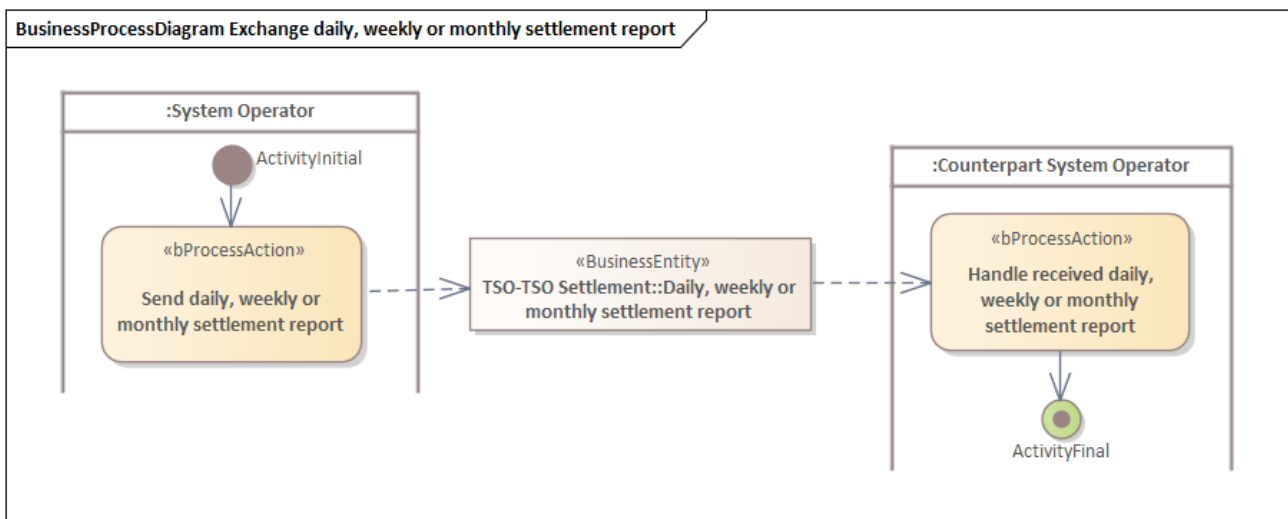


Figure 8: Activity diagram: Exchange daily, weekly and monthly settlement report

3 Business Partner View: Nordic TSO-TSO settlement

In **figure 4** and definitions below, the relevant parts of the ebIX[®], EFET and ENTSO-E Harmonised role model are outlined.

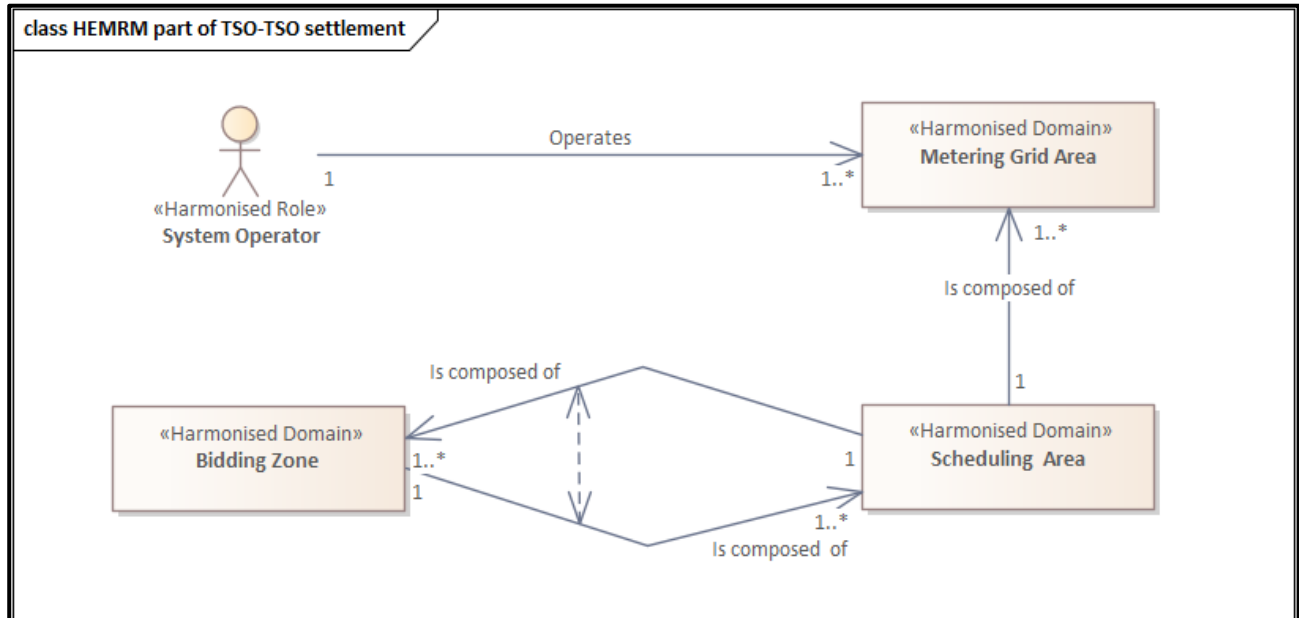


Figure 9: Outline of the Harmonised role model within the scope of capacity allocation

3.1 Roles from the ebIX[®], EFET and ENTSO-E Harmonised role model, see [3]:

System Operator: A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of energy.

