BRS

(Business Requirement Specification)

NORDIC

TSO-TSO SETTLEMENT PROCESS

A market model for data exchange

Content

1   Introduction

1.1   Background

The Nordic TSOs exchanges 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   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].

1.3   Project organisation

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

1.4   References

[1]   ENTSO-E implementation guides, see ENTSO-E Electronic Data Interchange (EDI) Library
   o   Implementation Guides
   o   CIM XML schemas
   o   Etc.

[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/

1.5   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:

BRS   Business Requirement Specification

FCR   Frequency Containment Reserve

FCR-D   Frequency Containment Reserve for Disturbances

FCR-N   Frequency Containment Reserve for Disturbances

mFRR   manual Frequency Restoration Reserves

NBM   Nordic Balancing Model

TSO   Transmission System Operator

1.6   Change log

Ver/rel/rev	Changed by	Date	Changes
1.0.A	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.
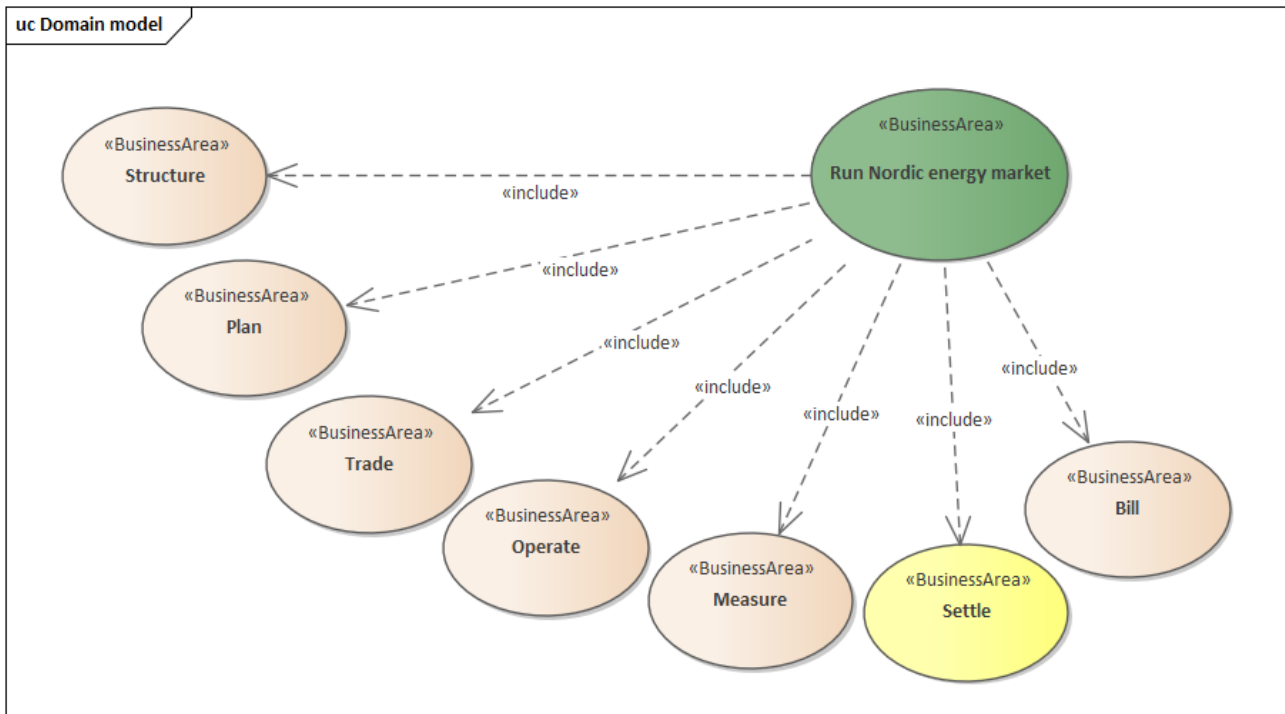
Figure 1: UseCase diagram: Domain model

