

BRS

(Business Requirement Specification)

Nordic trading system

A market model for data exchange

Business process: Nordic trading system
Version: 2.0.C
Status: Approved by NMEG
Date: June 23rd, 2021

CONTENT

1	Introduction	4
1.1	Background.....	4
1.2	Nordic Energy Domain Model	4
1.3	NMEG - Nordic Market Expert Group.....	4
1.4	Terms and notations used in this BRS	4
1.5	References.....	5
1.6	Terms and notation	5
1.7	Change log	6
2	Overview of the Nordic energy market domain	7
2.1	Trade in the overall context (Domain model)	7
2.2	Breakdown of the trading phase	8
2.3	Overview of information exchange for operational markets.....	10
2.4	Market implementations.....	14
2.4.1	<i>aFRR</i>	14
2.4.2	<i>Reserve options market (only used in Denmark and Norway)</i>	14
2.4.3	<i>Day-ahead market</i>	14
2.4.4	<i>Intraday market</i>	14
2.4.5	<i>Frequency activated reserves market</i>	14
2.4.6	<i>Balance regulation market</i>	14
2.4.7	<i>Bilateral trade between LFC Operators</i>	15
3	Harmonised roles used in Nordic trading system	16
3.1	Definitions (from the ebIX [®] , EFET and ENTSO-E Harmonised role model):.....	16
3.2	Trade Responsible Party.....	18
4	Process areas within Nordic trading system	19
4.1	Process area: Trade on aFRR market.....	19
4.2	Process area: Trade on Reserve options market (Norway and Denmark)	19
4.3	Process area: Trade on Frequency activated reserves market	20
4.4	Process area: Trade on the Balance regulation market	21
4.5	Process area: Bilateral trade between LFC Operators.....	23
5	Business Data View; Nordic trading system	25
5.1	IEC/CIM Ediel Currency Exchange Rate Document v2.0.....	25
5.1.1	<i>Class diagram (contextual model): IEC/CIM Ediel Currency Exchange Rate Document v2.0</i>	26
5.1.2	<i>Class diagram (assembly model): IEC/CIM Ediel Currency Exchange Rate Document v2.0</i>	27
5.1.3	<i>Attribute usage: IEC/CIM Ediel Currency Exchange Rate Document v2.0</i>	28
5.2	IEC/CIM Area Configuration Document.....	30
5.2.1	<i>Class diagram (contextual model): Area Configuration Market Document, v1.1</i>	30
5.2.2	<i>Class diagram (assembly model): IEC/CIM Area Configuration Market Document, v1.1</i>	31
5.2.3	<i>Attribute usage: IEC/CIM Area Configuration Market Document, v1.1</i>	32
5.2.4	<i>Dependency matrix for Area Configuration Document, v1.1</i>	33
5.3	IEC/CIM Ediel Capacity Auction Specification Document.....	34
5.3.1	<i>Class diagram (contextual model): Ediel Capacity Auction Specification Document</i>	34
5.3.2	<i>Class diagram (assembly model): Ediel Capacity Auction Specification Document</i>	35
5.3.3	<i>Attribute usage: Ediel Capacity Auction Specification Document</i>	36
5.3.4	<i>Dependency matrix for Ediel Capacity Auction Specification Document</i>	40
5.4	IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document).....	41
5.4.1	<i>Class diagram: Reserve Bid Document contextual model</i>	42
5.4.2	<i>Class diagram: Reserve Bid Document assembly model</i>	43

5.4.3	<i>Attribute usage: Reserve Bid Document</i>	44
5.4.4	<i>Dependency matrix for Reserve Bid Document</i>	48
5.5	IEC/CIM Ediel Reserve Allocation Result Document (ERRP).....	49
5.5.1	<i>Class diagram: Ediel Reserve Allocation Result Document contextual model</i>	49
5.5.2	<i>Class diagram: Ediel Reserve Allocation Result Document assembly model</i>	50
5.5.3	<i>Attribute usage: Ediel Reserve Allocation Result Document (CIM version)</i>	51
5.5.4	<i>Dependency matrix for Ediel Reserve Allocation Result Document</i>	53
5.6	IEC/CIM Ediel Publication Document (ECAN)	54
5.6.1	<i>Class diagram: Ediel Publication Document contextual model</i>	54
5.6.2	<i>Class diagram: Ediel Publication Document assembly model</i>	55
5.6.3	<i>Attribute usage: Ediel Publication Document (CIM version)</i>	56
5.6.4	<i>Dependency matrix for Ediel Publication Document</i>	59
6	Business rules	60
6.1	General ground rules	60

1 Introduction

1.1 Background

This document is made and maintained by the Nordic Market Expert Group (NMEG). NMEG is a continuation of earlier Nordic Ediel work started by Ediel Nordic Forum, established in 1995. “Ediel” is used as a term for Nordic data exchange standards, among others based on EDIFACT and XML formats.

Today the Nordic TSOs and the market actors, both in the retail and wholesale markets, exchange documents based on several different formats and standards, such as Ediel (XML and EDIFACT), NOIS (XML), ENTSO-E (XML), ebIX[®] XML, IEC (CIM/XML), Excel sheets etc. Further, there are several projects run in the Nordic energy market that will change the way the market participants do their work, such as the introduction of data hubs in all the Nordic countries and the introduction of new NEMOs (Nominated Electricity Market Operator). Hence, there is a huge need for identifying harmonisation potential of data exchange standards from various Nordic projects and to influence common exchange standards, in various international standardisation bodies, such as IEC (International Electrotechnical Commission, see www.iec.ch). Increasingly, organisations in the Nordic energy market needs to communicate with several external bodies, hence harmonisation is a necessity.

NMEG is responsible for the development and maintenance of the Nordic Ediel standards, based on available international standards and documented Nordic business processes for data exchange in the energy industry, supporting the Nordic TSOs strategies. NMEG documents existing business processes in a standardised way and will use internationally agreed procedures, where possible.

NMEG also works with harmonisation of communication protocols.

NMEG actively discusses and promotes positions, with a common Nordic voice, when participating in relevant European and worldwide organisations for data exchange standardisation, such as ebIX[®], ENTSO-E and IEC.

This document is a Business Requirement Specification (BRS) detailing the document exchanges related to trade in the Nordic energy market. The focus of the document is the business aspects of the document exchanges and the basis for the document is the ENTSO-E ERRP Implementation Guide [1] and ECAN Implementation Guide [1], together with the ebIX[®], EFET and ENTSO-E Harmonised role model [4].

Note: The documents used in this BRS is not necessarily the documents used today but should be the documents to be used in the future.

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 [8].

1.3 NMEG - Nordic Market Expert Group

The document is written by NMEG, see www.ediel.org.

1.4 Terms and notations used in this BRS

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.

1.5 References

- [1] ENTSO-E Electronic Data Interchange (EDI) Library, see <https://www.entsoe.eu/publications/electronic-data-interchange-edi-library/>.
- [2] IEC 62325: Framework for energy market communications, Part 451, see <http://www.iec.ch/>:
 - Part 451-1 Acknowledgement business process
 - Part 451-2 Scheduling business process
 - Part 451-3 Transmission capacity allocation business process (explicit or implicit auction)
 - Part 451-4: Settlement and reconciliation business process
 - Part 451-5: Problem statement and status request business processes
 - Part 451-6 Publication of information on market
 - Part 451-7 Balancing processes
- [3] Area Configuration Document UML Model and Schema, 2019-12-11, Approved Document, Version 1.2.
- [4] The Harmonised Role Model, ENTSO-E, ebIX® and EFET, see <http://www.ebix.org/>
- [5] UN/CEFACT Unified Modelling Methodology (UMM), see <http://www.unece.org/>
- [6] Nordic Ediel Group, Common Nordic XML rules and recommendations, see <http://www.ediel.org/>
- [7] Nordic Ediel Group, BRS for the Nordic TSO Determine transfer capacity model, see <http://www.ediel.org/>
- [8] Nordic Ediel Group, BRS for the Nordic TSO Scheduling and Ancillary Services Process, see <http://www.ediel.org/>
- [9] Nordic Ediel Group, BRS for Nordic operational system, see <http://www.ediel.org/>
- [10] Nordic Energy Market Domain Model, see <http://www.ediel.org/>

1.6 Terms and notation

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.

When the term TSO is used in this document, it normally also includes the Market Operator.

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.

1.7 Change log

Ver/rel/rev	Changed by	Date	Changes
2.0.A	Ove Nesvik	20210222	<p>Complete recast of BRS, including:</p> <ul style="list-style-type: none"> • TSO (SO) is replaced with LFC Operator. • Roles and domains are updated to the latest naming and definitions from the HRM [4] • A46 Balancing Service Provider is added to all documents where there is a BRP. • All “non-CIM” documents are replaced with CIM versions. • Detailed documentation for documents related to the MNA project and NEMO specific documents are removed, the data exchanges in the overviews (Sequence diagrams) are kept. • The Area Specification Document is replaced with the latest Area Configuration Document. • The ECAN Allocation Result document (Ediel version) is not used anymore in the Nordic trading processes • Corrected the Reserve Bid Document: <ul style="list-style-type: none"> ○ Corrected sequence of attributes in the Bid Time Series according to the latest IEC 62325-451-7 version ○ Added Sender Role A39 Data Provider ○ Corrected the Dependency matrix ○ Added Z49 and A97 as Business Types
2.0.B	Ove Nesvik	20210315	Correction of editorial error.
2.0.C	Ove Nesvik	20210623	Correction of editorial errors.

2 Overview of the Nordic energy market domain

2.1 Trade in the overall context (Domain model)

The *Domain model* describes the main business process 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.