Based on: [Consolidated text: Directive \(EU\) 2019/944](#).

3.2 Domains from the ebIX[®], EFET and ENTSO-E Harmonised role model, see [3]:

Bidding Zone The largest geographical area within which market participants are able to exchange energy without capacity allocation.

Source: [Consolidated text: Commission Regulation \(EU\) No 543/2013](#).

Metering Grid Area A Metering Grid Area is a physical area where consumption, production and exchange can be measured. It is delimited by the placement of meters for continuous measurement for input to, and withdrawal from the area.

Additional information:

It can be used to establish volumes that cannot be measured such as network losses.

Scheduling Area An area within which the TSOs' obligations regarding scheduling apply due to operational or organisational needs.

This area consists of one or more Metering Grid Areas with common market rules for which the settlement responsible party carries out an imbalance settlement and which has the same price for imbalance.

Source: [Consolidated text: Commission Regulation \(EU\) 2017/1485](#).

Additional information:

This covers both Imbalance Area and Imbalance Price Area from the [Consolidated text: Commission Regulation \(EU\) 2017/2195](#).

3.3 Nordic defined domains:

EIC code	Display name	Name
10Y1001A1001A91G	NORDIC_AREA	Nordic Market Area
10Y1001C--00146U	NORDIC_SYNC_AREA	Nordic Synchronous Area

4 Business Data View

4.1 Metering Data Document (FSKAR) based on IEC62325-351

This chapter describes a Nordic usage (subset) of the “metering data document (FSKAR)” from ENTSO-E.

4.1.1 Class diagram: Metering data document (FSKAR) contextual model, version 1.0

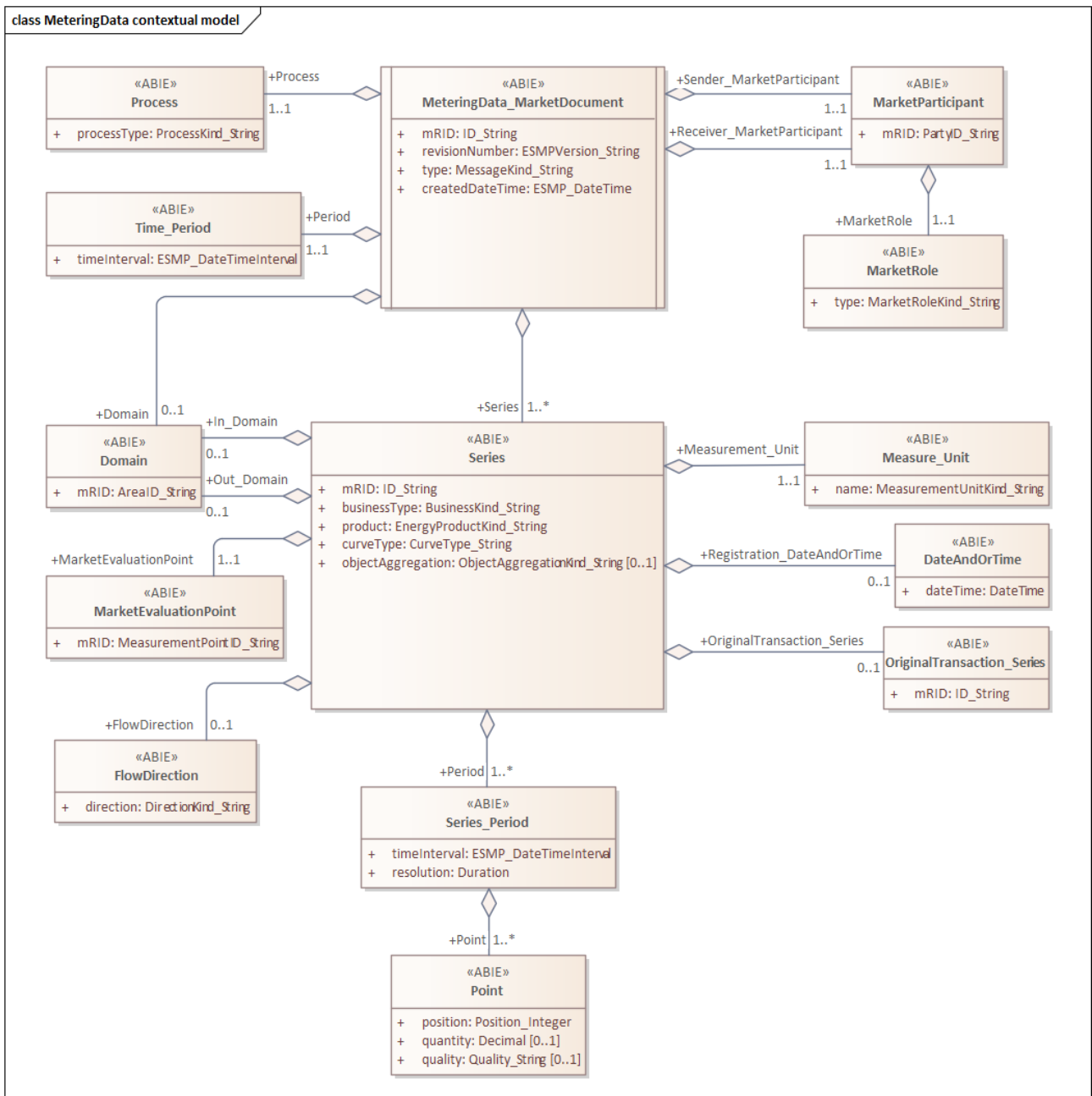


Figure 10: Class diagram: Metering data document (FSKAR) contextual model, version 1.0