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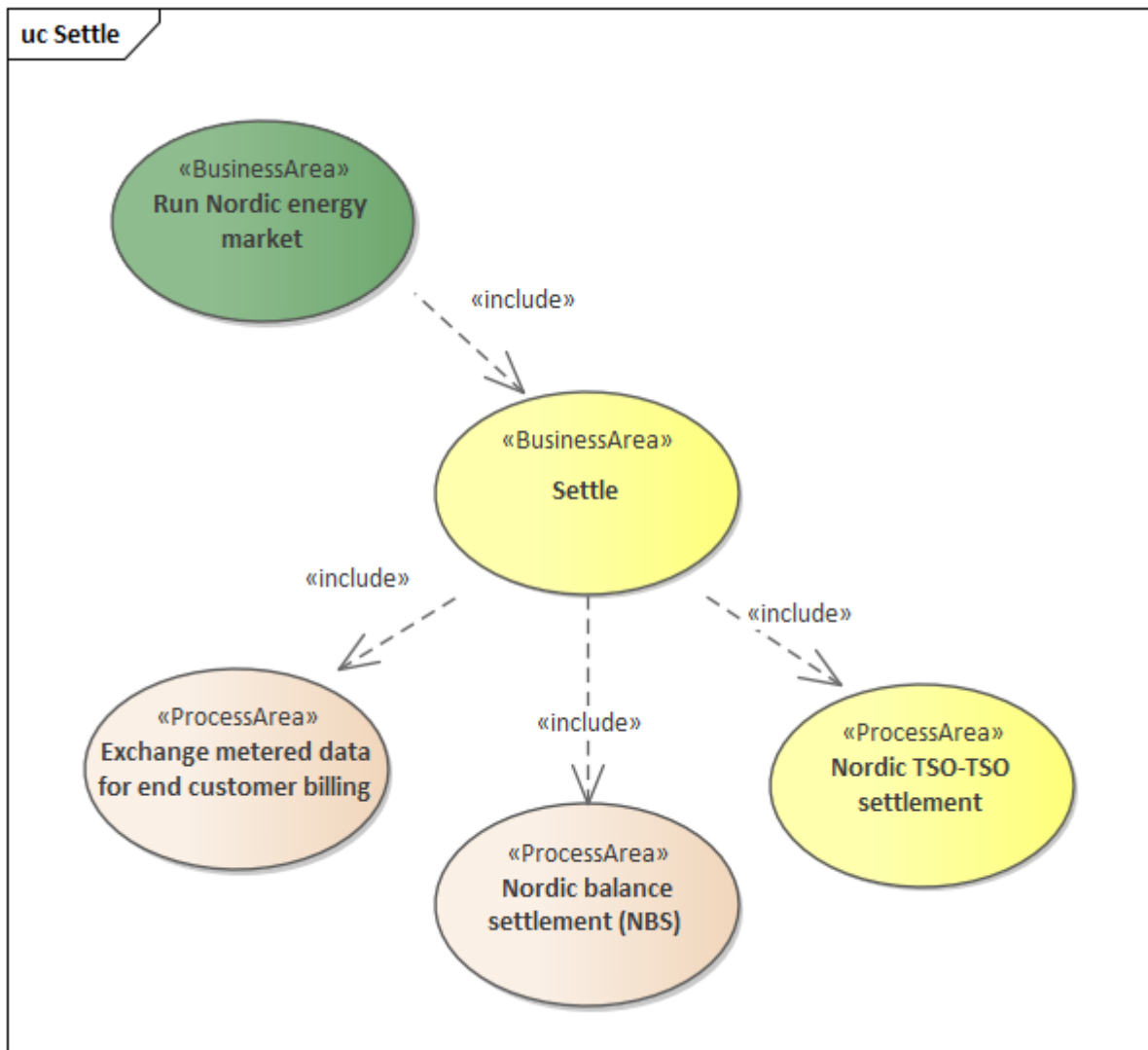
Figure 2: UseCase diagram: The Nordic TSO-TSO settlement process

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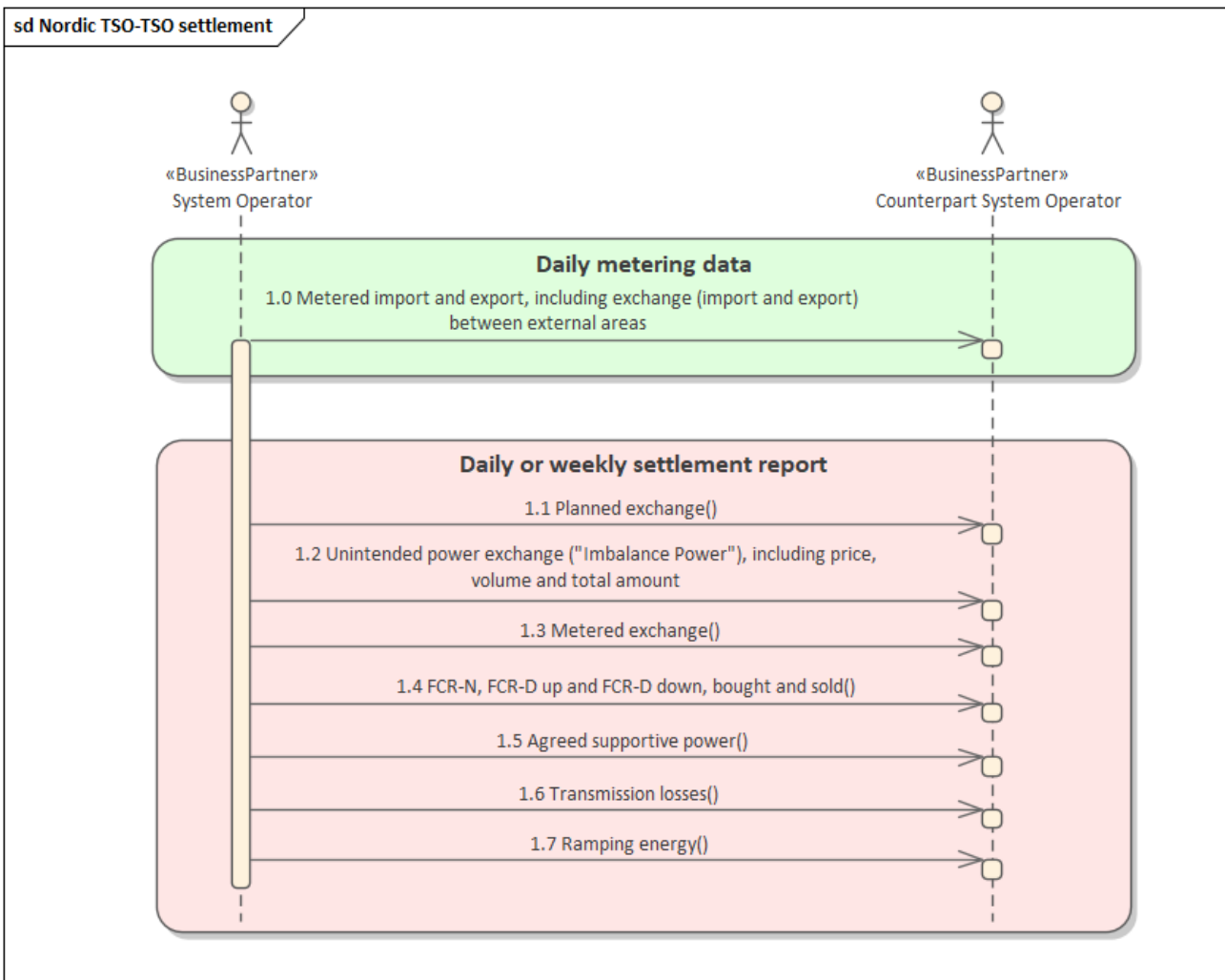
Figure 3: Sequence diagram: Information exchange overview for "Nordic TSO-TSO settlement"