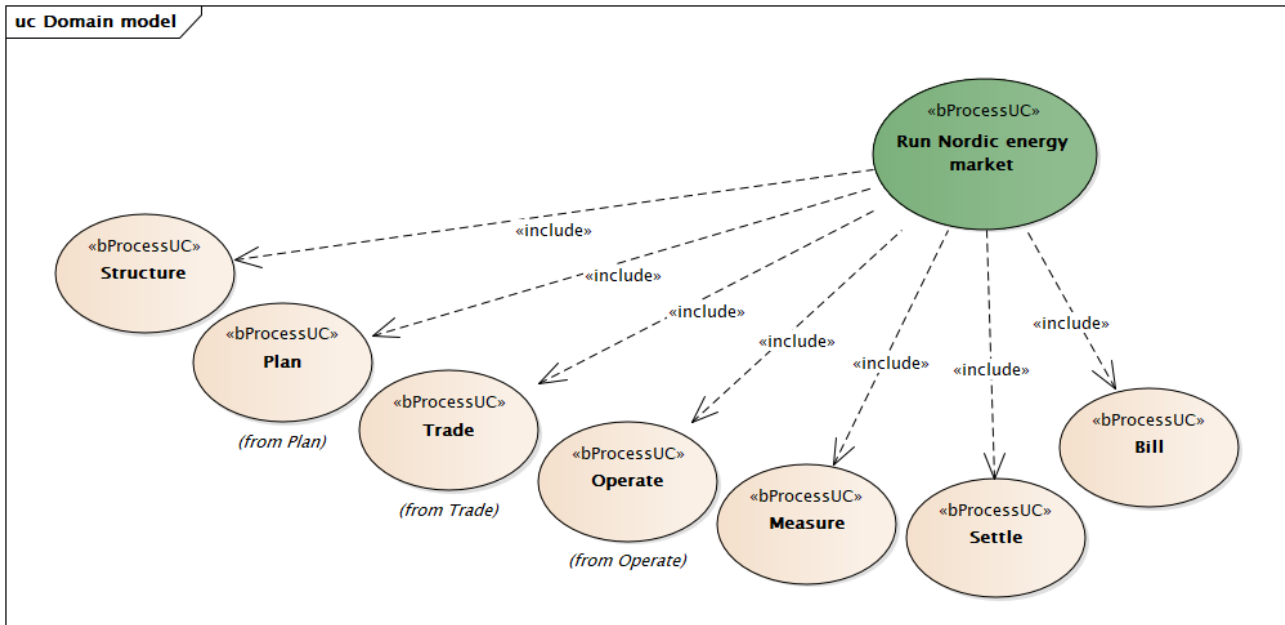


Figure 1: UseCase diagram: Domain model

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:

- Exchange of master data including the Change of Supplier processes
- Trade on different markets, including ancillary services, bilateral trade, etc.
- Planning of production, consumption, exchange and transport
- Operation
- Measuring of production, consumption, exchange and transport
- Settlement
- Billing

The *Nordic trading system process* is a part of the process area *Trade*.

For a more elaborated description of the processes include in the domain model, see [10].

2.2 Breakdown of the trading phase

In the rest of this document the *Business area (UseCase) Trade* is further elaborated.

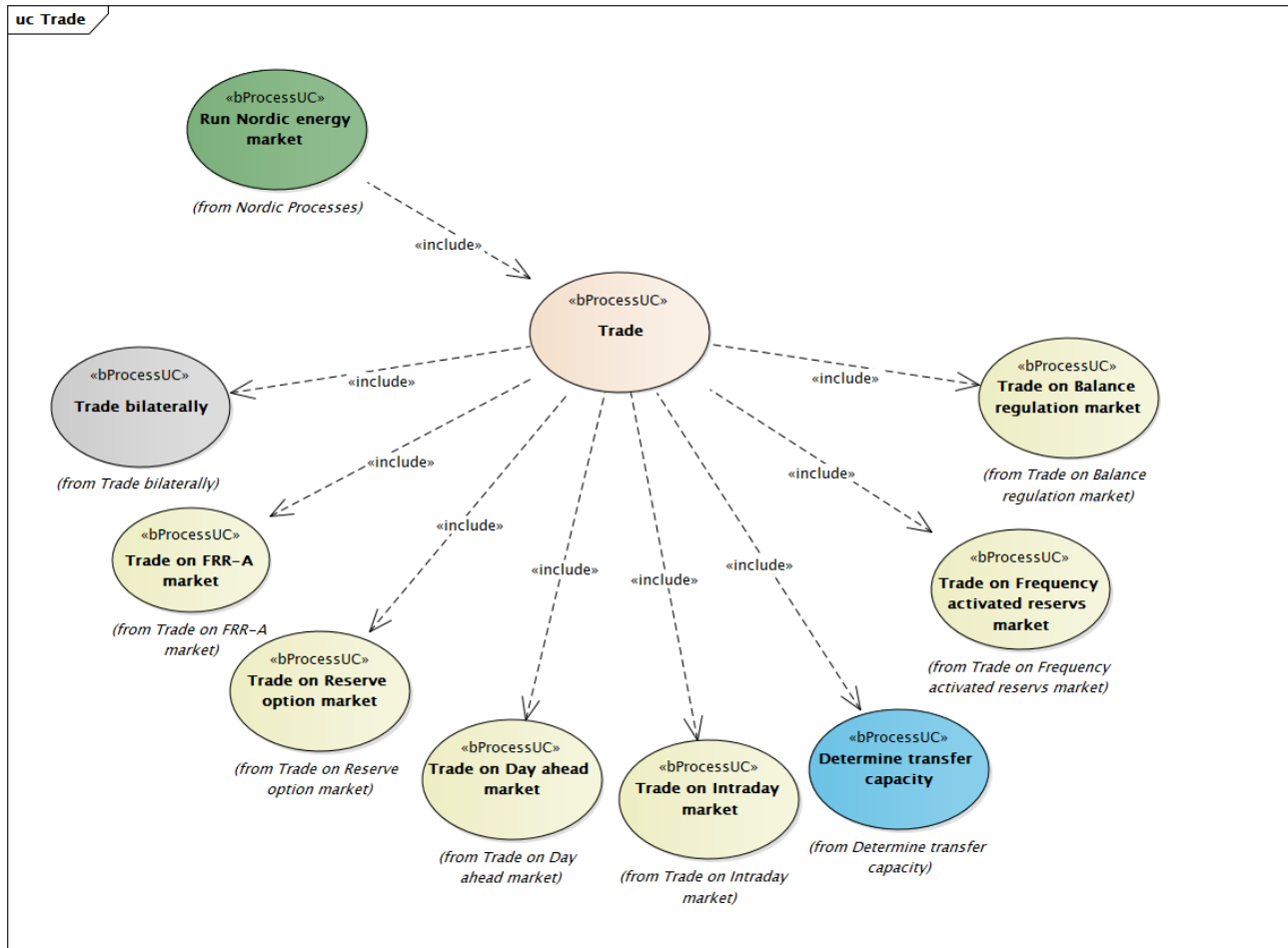


Figure 2: UseCase diagram: The Nordic trading system process

The *Business Area Trade* outlined in **Figure 2**, concerns principally buying and selling of energy between *Balance responsible parties*, including trade through the Market operators (e.g., Power exchanges), for fulfilling their contractual obligations. In addition, the trading phase includes the trade between *Balance responsible parties* and the *LFC Operators* for managing the operational need for regulation.

In the rest of this document the yellow UseCases, i.e., *Trade on aFRR (Frequency Restoration Reserves, Automatic, earlier LFC) market*, *Trade on Reserve options market*, *Trade on Frequency activated reserves market*, *Trade on day-ahead market*, *Trade on Balance regulation market* and *Bilateral trade between LFC Operators* are further elaborated, while the *UseCase Determine transfer capacity* is documented in a separate BRS [7].