4.1.2 Class diagram: Metering data document (FSKAR) assembly model, version 1.0

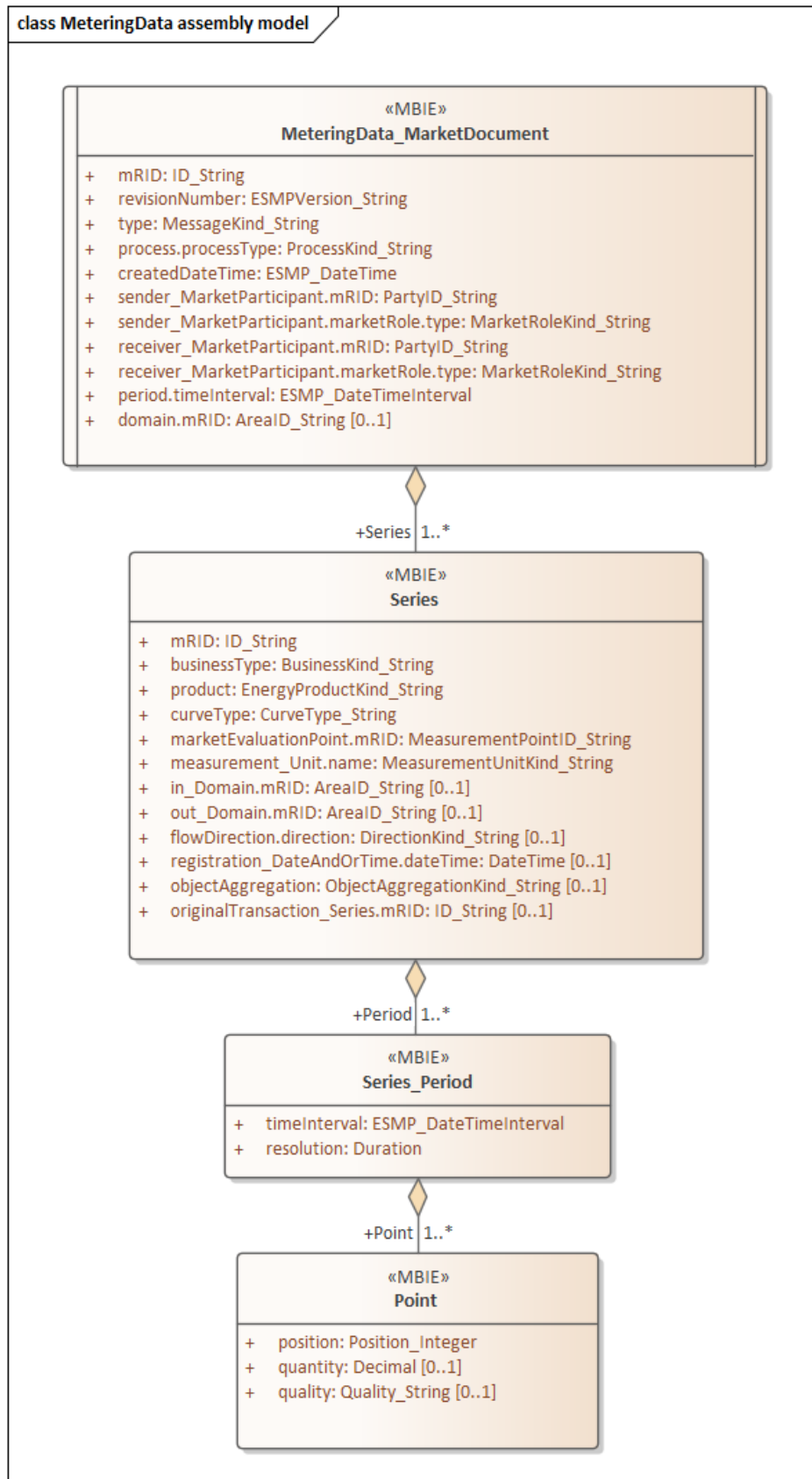


Figure 11: Class diagram: Metering data document (FSKAR) assembly model, version 1.0