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	MeteringData_MarketDocument (FSKAR) based on IEC62325-351, see chapter 4.1
Daily or weekly settlement report	1.1	Planned exchange	Ediel FinancialSettlementReport_MarketDocument (FSKAR) based on IEC62325-351, see chapter 4.2
	1.2	Unintended power exchange ("Imbalance Power"), including price, volume and total amount	Ediel FinancialSettlementReport_MarketDocument (FSKAR) based on IEC62325-351, see chapter 4.2

Process area	Arrow	Content	Where to find detailed description
	1.3	Metered exchange	Ediel FinancialSettlementReport_MarketDocument (FSKAR) based on $IEC62325\text{-}351$, see chapter 4.2
	1.4	FCR-N, FCR-D up and FCR-D down, bought and sold	ERRP Reserve Allocation Result Document based on $IEC62325\text{-}351$, see chapter 4.3
	1.5	Agreed supportive power	ERRP Reserve Allocation Result Document based on $IEC62325\text{-}351$, see chapter 4.3
	1.6	Transmission losses	Ediel FinancialSettlementReport_MarketDocument (FSKAR) based on $IEC62325\text{-}351$, see chapter 4.2
	1.7	Ramping energy	ERRP Reserve Allocation Result Document based on $IEC62325\text{-}351$, see chapter 4.3

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

2.4   Process Areas within the Nordic TSO-TSO settlement process

2.4.1   Process area: Exchange daily metering data

TBD

2.4.2   <u>Process area: Exchange daily or weekly settlement report</u>

TBD

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.
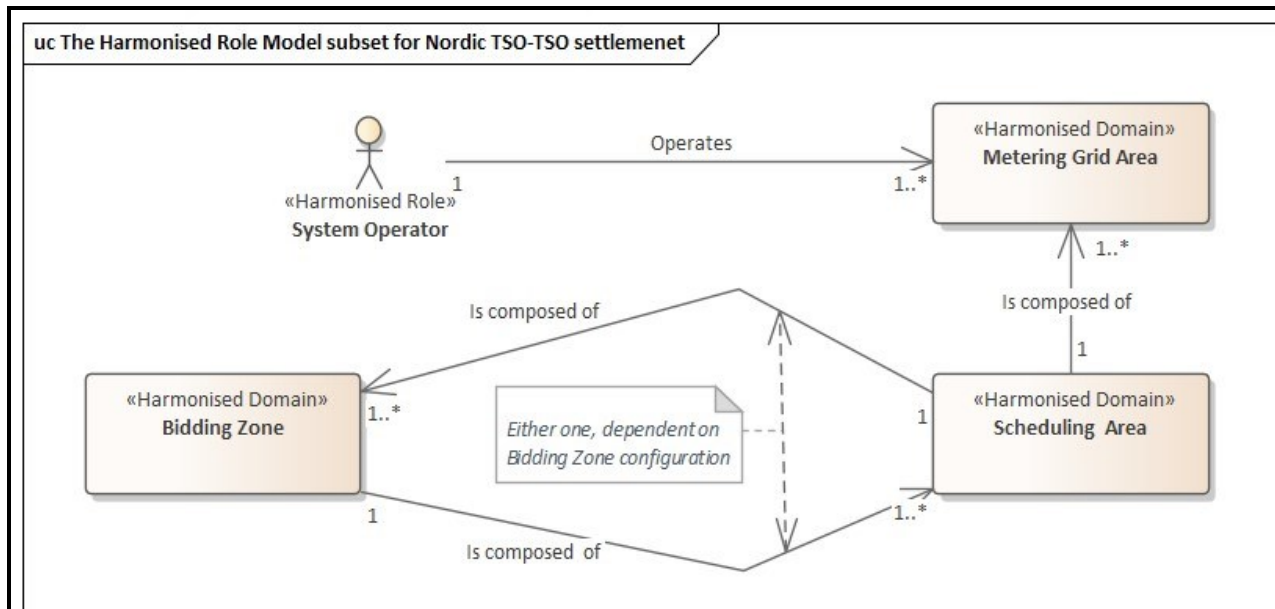
Figure 4: Outline of the Harmonised role model within the scope of capacity allocation

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.