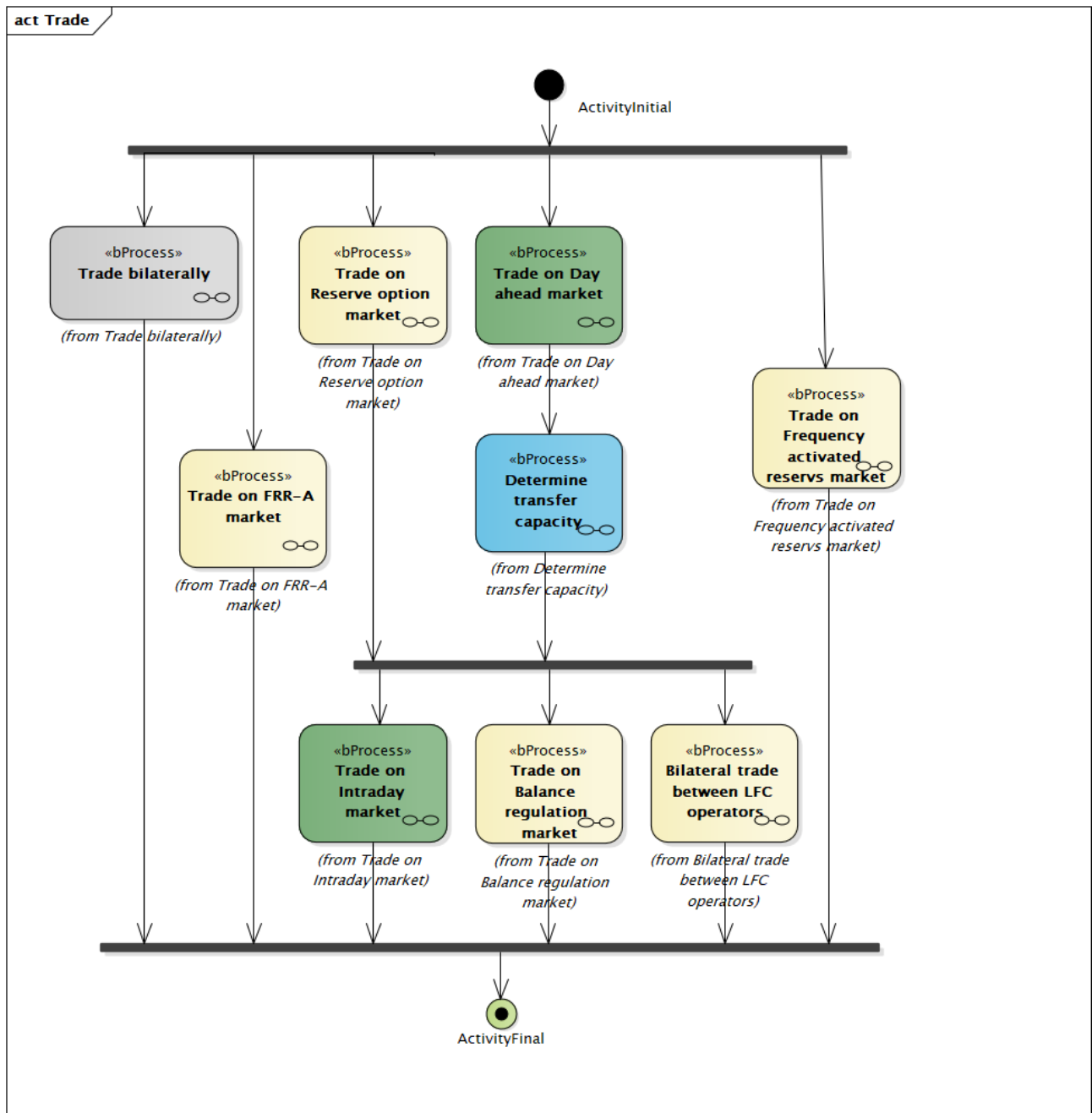


Figure 3 Activity diagram: The Nordic trading system process

Bilateral trade is restricted to a given Bidding Zone, while trade on the day-ahead, Adjustment and Balance regulation markets may be between Bidding Zones, i.e., through the Market operator, LFC Operators or between LFC Operators.

The Reserve options market is a tool to ensure enough fast reserves for the Balance regulation market, especially during wintertime when the load is high. The market is based on weekly contracts. There is no common Reserve options market within the Nordic power system and currently only used in Denmark and Norway.

The Frequency activated reserves market is a market that is weekly, daily and hourly based. In addition to national markets, the Frequency activated reserves are traded between the Nordic TSO’s on a bilateral basis.

2.3 Overview of information exchange for operational markets

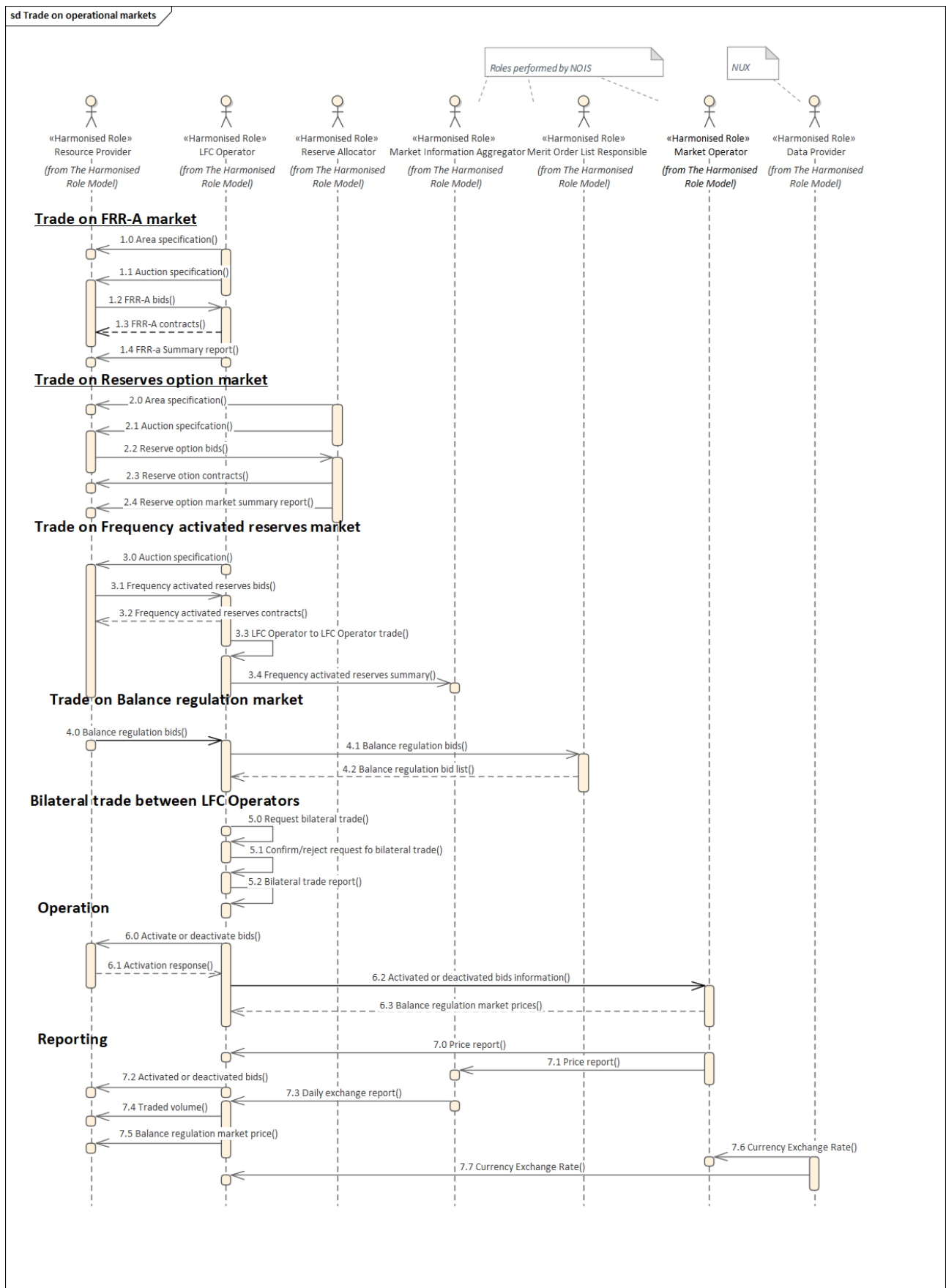


Figure 4 Sequence diagram: Overview of information exchange for operational markets

Process area	Arrow	Documentation
Trade on aFRR market	1.0 Area Specification	IEC/CIM Area Configuration Document, see 5.2.
	1.1 Auction Specification	IEC/CIM Ediel Capacity Auction Specification Document, see 5.3.
	1.2 aFRR bids	IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document), see 5.4.
	1.3 aFRR contracts	IEC/CIM Ediel Reserve Allocation Result Document (ERRP), see 5.5.
	1.4 aFRR summary report	IEC/CIM Ediel Publication Document (ECAN), see 5.6.
Trade on Reserve option market	2.0 Area specification	5.2, see: IEC/CIM Area Configuration Document.
	2.1 Auction specification	5.3, see: IEC/CIM Ediel Capacity Auction Specification Document.
	2.2 Reserve option bids	IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document), see 5.4.
	2.3 Reserve option contracts	IEC/CIM Ediel Reserve Allocation Result Document (ERRP), see 5.5.
	2.4 Reserve option market summary report	IEC/CIM Ediel Publication Document (ECAN), see 5.6.
Trade on Frequency activated reserves market	3.0 Auction specification	IEC/CIM Ediel Capacity Auction Specification Document, see 5.3.
	3.1 Frequency activated reserves bids	IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document), see 5.4.
	3.2 LFC Operator to LFC Operator trade	Currently by telephone.
	3.3 Frequency activated reserves contracts	IEC/CIM Ediel Reserve Allocation Result Document (ERRP), see 5.5.
	3.4 Frequency activated reserves summary	IEC/CIM Ediel Publication Document (ECAN), see 5.6.
Trade on Balance regulation market	4.0 Balance regulation bids	IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document), see 5.4
	4.1 Balance regulation bids	IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document), see 5.4
	4.2 Balance regulation bid list	Made available for LFC Operators via NOIS
Bilateral trade between LFC Operators	5.0 Request bilateral trade	<i>Currently:</i> By telephone <i>Later:</i> ERRP Activation Document (Status = A10 , Ordered), See [9]

Process area	Arrow	Documentation
	5.1 Confirm/Reject bilateral trade	ERRP Activation Document (Status = A07 , Activated or A09 , cancelled) See [9]
	5.2 Bilateral trade report	IEC/CIM Ediel Publication Document (ECAN), see 5.6
Operation (activation)	6.0 Activate or deactivate bids	ERRP Activation Document (Status = A10 , Ordered), documented in BRS for Nordic operational system [9]
	6.1 Activation response	ERRP Activation Document (Status = A07 , Activated or A09 , cancelled), documented in BRS for Nordic operational system [9]
	6.2 Activated or deactivated bids information	ERRP Activation Document, documented in BRS for Nordic operational system [9]
	6.3 Balance regulation market price	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
Reporting	7.0 Price report	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
	7.1 Price report	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
	7.2 Activated or deactivated bids	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
	7.3 Daily exchange report	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
	7.4 Traded volume	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
	7.5 Balance regulation market price	NEG ECAN Publication Document, documented in BRS for Nordic operational system [9]
	7.6 Currency Exchange Rate	IEC/CIM Ediel Currency Exchange Rate Document v2.0, see 5.1
	7.7 Currency Exchange Rate	IEC/CIM Ediel Currency Exchange Rate Document v2.0, see 5.1

Table 1: ENTSO-E documents used in the Nordic trading system

Figure 4 shows the main electronic documents exchanged between the *Resource providers* (market participants), *LFC Operators*, *Market information aggregator*, *Merit Order List Responsible* and the *Market operator*. Reporting to the Imbalance settlement responsible is shown in a separate BRS.