4.1.3 Attribute usage: Metering data document (FSKAR), version 1.0

IEC CIM Attribute	Cl.	Code and description
	[1]	MeteringData_MarketDocument (FSKAR)
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1
type	[1]	A45 Measurement Value Document
process.processType	[1]	A20 SOMA (System Operator meter alignment) process
sender_MarketParticipant.mRID	[1]	sender_MarketParticipant.mRID
sender_MarketParticipant.marketRole.type	[1]	A54 Settlement Responsible
receiver_MarketParticipant.mRID	[1]	receiver_MarketParticipant.mRID
receiver_MarketParticipant.marketRole.type	[1]	A54 Settlement Responsible
createdDateTime	[1]	Date and time for creation of the document.
period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document.
domain.mRID	[0..1]	Nordic market area
	[1..*]	TimeSeries
mRID	[1]	The identification of the time series instance.
businessType	[1]	A64 Metered measurement data
product	[1]	8716867000030 Active energy 8716867000047 Reactive energy
curveType	[1]	A01 Sequential fixed size block
marketEvaluationPoint.mRID	[1]	Unique identification of an Exchange Point.
measurement_Unit.name	[1]	MAH megavolt ampere reactive hours MWH MWh
in_Domain.mRID	[0..1]	The unique identification of a domain, either MGA or Bidding Zone
out_Domain.mRID	[0..1]	The unique identification of a domain, either MGA or Bidding Zone
registration_DateAndOrTime.dateTime	[0..1]	Data and time for registration or update
	[1..*]	Series_Period
timeInterval	[1]	The start and end date and time of the time interval of the period in question.

IEC CIM Attribute	Cl.	Code and description
resolution	[1]	<p>The resolution defining the number of periods that the time interval is divided. The resolution is expressed in compliance with ISO 8601 in the following format:</p> <p style="text-align: center;">PnYnMnDTnHnMnS.</p> <p>Where nY expresses a number of years, nM a number of months, nD a number of days. The letter "T" separates the date expression from the time expression and after it nH identifies a number of hours, nM a number of minutes and nS a number of seconds.</p> <p>E.g.:</p> <p style="text-align: center;">PT60M PT30M PT15M</p>
	[1..*]	Point
position	[1]	A sequential value representing the relative position within a given time interval.
quantity	[0..1]	The principal quantity identified for an observation.
quality	[0..1]	<p>A01 Adjusted A02 Not available A03 Estimated A04 As provided A05 Incomplete A06 Calculated</p>

Table 2: Attribute usage: Metering data document (FSKAR), version 1.0

5 Financial Settlement Report (FSKAR) based on IEC62325-351

This chapter describes the “Financial Settlement Report (FSKAR)” from ENTSO-E.