3.3   Nordic defined domains:

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

4   Business Data View

4.1   MeteringData_MarketDocument (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
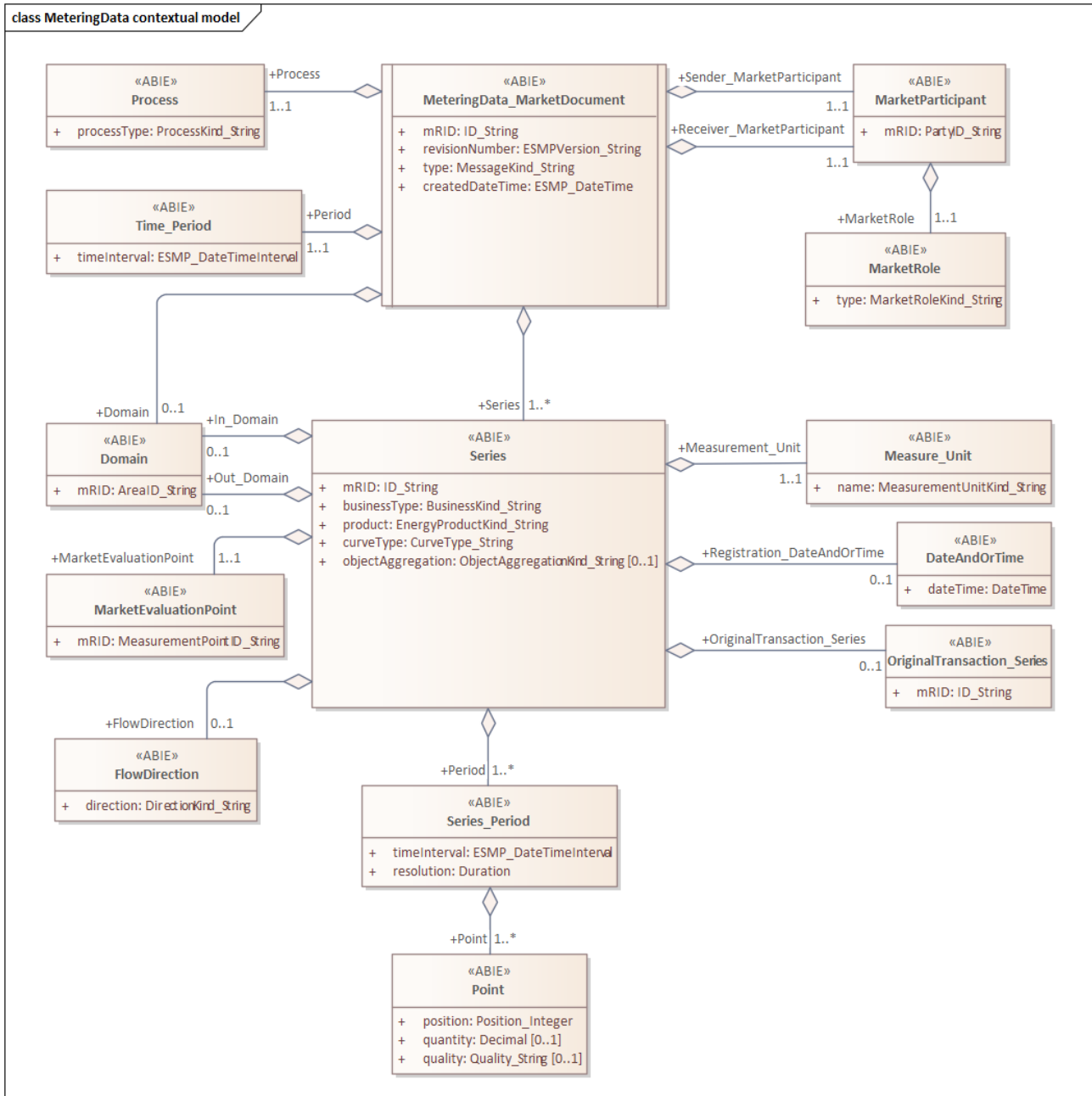
Figure 5: Class diagram: Metering data document (FSKAR) contextual model, version 1.0

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

class MeteringData assembly model

«MBIE»
MeteringData_MarketDocument

+ mRID: ID_String
+ revisionNumber: ESMPVersion_String
+ type: MessageKind_String
+ process.processType: ProcessKind_String
+ createdDateTime: ESMP_DateTime
+ sender_MarketParticipant.mRID: PartyID_String
+ sender_MarketParticipant.marketRole.type: MarketRoleKind_String
+ receiver_MarketParticipant.mRID: PartyID_String
+ receiver_MarketParticipant.marketRole.type: MarketRoleKind_String
+ period.timeInterval: ESMP_DateTimeInterval
+ domain.mRID: AreaID_String [0..1]

+Series 1..*

«MBIE»
Series

+ mRID: ID_String
+ businessType: BusinessKind_String
+ product: EnergyProductKind_String
+ curveType: CurveType_String
+ marketEvaluationPoint.mRID: MeasurementPointID_String
+ measurement_Unit.name: MeasurementUnitKind_String
+ in_Domain.mRID: AreaID_String [0..1]
+ out_Domain.mRID: AreaID_String [0..1]
+ flowDirection.direction: DirectionKind_String [0..1]
+ registration_DateAndOrTime.dateTime: DateTime [0..1]
+ objectAggregation: ObjectAggregationKind_String [0..1]
+ originalTransaction_Series.mRID: ID_String [0..1]