As seen from the diagram the basic information exchange is similar for the *Trade on aFRR market*, the *Reserve options market* and the *Frequency activated reserves market*. First an *Auction specification document* is sent from the *LFC Operator* to the *Resource providers* (market participants), then the *Resource providers* send in their bids to the *LFC Operator* and finally the resulting contracts are sent to the *Resource providers*. The *Auction specification document* contains information about the available auctions, products, areas and cut-off times.

Trade in the *Frequency activated reserves market* can in addition be executed between the *LFC Operators*. Summary of the trade on the *Frequency activated reserves market* is sent to the *Market information aggregator*.

For the *Balance regulation market*, the *Auction specification* is not sent explicitly, but follows the area definitions from the day-ahead market. In addition to the bids, the *Resource providers* must send *Production schedules* and *Ancillary services schedules*; including the result from the *Frequency activated*

reserves market see [8]. The *Balance regulation bids* are sent from the *LFC Operators* to the *Merit Order List Responsible* and made available for the *LFC Operators* as a sorted list of bids.

When needed the *LFC Operators* may, in addition to the trade on the *Balance regulation market*, trade bilaterally. Today this trade is executed using telephone.

After the bids have been received the bids may be activated. Each activated bid is reported back to the *Resource provider in question* and reported to the *Market information aggregator*. After the operational phase, on a daily basis, the activated and deactivated bids, and *Balance regulation market prices* are distributed to the *Resource providers*.

Summaries of traded volumes for consumption and production per Bidding area may be sent from the *LFC Operator* to the *Resource provider*.

In addition to the information exchange shown in the diagram above, the *marginal prices* and *total quantity bought* are made available on a webserver for the different markets.

The *Resource providers* are cautioned by *Balance Responsible Parties*, which may be responsible for consumption, production or both.

In addition to the “operational markets” described above the Market operator run the *day-ahead* and *intraday markets*, which is described below.

2.4 Market implementations

2.4.1 aFRR

aFRR (*Automatic Frequency Restoration Reserves*) market bids are based on Bidding Zones, prices and sizes. aFRR regulation is always carried out where it is cheapest, provided there are no network restrictions.

2.4.2 Reserve options market (only used in Denmark and Norway)

Reserve option bids are based on area, product (production and reduced consumption), option price, and size (a minimum of 25 MW). Offers must state potential restrictions regarding duration of continuous activation and interval between activations. Such restrictions result in price reductions based on agreed terms.

One *marginal price* is set for each bidding area. This means that the production reserves and decreased consumption reserves always get the same price although the *Reserve Allocator* might choose to buy just production, just reduced consumption or both. Unavailability of contracted resources shall be reported immediately to the *Reserve Allocator*. The option price will then be reduced according to agreed terms.

2.4.3 Day-ahead market

The balance demand on the day-ahead market assures that the predictable part of the difference between the participant's energy supply and obligations are outbalanced in the day-ahead market.

2.4.4 Intraday market

Intraday is a continuous cross border intra-day market.

All trades done on intraday are implicit utilising cross border capacity. Available cross border capacity for intra-day trading is updated after each executed trade. The participants are, in some of the countries obligated to report the trades done on intraday to their local LFC Operator (SO).

2.4.5 Frequency activated reserves market

The *Frequency activated reserves* are split into *Frequency Containment Reserves, Disturbance* (**FCR-D** earlier **FDR**) and *Frequency Containment Reserves, Normal* (**FCR-N** earlier **FNR**).

Marginal price is set per bidding area and unavailability of contracted reserves will induce a penalty according to agreed terms.

Acquired reserves may be traded between the *LFC Operators*.

2.4.6 Balance regulation market

Balance regulation bids are based on bidding area, price and size and must state restrictions regarding duration of continuous activation and interval between activations. Activation time, minimum duration, maximum duration and resting time is based on national rules. The participants are allowed to correct the bids until 45 minutes before the hour. It is not allowed to correct bids back in time.

Balance regulation is always carried out where it is cheapest, provided there are no network restrictions. All the regulations are implemented in the national markets. This means there can be different rules for the national markets, which obviated the need to harmonise all the market rules before the start of the *Nordic (international) balance regulation market*. All imbalance prices are set per Bidding Zone.

2.4.7 Bilateral trade between LFC Operators

There are two types of trade, and related exchange, as a result of ramping deviations for HVDC cables. The two types of trade are *trade for system reasons* (counter purchases) and *trade for balance reasons*. Ramping deviation is the calculated deviation from the trading plan as a result of ramping of HVDC cable. This discrepancy is cleared by trade rules for the connection.

Trade for system reasons and trade for balance reasons are based on the terms of the *Balance regulation market*.

The agreements are between national and foreign bidding areas.

Trade for system reasons and trade for balance reasons have two different purposes. Trade for balance reasons is a part of the handling of the *Balance regulation market* in the Nordic area.

Trade for system reasons is trade to deal with bottlenecks and errors.

For system reasons, the price is agreed for each trade and calculated using the "pay as bid" principle. For trade for balance reasons there are separate agreements for the exchange and pricing (market conditions for *Balance regulation market*).

3 Harmonised roles used in Nordic trading system

In **Figure 5** and in definitions below the relevant parts of the ebIX®, EFET and ENTSO-E Harmonised role model are outlined.

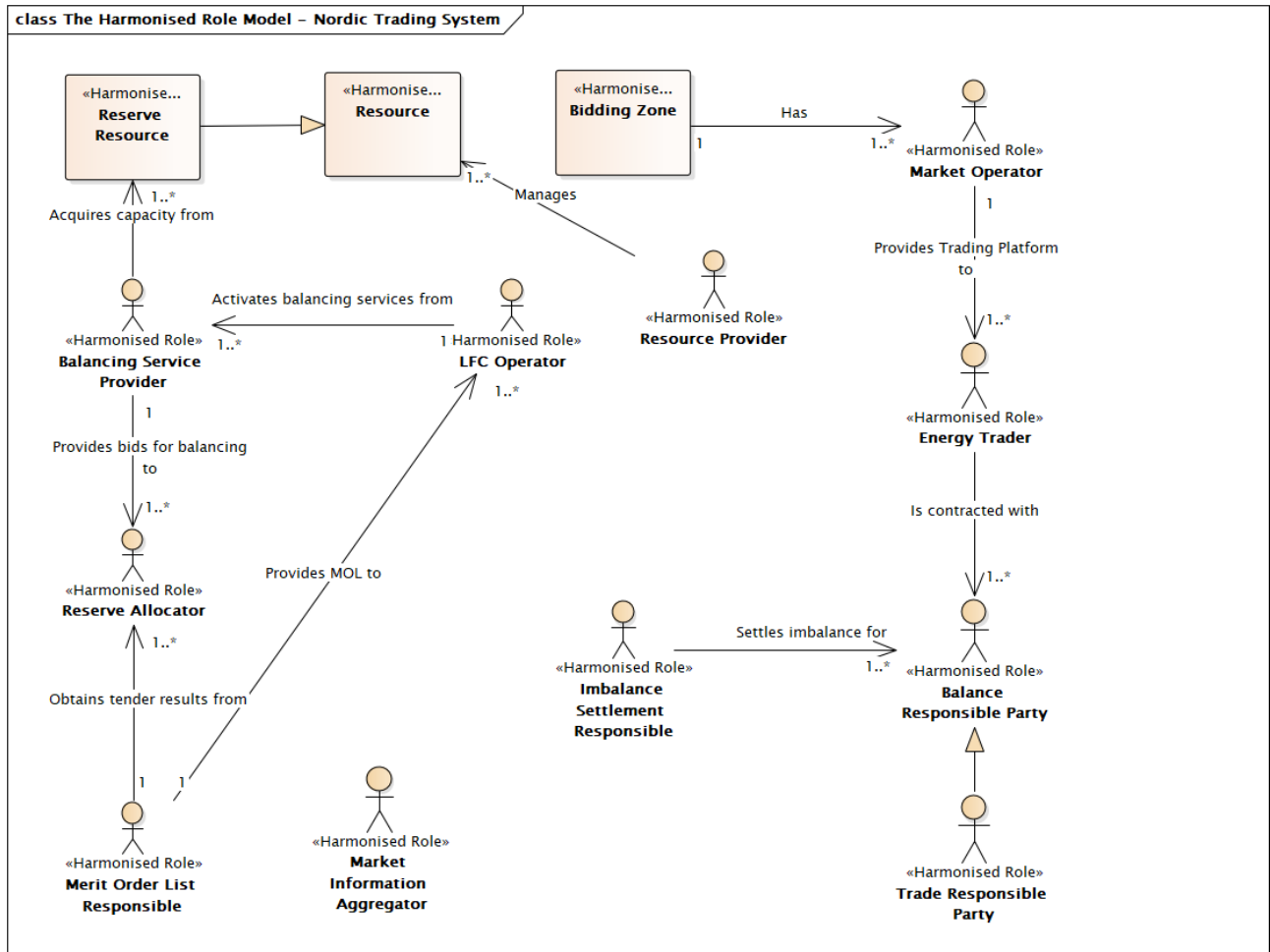


Figure 5: Outline of the Harmonised role model within the scope of the Nordic trading system

3.1 Definitions (from the ebIX®, EFET and ENTSO-E Harmonised role model):

Role/domain	Definition
Roles	
Balance Responsible Party	<p>A Balance Responsible Party is responsible for its imbalances, meaning the difference between the energy volume physically injected to or withdrawn from the system and the final nominated energy volume, including any imbalance adjustment within a given imbalance settlement period.</p> <p>Note: Based on Electricity Balancing - Art.2 Definitions.</p> <p>Additional information: Responsibility for imbalances (Balance responsibility) requires a contract proving financial security with the Imbalance Settlement Responsible of the Scheduling Area entitling the party to operate in the market.</p>