5.1.1 Class diagram: Financial Settlement Report (FSKAR) contextual model, version 1.0

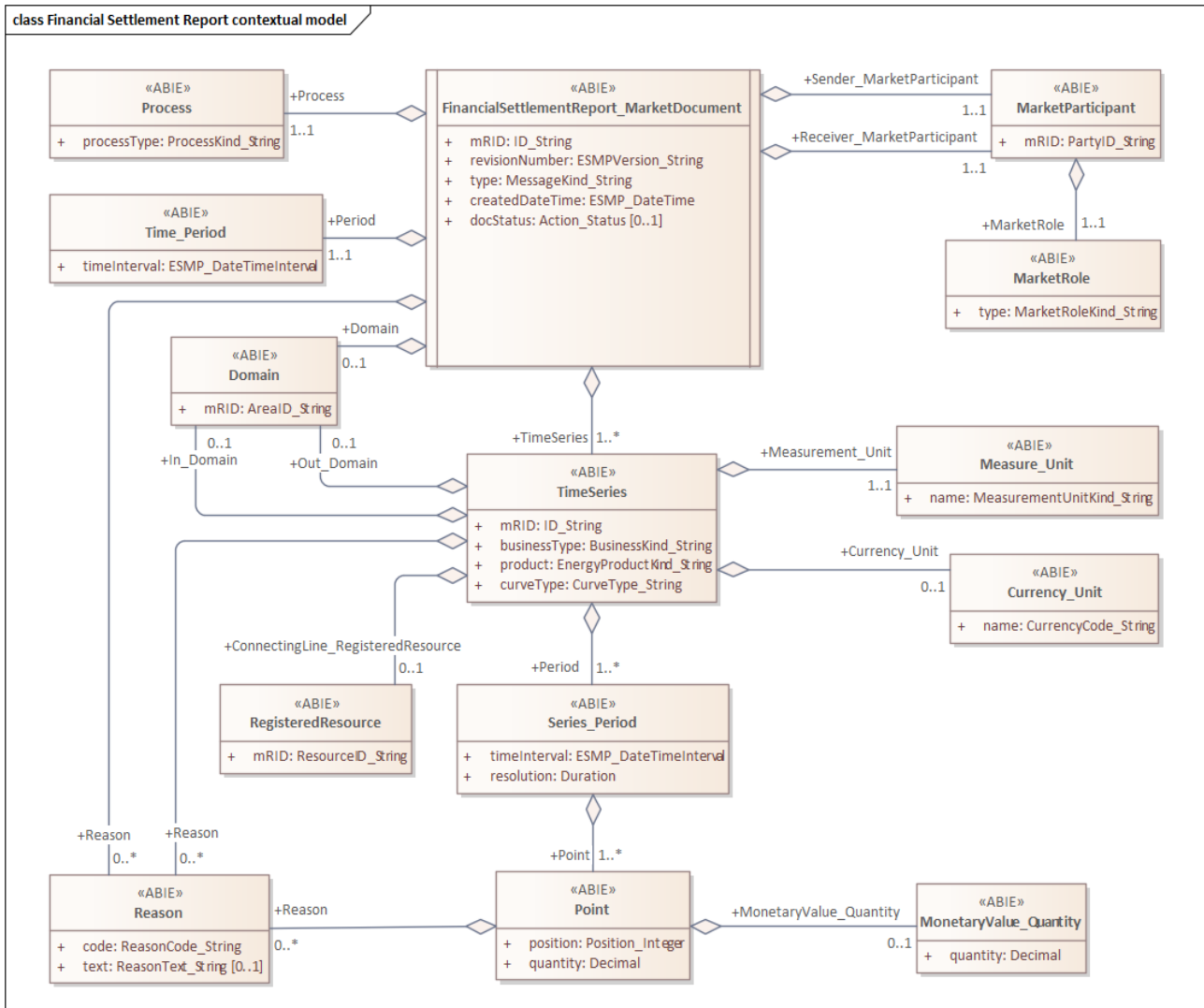


Figure 12: Class diagram: Financial Settlement Report (FSKAR) contextual model, version 1.0

5.1.2 Class diagram: Financial Settlement Report (FSKAR) assembly model, version 1.0

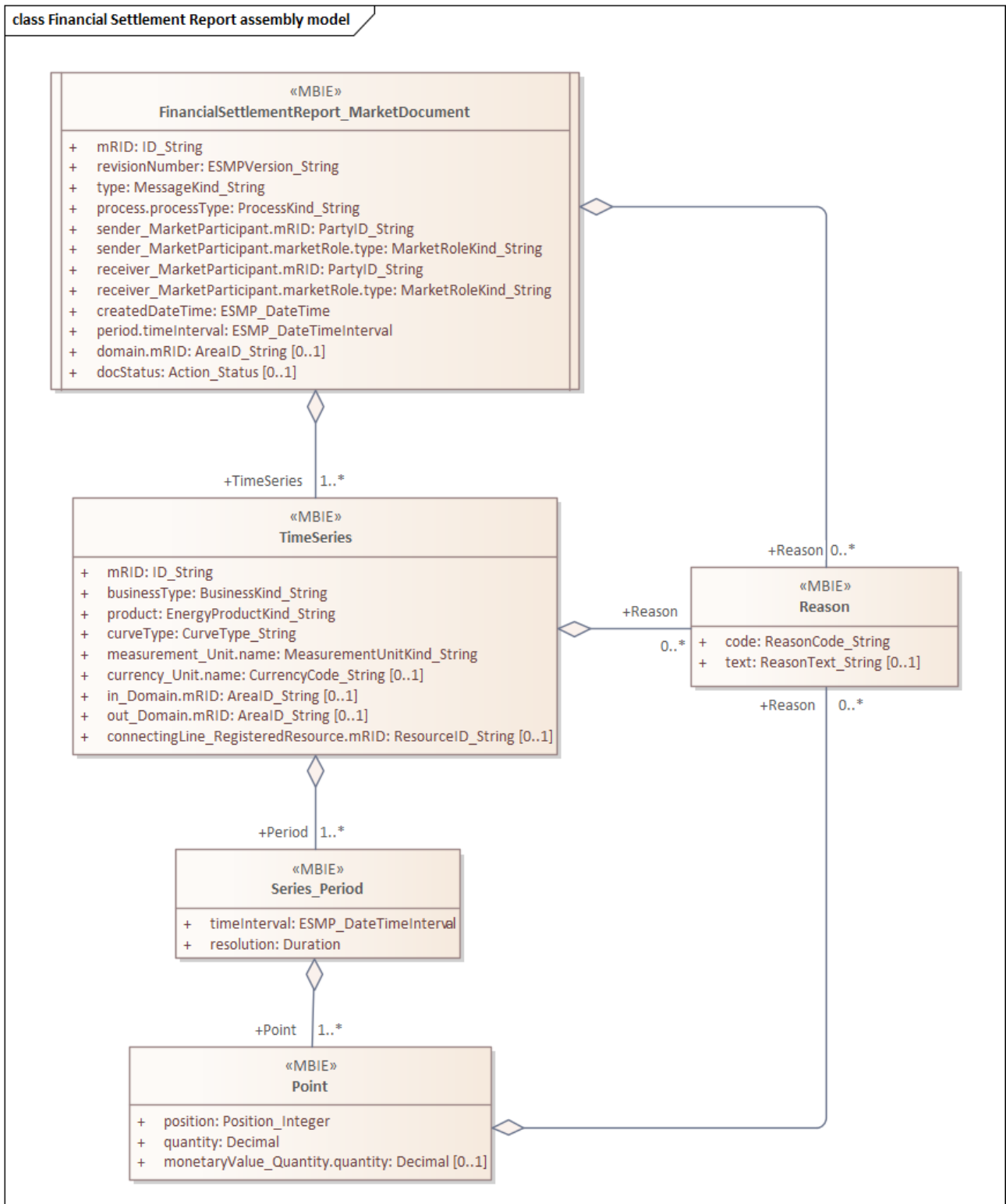


Figure 13: Class diagram: Financial Settlement Report (FSKAR) assembly model, version 1.0