+Period 1..*

«MBIE»
Series_Period

+ timeInterval: ESMP_DateTimeInterval
+ resolution: Duration

+Point 1..*

«MBIE»
Point

+ position: Position_Integer
+ quantity: Decimal [0..1]
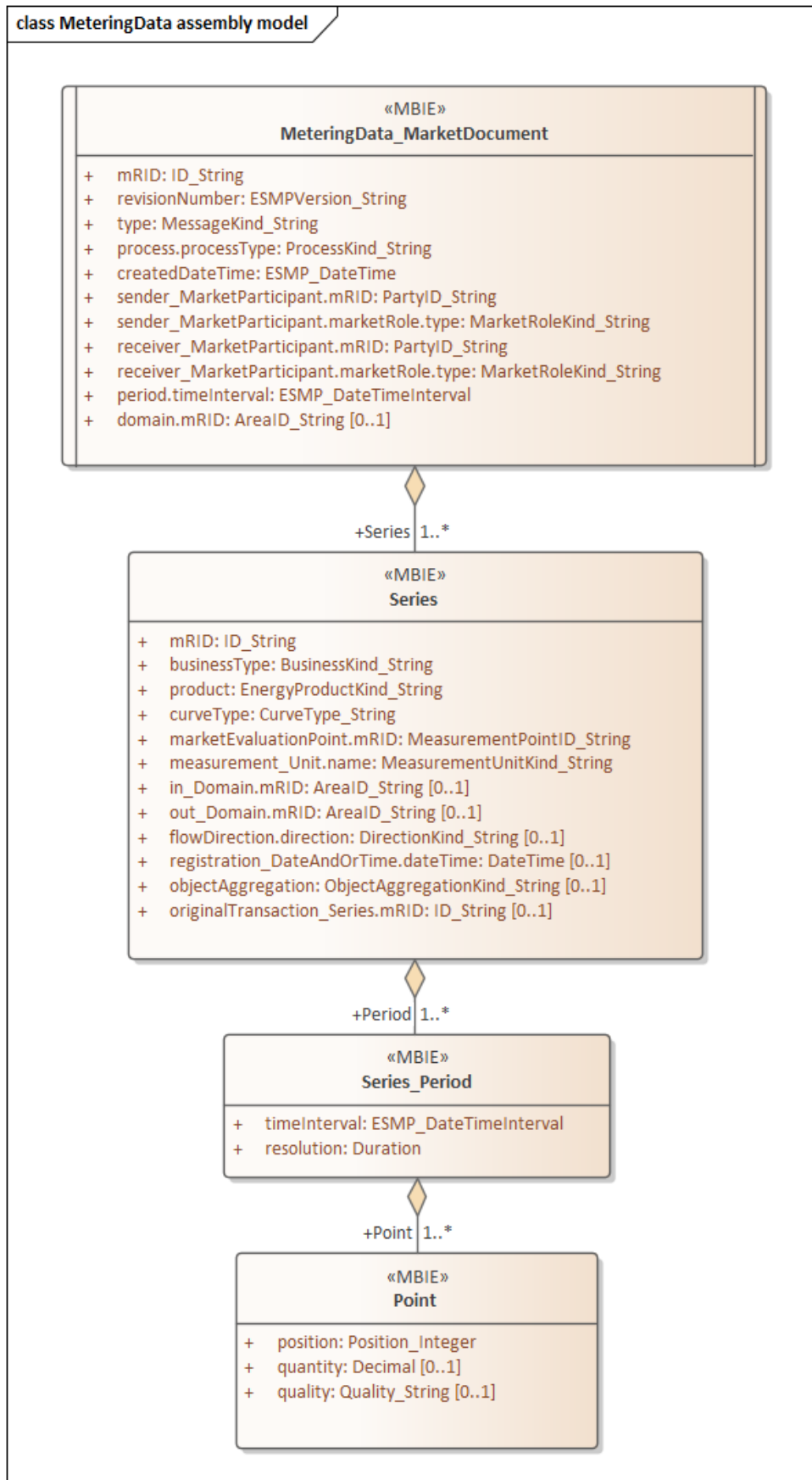+ quality: Quality_String [0..1]

Figure 6: 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 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]	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	[0..1]	The principal quantity identified for an observation.
quality	[0..1]	**A01** Adjusted **A02** Not available **A03** Estimated **A04** As provided **A05** Incomplete A06 Calculated

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

4.1.4   Business rules: Metering data document (FSKAR) in the Nordic countries

The following business rules apply to the metering data document (FSKAR) in the Nordic countries:

TBD.

4.2   Ediel FinancialSettlementReport_MarketDocument (FSKAR) based on IEC62325-351

This chapter describes an extended Nordic Ediel version of the "Financial Settlement Report (FSKAR)" from ENTSO-E.

The document has been extended with a new Price class for conveying a price.

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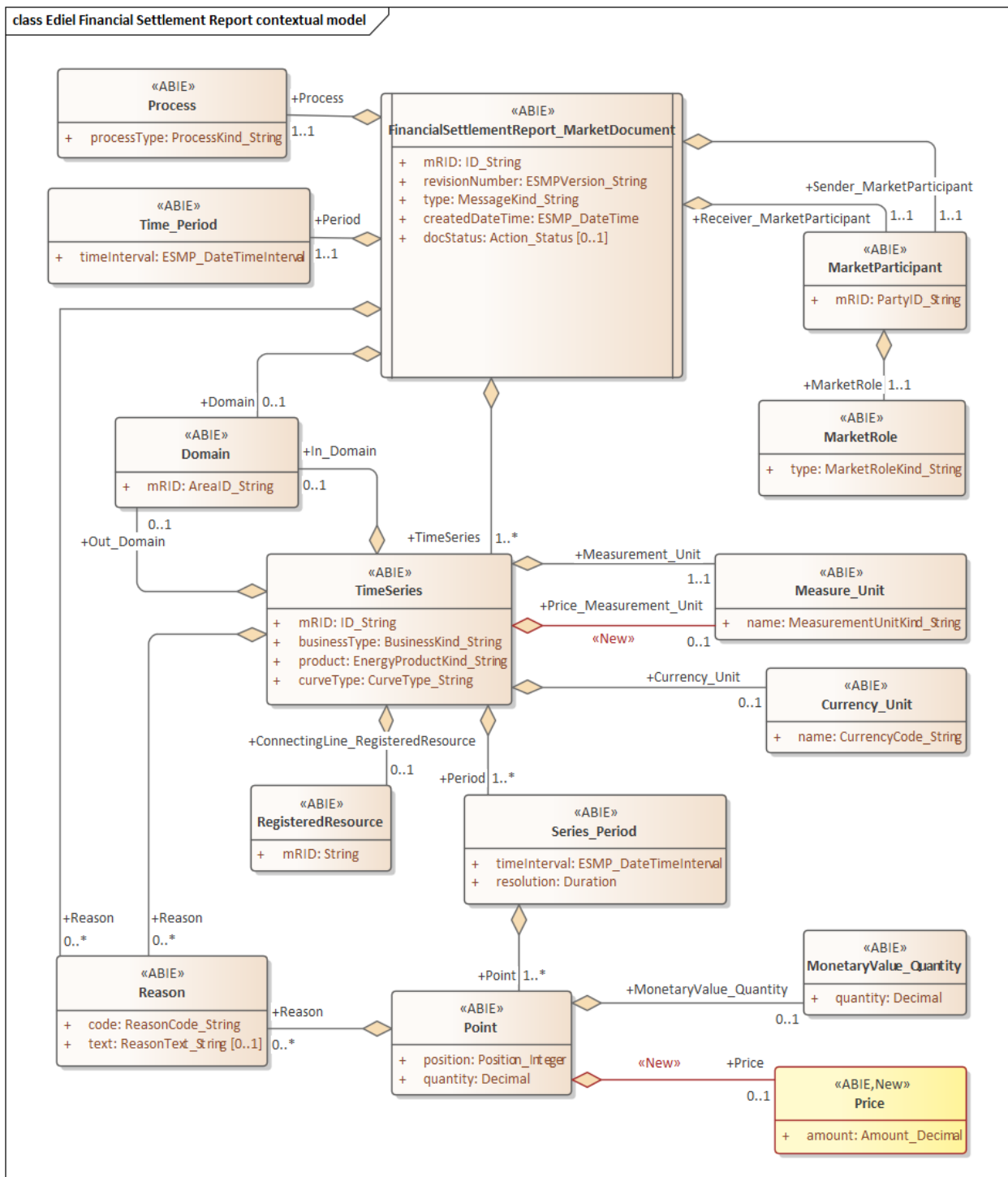