Balancing Service Provider	<p>A party with reserve-providing units or reserve-providing groups able to provide balancing services to one or more LFC Operators.</p> <p>Additional information: Based on Electricity Balancing - Art.2 Definitions.</p>
Energy Trader	A party that is selling or buying energy.
Imbalance Settlement Responsible	<p>A party that is responsible for settlement of the difference between the contracted quantities with physical delivery and the established quantities of energy products for the Balance Responsible Parties in a Scheduling Area.</p> <p>Note: The Imbalance Settlement Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.</p>
LFC Operator	<p>Responsible for the load frequency control for its LFC Area or LFC Block.</p> <p>Additional information: This role is typically performed by a TSO.</p>
Market Information Aggregator	<p>A party that provides market related information that has been compiled from the figures supplied by different actors in the market. This information may also be published or distributed for general use.</p> <p>Note: The Market Information Aggregator may receive information from any market participant that is relevant for publication or distribution.</p>
Market Operator	<p>A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity.</p> <p>Additional Information: This usually is an energy/power exchange or platform.</p> <p>The definition is based on Regulation on the internal market for electricity (EU) 2019/943.</p>
Merit Order List Responsible	Responsible for the management of the available tenders for all Acquiring LFC Operators to establish the order of the reserve capacity that can be activated.
Reserve Allocator	Informs the market of reserve requirements, receives bids against the requirements and in compliance with the prequalification criteria, determines which bids meet requirements and assigns bids.
Resource Provider	A role that manages a resource and provides production/consumption schedules for it, if required.
LFC Operator	<p>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 electricity.</p> <p>Additional information: The definition is based on DIRECTIVE 2009/72/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, Article 2 (Definitions).</p>
Trade Responsible Party	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points.

	<p>Note: A power exchange without any privileged responsibilities acts as a Trade Responsible Party.</p> <p>Additional information: This is a type of Balance Responsible Party.</p>
Domains	
Bidding Zone	<p>The largest geographical area within which market participants are able to exchange energy without capacity allocation.</p> <p>Source: Commission Regulation (EU) 543/2013.</p>
Resources	
Reserve Resource	<p>A resource technically pre-qualified using a uniform set of standards to supply reserve capabilities to a LFC Operator and is associated with one or more tele-measuring devices.</p> <p>Additional information: This is a type of Resource.</p>
Resource	<p>A market representation of an asset or a group of assets related to the energy industry.</p> <p>Additional information: A Resource represents for example grid assets, consumption assets or production assets, such as generating units, consumption units, energy storage units or virtual power plants.</p>

Table 2: Definitions (from the eBIX[®], EFET and ENTSO-E Harmonised role model)

In the Nordic countries NOIS will perform the roles of Market operator, Market information aggregator and Merit Order List Responsible.

3.2 Trade Responsible Party

In the diagrams describing the markets the term Trade Responsible Party is used, even if the actor is a Energy Trader, without Balance responsibility. In the detailed document description both Balance responsible parties and Trade Responsible Parties may be identified.

4 Process areas within Nordic trading system

4.1 Process area: Trade on aFRR market

The Trade on **aFRR** (*Automatic Frequency Restoration Reserves*) market will be specified when available and agreed by the Nordic countries.

4.2 Process area: Trade on Reserve options market (Norway and Denmark)

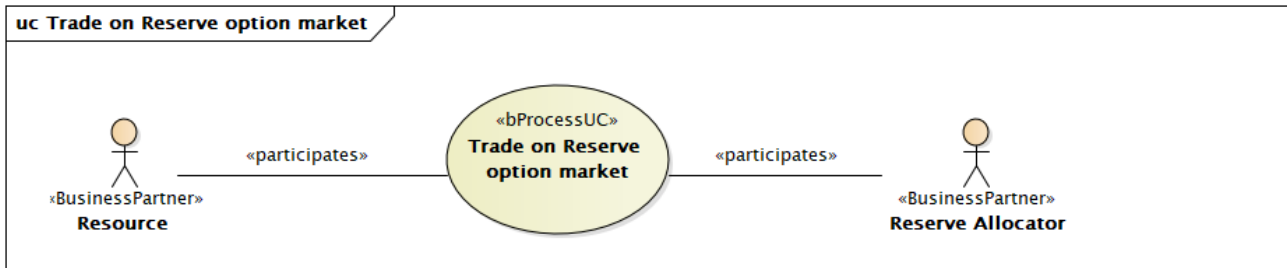


Figure 6: UseCase: Trade on Trade on Reserves option market

The documents exchanged within the Trade on Reserves option market process are sent between Resource providers and the Reserve Allocator. Today the role Reserve Allocator is played by the TSOs, i.e., Energinet and Statnett.

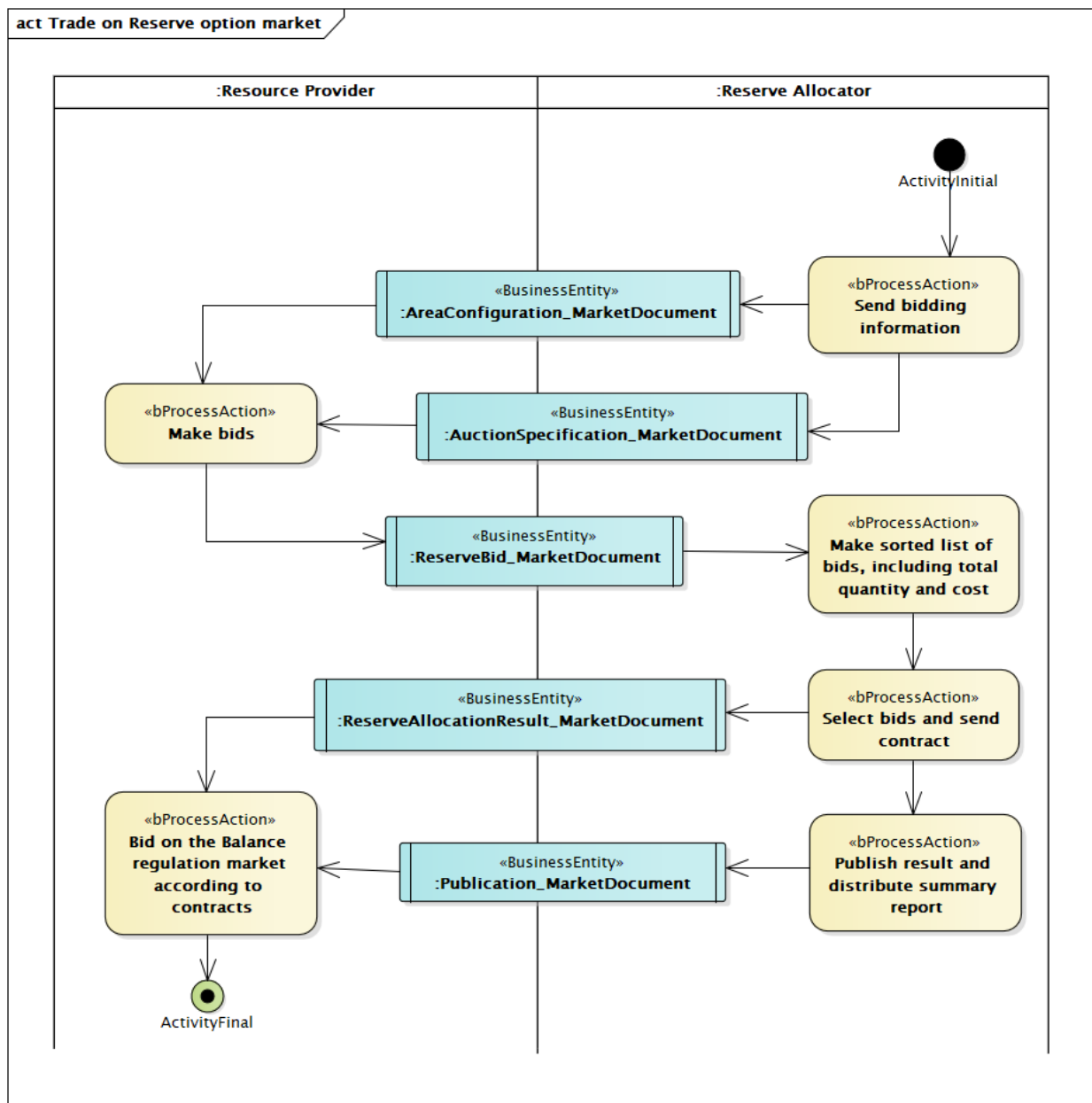


Figure 7: Activity diagram: Trade on Reserves option market

As seen from the diagram above, the bids are collected, accumulated by the Reserve Allocator as a merit order list (sorted list of bids) for each area, with accumulated quantity and cost shown along with each bid. The Reserve Allocator selects the highest bid to use to fulfil the requirements for Reserve options. Once satisfied the contracts are sent to the Resource provider and the price and total quantity are published on the web.

4.3 Process area: Trade on Frequency activated reserves market

The Trade on *Frequency activated reserves market* is expected to be redone as a common Nordic market, with new rules. The process will be specified when available and agreed by the Nordic countries.