5.1.3 Attribute usage: Financial Settlement Report (FSKAR), version 1.0

IEC CIM Attribute	Cl.	Code and description
	[1]	FinancialSettlementReport_MarketDocument (FSKAR)
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1
type	[1]	B38 Settlement document (e.g. for monthly settlement) A49 Daily settlement document A50 Weekly settlement document
process.processType	[1]	A57 FSKAR settlement
sender_MarketParticipant.mRID	[1]	sender_MarketParticipant.mRID
sender_MarketParticipant.marketRole.type	[1]	A54 Settlement Responsible
receiver_MarketParticipant.mRID	[1]	receiver_MarketParticipant.mRID
receiver_MarketParticipant.marketRole.type	[1]	A54 Settlement Responsible
createdDateTime	[1]	Date and time for creation of the document.
period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document.
domain.mRID	[0..1]	Nordic market area
	[1..*]	TimeSeries
mRID	[1]	The identification of the time series instance.
businessType	[1]	A15 Losses A21 Unintended energy A64 Metered measurement data C36 Ramping period energy Z88 Total planned flow Z92 Agreed Supportive Power (ASP) ZA2 Imbalance losses
product	[1]	8716867000030 Active energy 8716867000047 Reactive energy (only used for Business type = A64)
curveType	[1]	A01 Sequential fixed size block
measurement_Unit.name	[1]	MAH Megavolt ampere reactive hours (Only used for Business type = A64) MWH MWh
price_Measurement_Unit.name	[0..1]	MWH MWh (Only used for Business type = A15 , A21 , C36 and Z92)

IEC CIM Attribute	Cl.	Code and description
currency_Unit.name	[0..1]	Any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner SEK Swedish Kronor The currency_Unit.name is only used for Business type = A15 , A21 , and C36
in_Domain.mRID	[0..1]	The unique identification of a Bidding Zone
out_Domain.mRID	[0..1]	The unique identification of a Bidding Zone
connectingLine_RegisteredResource.mRID	[0..1]	May be used if a corridor is needed.
	[1..*]	Series_Period
timeInterval	[1]	The start and end date and time of the time interval of the period in question.
resolution	[1]	The resolution defining the number of periods that the time interval is divided. The resolution is expressed in compliance with ISO 8601 in the following format: PnYnMnDTnHnMnS. Where nY expresses a number of years, nM a number of months, nD a number of days. The letter "T" separates the date expression from the time expression and after it nH identifies a number of hours, nM a number of minutes and nS a number of seconds. E.g.: PT60M PT30M PT15M
	[1..*]	Point
position	[1]	A sequential value representing the relative position within a given time interval.
quantity	[1]	The principal quantity identified for an observation.
monetaryValue_Quantity.quantity	[0..1]	The total amount (Only used for Business type = A15 , A21 , and C36)
	[0..*]	Reason
code	[1]	If more detailed supportive power is needed, reason codes may be used, see https://nordic-balancing.pages.fifty.eu/information/common-guidelines.html#_harmonized_products_definitions

Table 3: Attribute usage: Financial Settlement Report (FSKAR), version 1.0

5.2 ERRP Reserve Allocation Result Document based on IEC62325-351

This chapter describes a Nordic subset of the “ERRP Reserve allocation result document”, version 6.4, from ENTSO-E.