Figure 7: Class diagram: Ediel Financial Settlement Report (FSKAR) contextual model, version 1.0

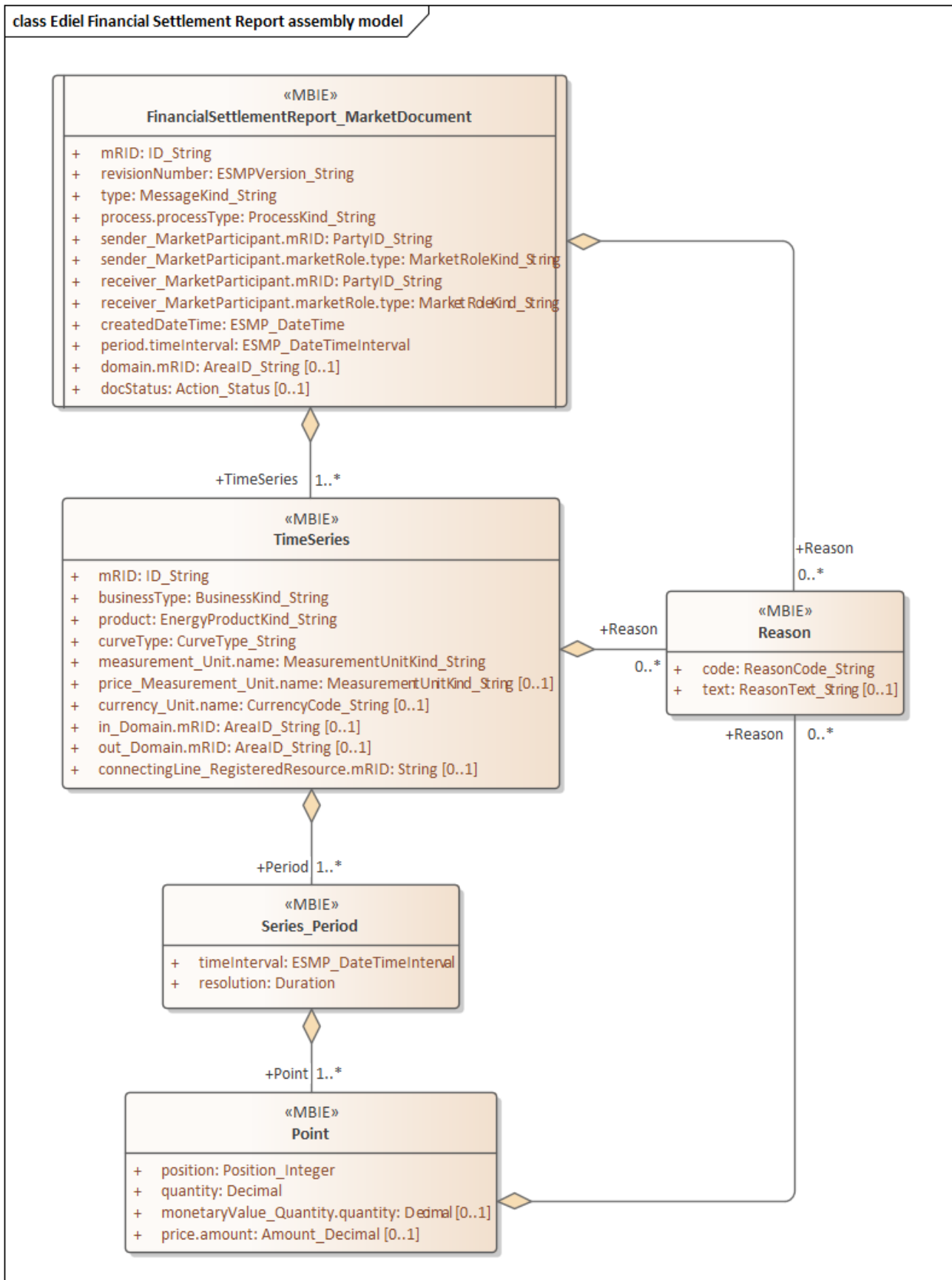4.2.2   Class diagram: Ediel Financial Settlement Report (FSKAR) assembly model, version 1.0

Figure 8: Class diagram: Ediel Financial Settlement Report (FSKAR) assembly model, version 1.0

4.2.3   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]	**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 area
	[1..*]	**TimeSeries**
mRID	[1]	The identification of the time series instance.
businessType	[1]	**A15** Losses **A21** Unintended energy **A64** Metered measurement data **Z88** Total planned flow
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** and **A21)**
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** and **A21**
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.