4.4 Process area: Trade on the Balance regulation market

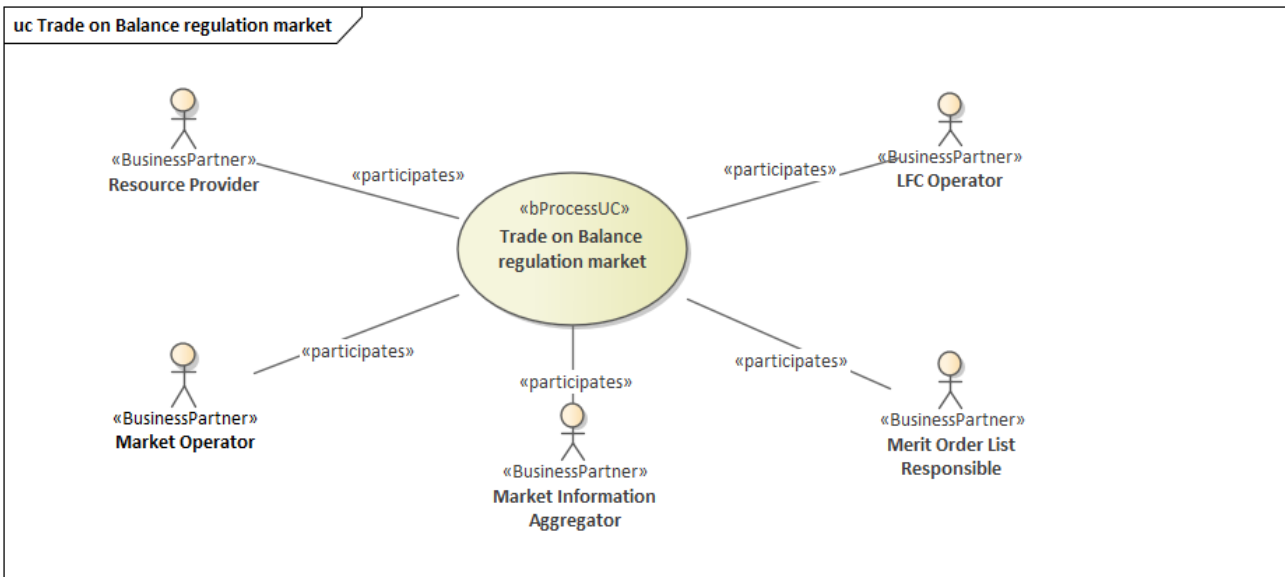


Figure 8: UseCase diagram: The Nordic Balance regulation market process

Figure 8 shows the process *Trade on the Nordic Balance regulation market* and the participating actors. The *Business process* is further described below.

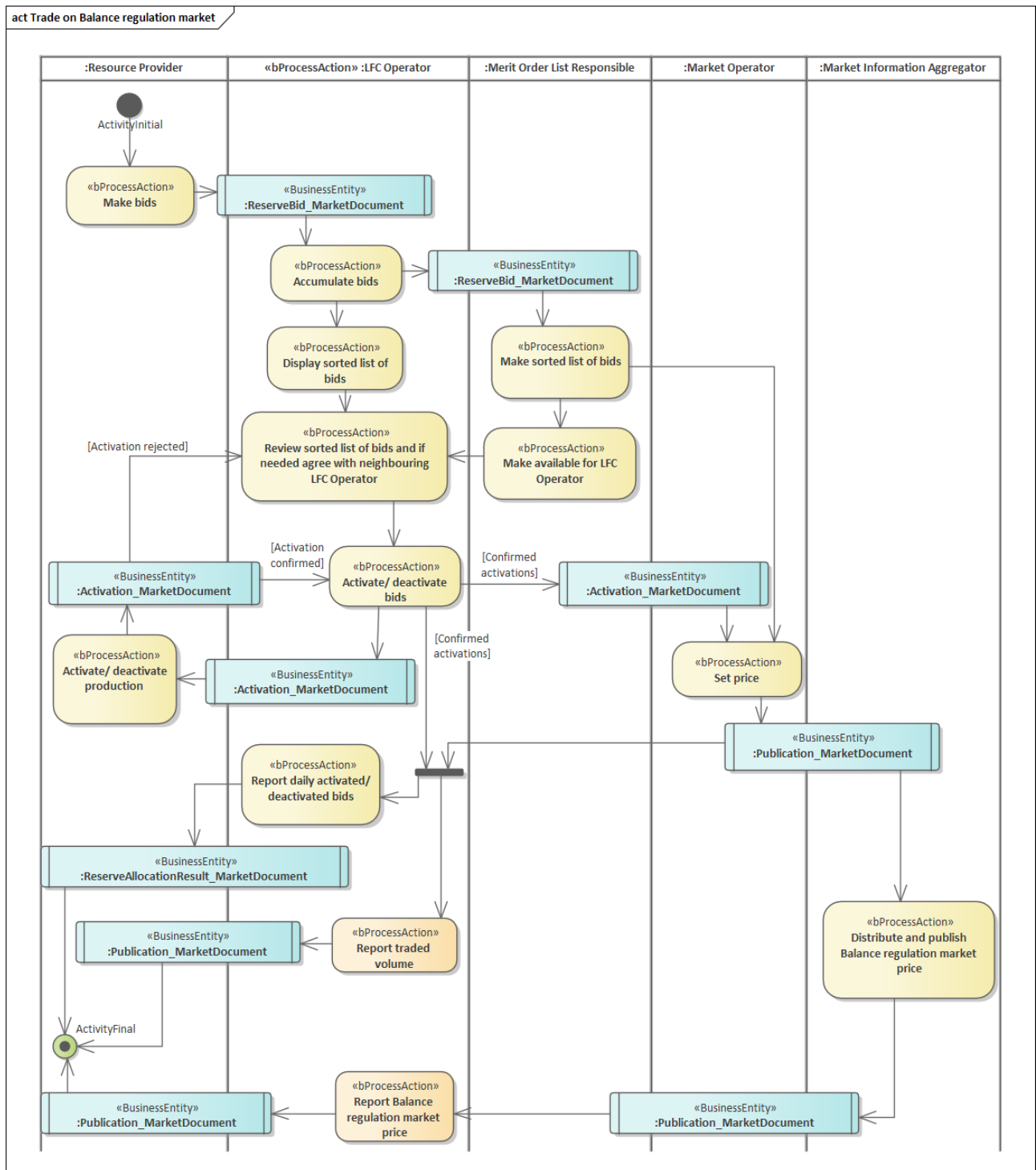


Figure 9: Activity diagram: The Nordic Balance regulation market process

The Balance regulation market is a tool for the *LFC Operators* and must be able to handle all unpredictable differences between planned and actual exchange in the delivery phase on short notice.

Active bidders on the Balance regulation market must be able to regulate their delivery and usage within a given time defined by the market rules. This means that only producers and large consumers bid actively without the buyers responding to the price. All other participants remain passive. Their purchases/sales are settled deriving from the imbalance between weighed values for delivery, usage and contracted fixed energy supplies/obligations.

As seen from **Figure 9**, the bids are collected, accumulated and then presented for the *LFC Operator*, by the Merit Order List Responsible, as a sorted list of bids.

The Nordic Balance regulation market document transmission cycle is composed of the following phases:

1. In the national Balance regulation market, *Balance responsible parties* sends bids to the *LFC Operators* on a day-ahead basis. Bids may be for both up and down regulation and be corrected during the operational phase (e.g., within 45 minutes before operation). The *LFC Operator* activates up or down regulation according to the lowest bids.
2. The national *LFC Operator* forwards all the bids to the *Merit Order List Responsible*.
3. When there is a need to perform balance regulation, and provided there are no network restrictions, the operator checks with the *Merit Order List Responsible* list of sorted bids to find the cheapest unused bid. If it is within the operator's area, he or she activates the bid, otherwise he or she calls the *LFC Operator* with the cheapest unused bid

Related documents are defined, according to the UMM Business Data View [5], in chapter 5.

In the Nordic market NOIS act as *Market operator* and *Merit Order List responsible*.

Manual Frequency Restoration Reserve (mFFR) is a rescheduling action to cater for a high rate of change of demand or generation, demand forecast errors or short-term plant losses.

Two types of mFFR activation are possible:

- Schedule Activated mFFR Reserve (SATCR): is activated with relation to the predefined timeframe of exchange schedules, e.g., 15 minutes. A special exchange scheduling procedure is used. It may include exchange rescheduling between TSOs, a special kind of exchange schedule is used.
- Directly Activated mFFR Reserve (DATCR): can be activated at any time, independent from a timeframe of exchange schedules. It is activated by manual action at any time and may also include call-up reserve contracts between TSOs. In this case, the activation procedure results in a dynamically changing exchange pattern.

4.5 Process area: Bilateral trade between LFC Operators

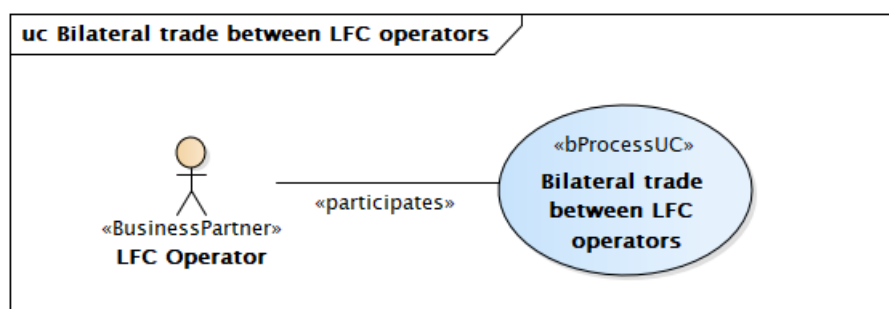


Figure 10: UseCase diagram: Bilateral trade between LFC Operators

Figure 10 shows the process *Bilateral trade between LFC Operators* and the participating actors (*LFC Operators*). The *Business process* is further described below.