5.2.1 Class diagram: ERRP Reserve Allocation Result Document contextual model, version 6.4

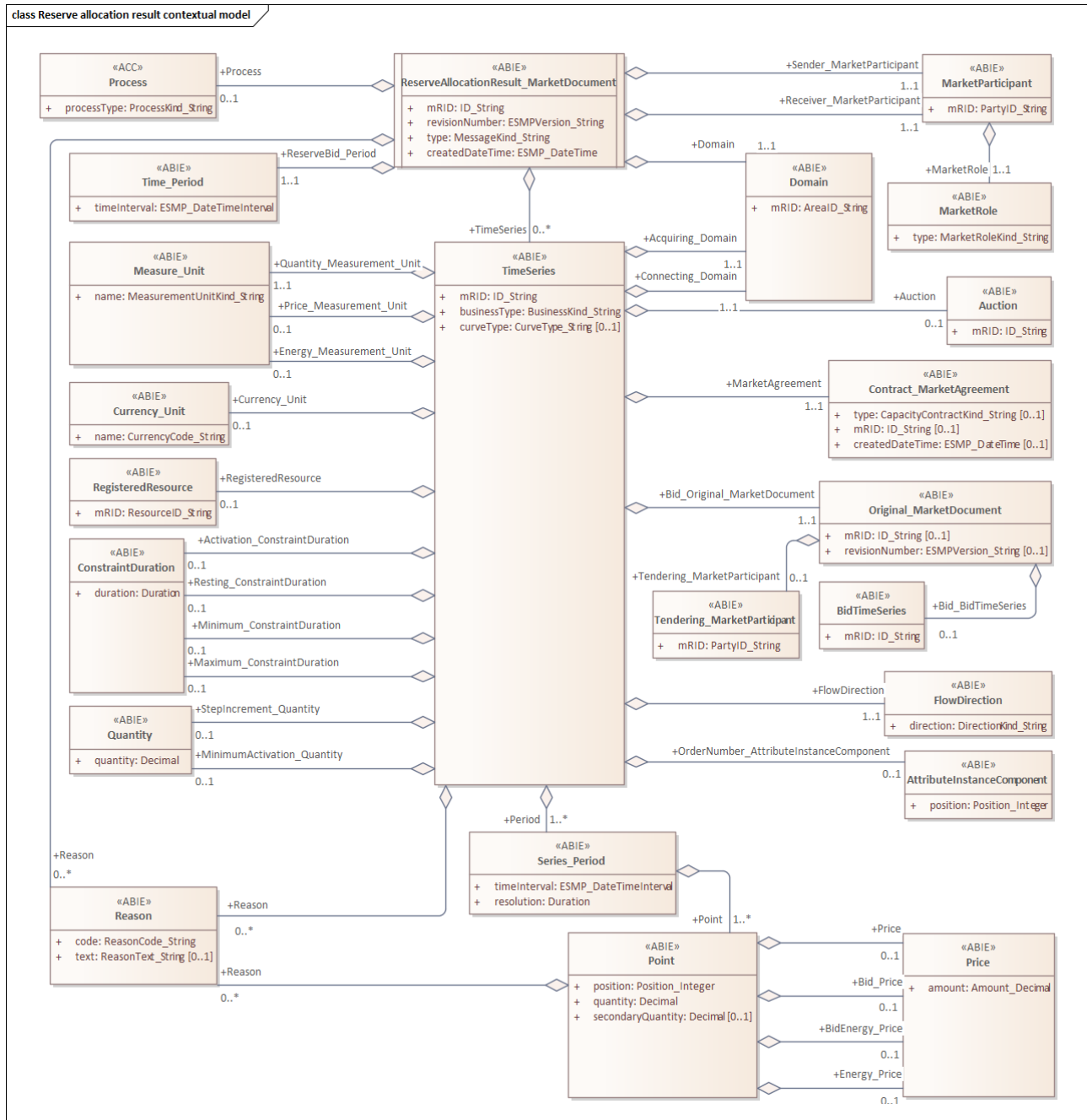


Figure 14: Class diagram: ERRP Reserve Allocation Result contextual model, version 6.4