IEC CIM Attribute	Cl.	Code and description
	[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** and **A21)**
price.amount	[1]	The price per unit (Only used for Business type = **A21)**

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

4.2.4   Business rules for the Ediel Financial Settlement Report (FSKAR) in the Nordic countries

The following business rules apply to the Ediel Financial Settlement Report (FSKAR) in the Nordic countries:

    TBD.

4.3   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.

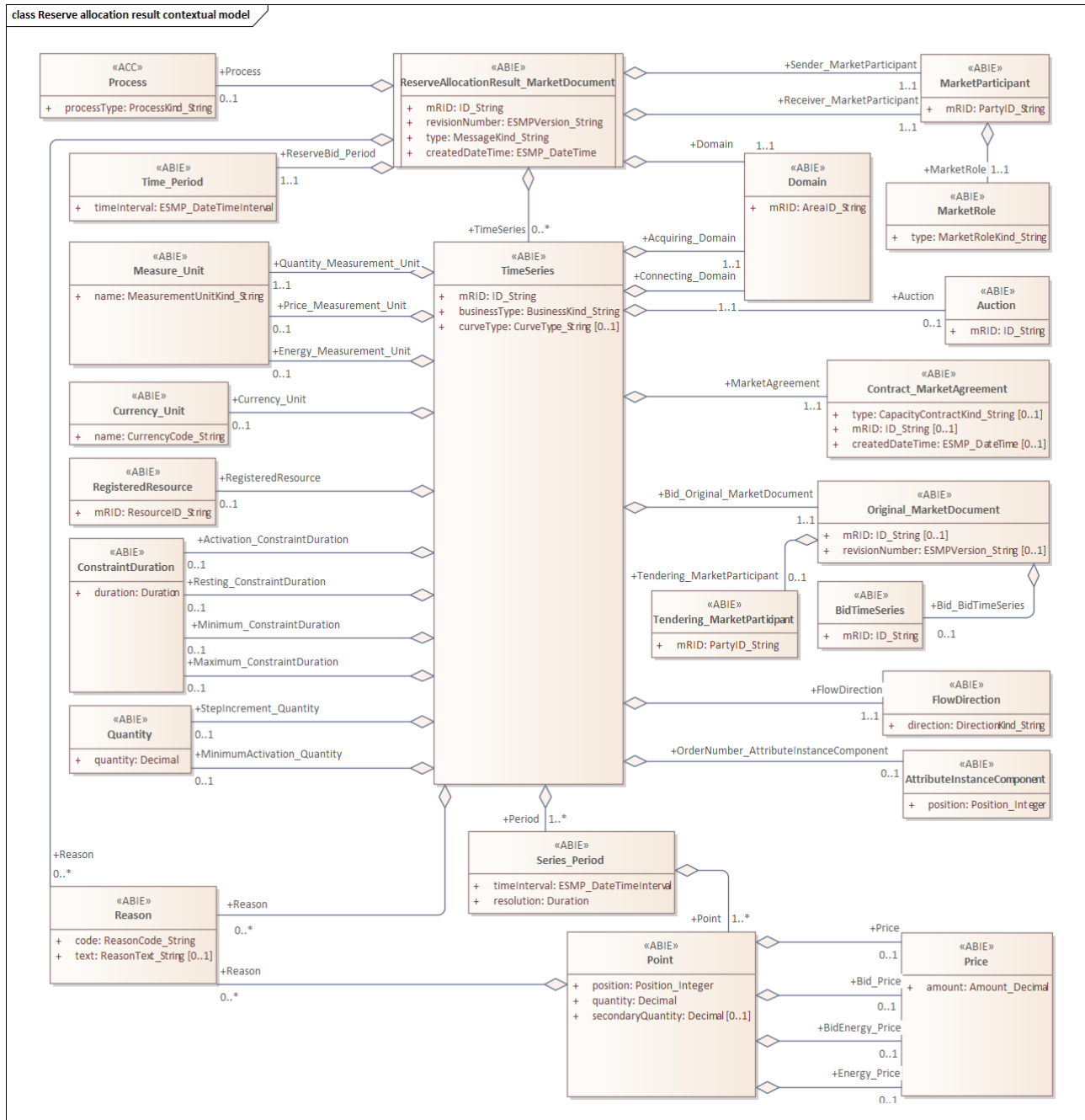### 4.3.1   Class diagram: ERRP Reserve Allocation Result Document contextual model, version 6.4

Figure 9: Class diagram: ERRP Reserve Allocation Result contextual model, version 6.4