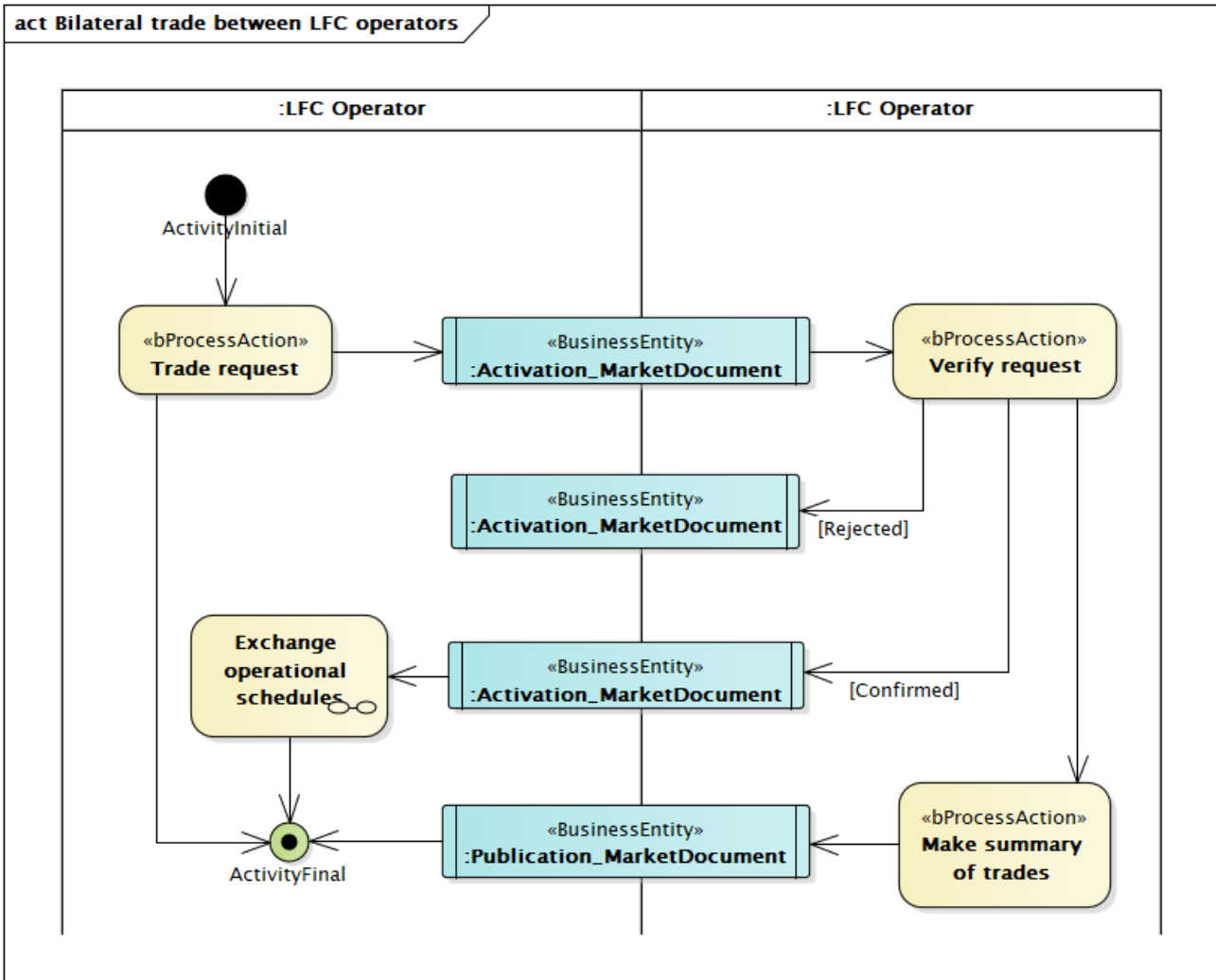


Figure 11: Activity diagram: Bilateral trade between LFC Operators

The request for *Bilateral trade between LFC Operators* is currently is mostly done by telephone. Specification of the actual documents to be exchanged is postponed to a later stage.

A *Bilateral trade between LFC Operators* may result in an update of break point plans and/or operational schedules see Nordic Ediel Group, BRS for the Nordic TSO Scheduling and Ancillary Services Process, see <http://www.ediel.org/> [8].

The *Trade rejected* state occurs if there is a negative answer on a request for a bilateral trade.

5 Business Data View; Nordic trading system

5.1 IEC/CIM Ediel Currency Exchange Rate Document v2.0

The IEC/CIM Ediel Currency Exchange Rate Document described below is a Nordic document, which not is expected to be specified by ENTSO-E.

The document is used in the following exchanges:

- **Figure 4** Sequence diagram: Overview of information exchange for operational markets
 - 7.6, Currency Exchange Rate
 - 7.7, Currency Exchange Rate

The NEG Currency Exchange Rate Document is sent daily from the *Market Operator* to the *LFC Operators* and to other actors on request. The Document must cover a full market day and contain exchange rates for all Nordic currencies and Euro.

The general rule for calculating the Currency Exchange Rate is:

$$\text{Reference Currency} * \text{Currency Exchange Rate} = \text{Target Currency}$$

5.1.1 Class diagram (contextual model): IEC/CIM Ediel Currency Exchange Rate Document v2.0

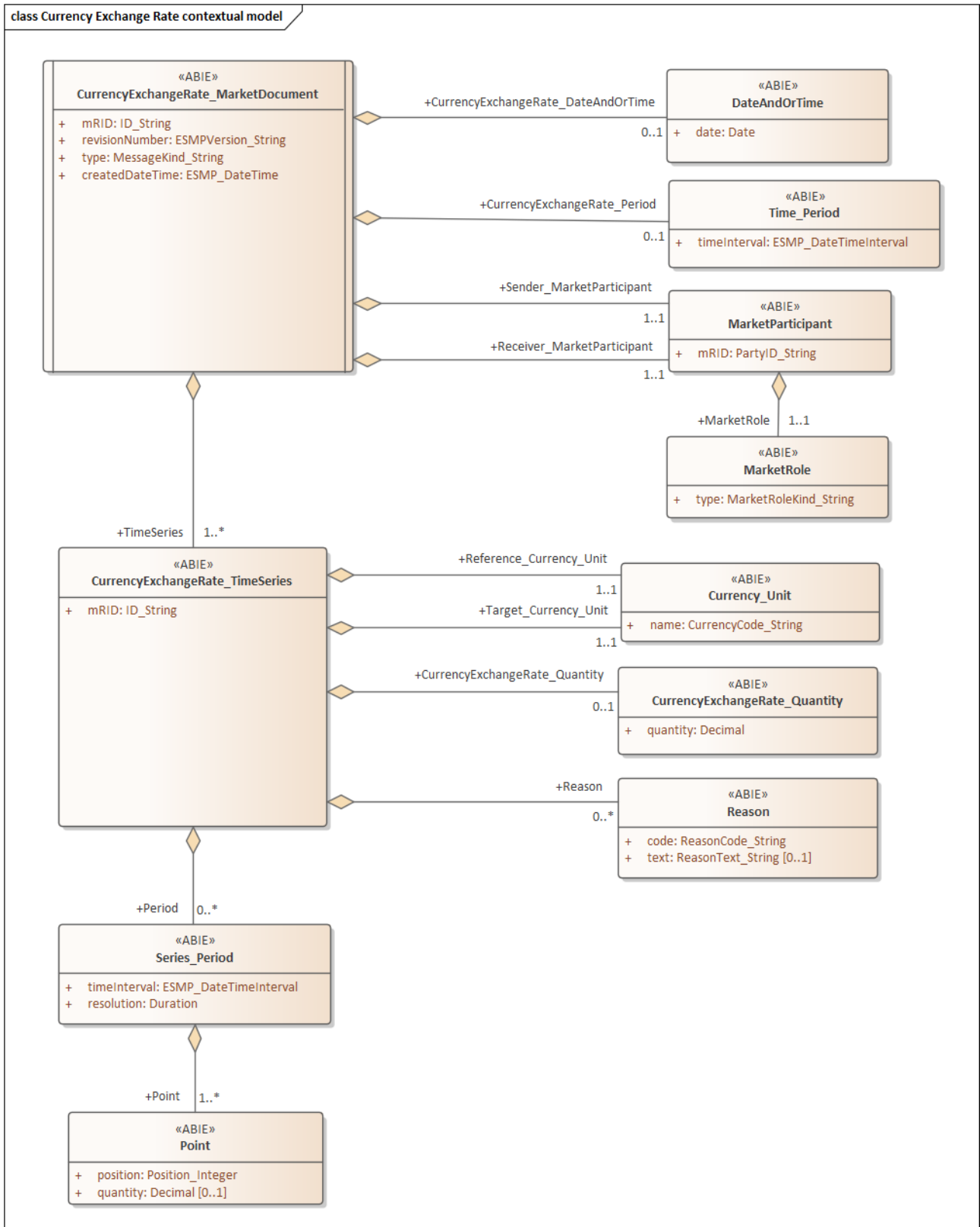


Figure 12: Class diagram (contextual model): IEC/CIM Ediel Currency Exchange Rate Document v2.0