5.2.2 Class diagram: ERRP Reserve Allocation Result assembly model, version 6.4

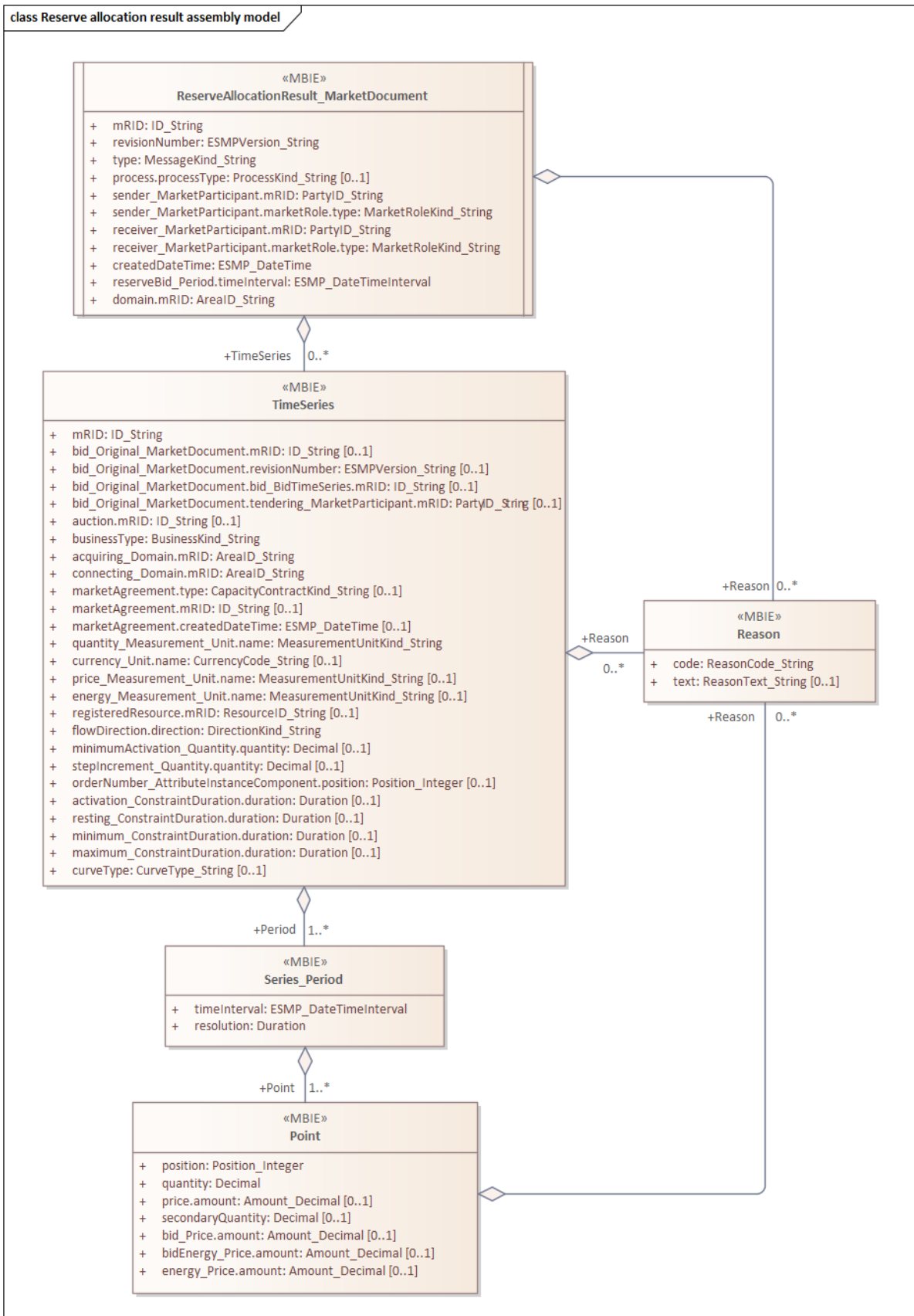


Figure 15: Class diagram: ERRP Reserve Allocation Result assembly model, version 6.4

5.2.3 Attribute usage: ERRP Reserve Allocation Result document, version 6.4

IEC CIM Attribute	Cl.	Code and description
	[1]	ERRP ReserveAllocationResult_MarketDocument
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1
type	[1]	B44 Financial settlement document
process.processType	[1]	A57 FSKAR settlement
sender_MarketParticipant.mRID	[1]	sender_MarketParticipant.mRID
sender_MarketParticipant.marketRole.type	[1]	A54 Settlement Responsible
receiver_MarketParticipant.mRID	[1]	receiver_MarketParticipant.mRID
receiver_MarketParticipant.marketRole.type	[1]	A54 Settlement Responsible
createdDateTime	[1]	Date and time for creation of the document.
reserveBid_Period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document.
domain.mRID	[0..1]	Nordic market area
	[1..*]	TimeSeries
mRID	[1]	The identification of the time series instance.
auction.mRID	[1]	FCR-D or FCR-N
businessType	[1]	C26 Frequency Containment Reserve-Normal (FCR-N) C27 Frequency Containment Reserve-Disturbance (FCR-D)
acquiring_Domain.mRID	[1]	Unique identification of the buyer's area (For Business type = C26 and C27) The Acquiring Domain is the one requesting up- or down regulation of a Resource.
connecting_Domain.mRID	[1]	Unique identification of the seller's area. The Connecting Domain is the one providing up- or down regulation of a Resource.
marketAgreement.type	[1]	A05 Total contract
marketAgreement.mRID	[1]	Use fixed value "na"
quantity_Measure_Unit.name	[1]	MAW MW
currency_Unit.name	[0..1]	Any valid ISO 3 letter currency code, such as: EUR EURO
price_Measurement_Unit.name	[0..1]	MAW MW
flowDirection.direction	[1]	A01 Up A02 Down A03 Up and down (only for FCR-N)

IEC CIM Attribute	Cl.	Code and description
curveType	[1]	A01 Sequential fixed size block
	[1..*]	Series_Period
timeInterval	[1]	The start and end date and time of the time interval of the period in question.
resolution	[1]	<p>The resolution defining the number of periods that the time interval is divided. The resolution is expressed in compliance with ISO 8601 in the following format:</p> <p style="text-align: center;">PnYnMnDTnHnMnS.</p> <p>Where nY expresses a number of years, nM a number of months, nD a number of days. The letter "T" separates the date expression from the time expression and after it nH identifies a number of hours, nM a number of minutes and nS a number of seconds.</p> <p>E.g.:</p> <p style="text-align: center;">PT60M PT30M PT15M</p>
	[1..*]	Point
position	[1]	A sequential value representing the relative position within a given time interval.
quantity	[1]	The principal quantity identified for an observation.
price.amount	[0..1]	The amount bought or sold

Table 4: Attribute usage: ERRP Reserve Allocation Result document, version 6.4

Appendix A Business rules

A.1 General ground rules

Below are shown some basic rules that must be respected.

- Rule 001 The originator of the information is responsible for reporting the information to the counterpart. I.e. information from Country-A shall be reported by TSO-A and information from Country-B shall be reported by TSO-B, i.e. the TSO that sells a product shall send his_claim to the obliged TSO.
- Rule 002 Settlement data shall be reported in CET with adjustment for daylight-saving time.
- Rule 003 A TSO is responsible for reporting data from the Metering Points located in his country, in both directions (export and import), and both jointly owned links and non-jointly owned links.
- Rule 004 All measured data are reported in MWh with a resolution of three (3) decimals.
- Rule 005 Prices are reported in Euro (€) per MWh with the accuracy of two (2) decimals.
- Rule 006 The Parties shall correct incorrect metered data no later than 06:00 CET/CEST 4 days after the delivery day (D+4). If any new meter value appears after the limit of four days after delivery, the parties shall correct the report.

A.2 Usage of direction when sending Agreed Supportive Power (ASP)

- Rule 007 It is always the TSO that has sold the ASP that will be sending settlement report in the Financial Settlement Report Document containing the ASP.