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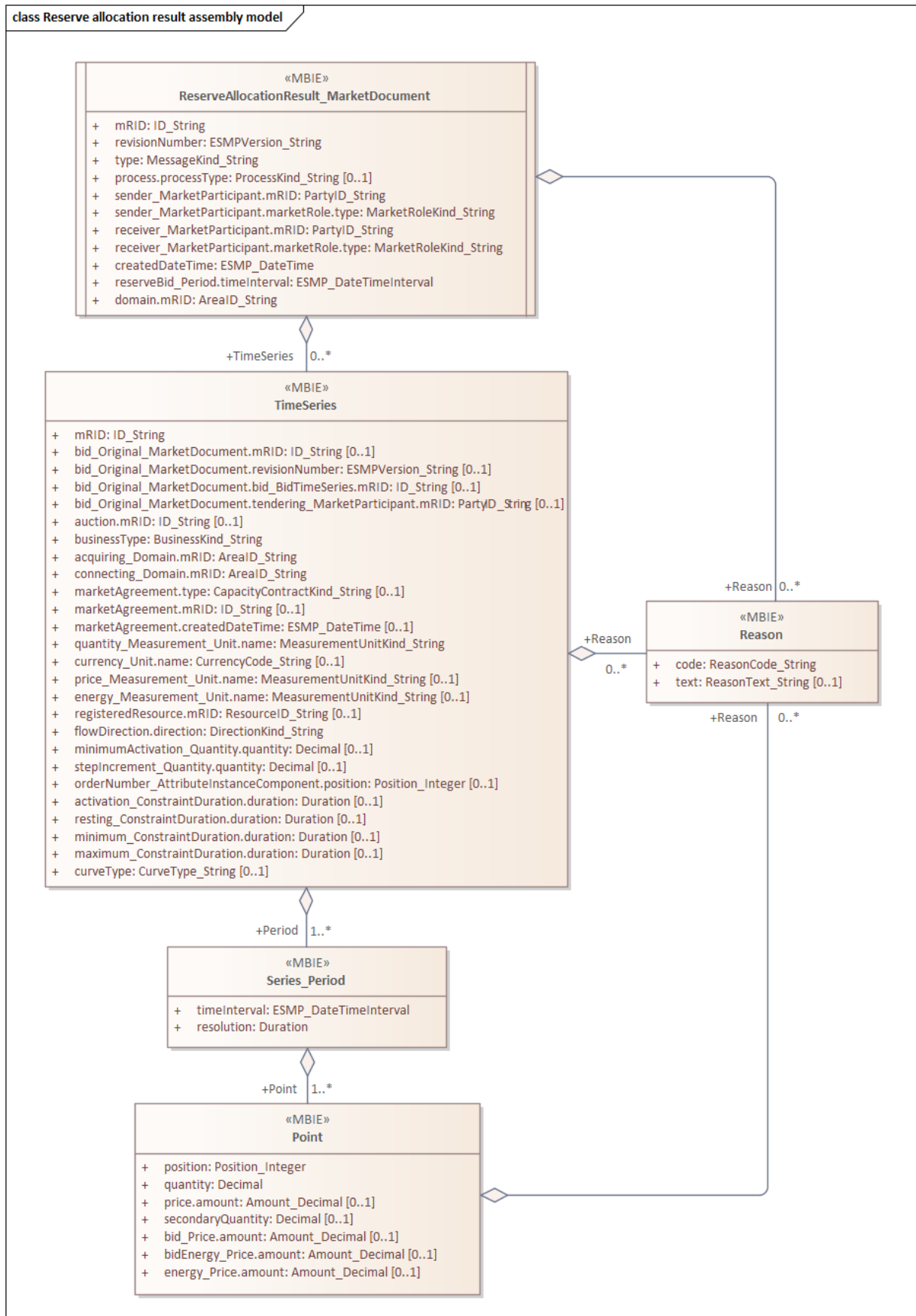

Figure 10: Class diagram: ERRP Reserve Allocation Result assembly model, version 6.4

4.3.3 <u>Attribute usage: ERRP Reserve Allocation Result document, version 6.4</u>

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 area
	[1..*]	**TimeSeries**
mRID	[1]	The identification of the time series instance.

auction.mRID	[1]	For Business type = **C26** and **C27**
		    FCR-D or
		    FCR-N
		
		For Business type = **C36** and **Z92**
		    mFRR

businessType	[1]	**C26** Frequency Containment Reserve-Normal (FCR-N) **C27** Frequency Containment Reserve-Disturbance (FCR-D) **C36** Ramping period energy **Z92** Agreed Supportive Power (ASP)
acquiring_Domain.mRID	[1]	Unique identification of the buyer's area (For Business type = **C26**, **C27** and **Z92**) Unique identification of the acquiring area, which is the same as the connecting area (For Business type = **C36**) 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 (For Business type = **C26**, **C27** and **Z92**) Unique identification of the connecting area, which is the same as the acquiring area (For Business type = **C36**) The Connecting Domain is the one providing up- or down regulation of a Resource.
marketAgreement.type	[1]	**A05** Total contract

IEC CIM Attribute	Cl.	Code and description
marketAgreement.mRID	[1]	Use fixed value "**na**"
quantity_Measure_Unit.name	[1]	**MAW** MW (Only used for Business type = **C26** and **C27**) **MWH** MWh (Only used for Business type = **C36** and **Z92**)
currency_Unit.name	[0..1]	Any valid ISO 3 letter currency code, such as: **EUR** EURO
price_Measurement_Unit.name	[0..1]	**MAW** MW (Only used for Business type = **C26** and **C27**) **MWH** MWh (Only used for Business type = **C36** and **Z92**)
flowDirection.direction	[1]	**A01** Up **A02** Down **A03** Up and down (only for FCR-N)
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]	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.
price.amount	[0..1]	The amount bought or sold
	[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 4: Attribute usage: ERRP Reserve Allocation Result document, version 6.4

4.3.4   Business rules for the ERRP Reserve allocation result in the Nordic countries

The following business rules apply to the ERRP Reserve allocation result in the Nordic countries:

TBD.