5.1.2 Class diagram (assembly model): IEC/CIM Ediel Currency Exchange Rate Document v2.0

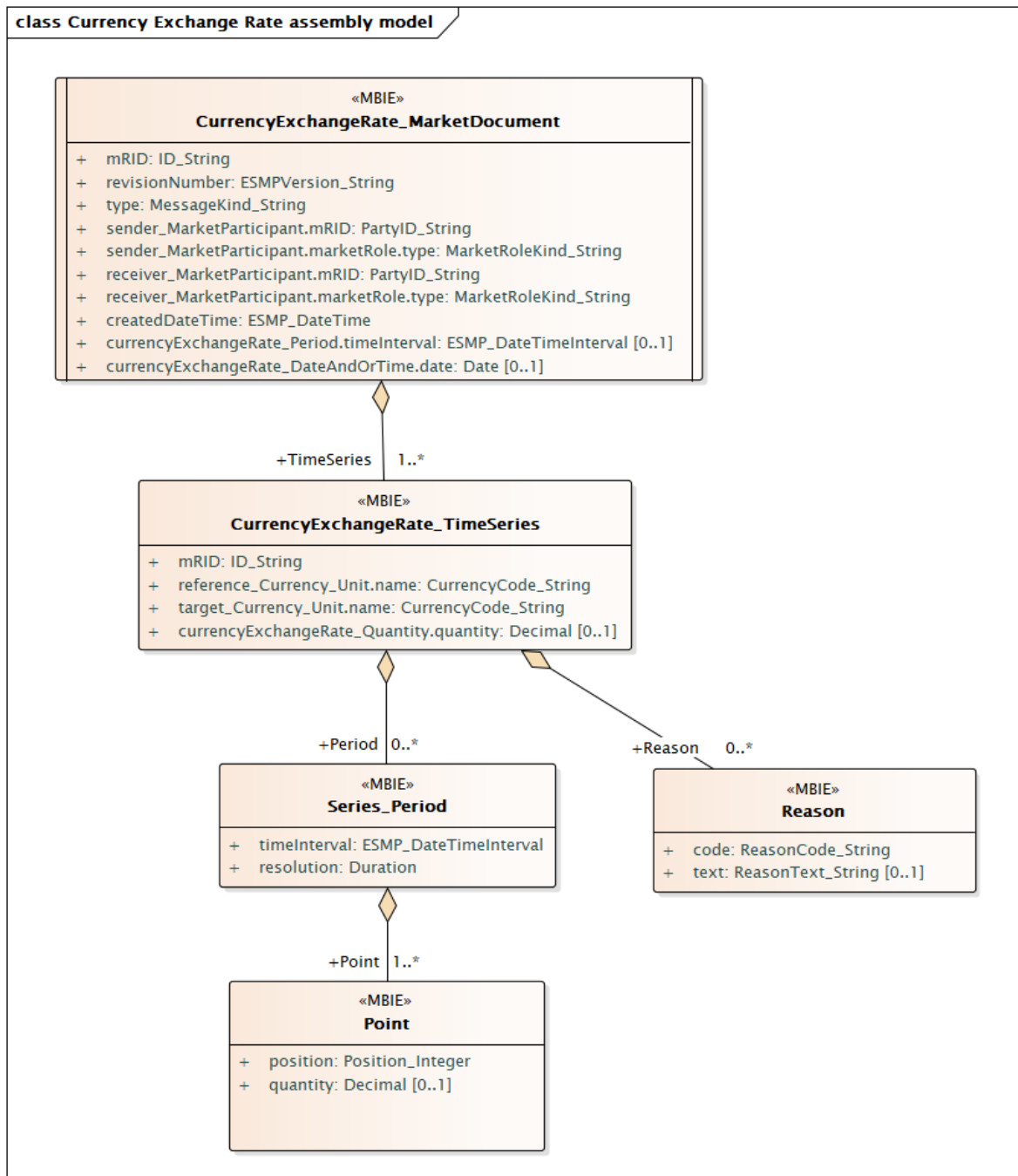


Figure 13: Class diagram (assembly model): IEC/CIM Ediel Currency Exchange Rate Document v2.0

5.1.3 Attribute usage: IEC/CIM Ediel Currency Exchange Rate Document v2.0

Attribute	Cl.	Code and description
<i>Ediel Currency Exchange Rate Document v2.0</i>		
mRID	[1]	The unique identification of the document being exchanged. Note: The maximum length of the mRID is 35 characters.
type	[1]	Z07 Currency exchange rate document
process.processType	[1]	
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document.
sender_MarketParticipant.marketRole.type	[1]	A11 Market operator
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules.
receiver_MarketParticipant.marketRole.type	[1]	A08 Balance responsible party A46 Balancing Service Provider A47 Energy Trader (Used for non-balance responsible traders) A48 LFC Operator (replaces A04 System Operator)
createdDateTime	[1]	Date and time for creation of the document.
currencyExchangeRate_Period.timeInterval	[0..1]	The beginning and ending date and time of the period covered by the document. Shall be used if the Series_Period level is used. Else, not used.
currencyExchangeRate_DateAndOrTime.date	[0..1]	The day for which the Currency Exchange Rate is valid. Shall be used if the currencyExchangeRate_Quantity.quantity attribute is used. Else, not used.
<i>CurrencyExchangeRate_TimeSeries</i>	<i>[1..*]</i>	
mRID	[1]	Unique ID of the Time Series.
reference_Currency_Unit.name	[1]	The reference currency may be any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner RUB Russian Ruble SEK Swedish Kronor
target_Currency_Unit.name	[1]	The target currency may be any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner RUB Russian Ruble SEK Swedish Kronor
currencyExchangeRate_Quantity.quantity	[0..1]	Currency Exchange Rate. Either this attribute or the Series_Period shall be used (XOR).

Attribute	Cl.	Code and description
<i>Reason</i>	[0..1]	
reason.Code	[1]	<p>B17 Price based on preliminary exchange rate (The exchange rate is preliminary and will be updated when an official currency exchange rate is available)</p> <p>B21 Official exchange rate approved (The official exchange rate has been approved)</p>
<i>Series_Period</i>	[0..*]	Either the Series_Period or the attribute currencyExchangeRate_Quantity.quantity shall be used (XOR).
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 style="text-align: center;">E.g., PT1H or PT60M</p>
<i>Point</i>	[1..*]	
position	[1]	The relative position of a period within an interval.
quantity	[1]	Currency Exchange Rate.

Table 3: Attribute usage: IEC/CIM Ediel Currency Exchange Rate Document v2.0

5.2 IEC/CIM Area Configuration Document

The IEC/CIM Area Configuration Market Document described below is specified by CIM EG (ENTSO-E) [1].

The document is used in the following exchanges:

- **Table 1:** ENTSO-E documents used in the Nordic trading system:
 - 1.0, Area Specification
 - 2.0, Area specification

5.2.1 Class diagram (contextual model): Area Configuration Market Document, v1.1

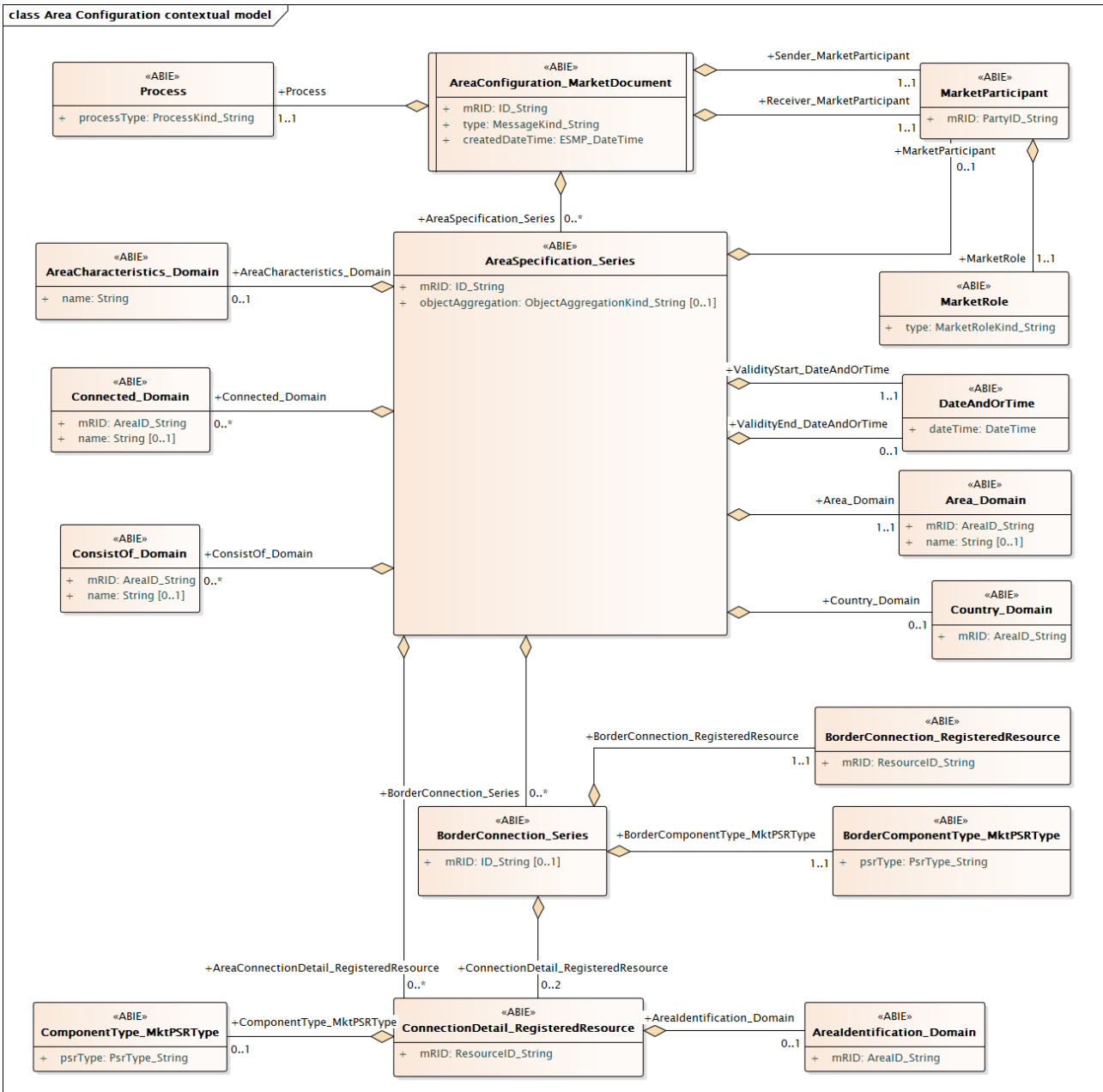


Figure 14: Class diagram (contextual model): IEC/CIM Area Configuration Market Document, v1.1

5.2.2 Class diagram (assembly model): IEC/CIM Area Configuration Market Document, v1.1

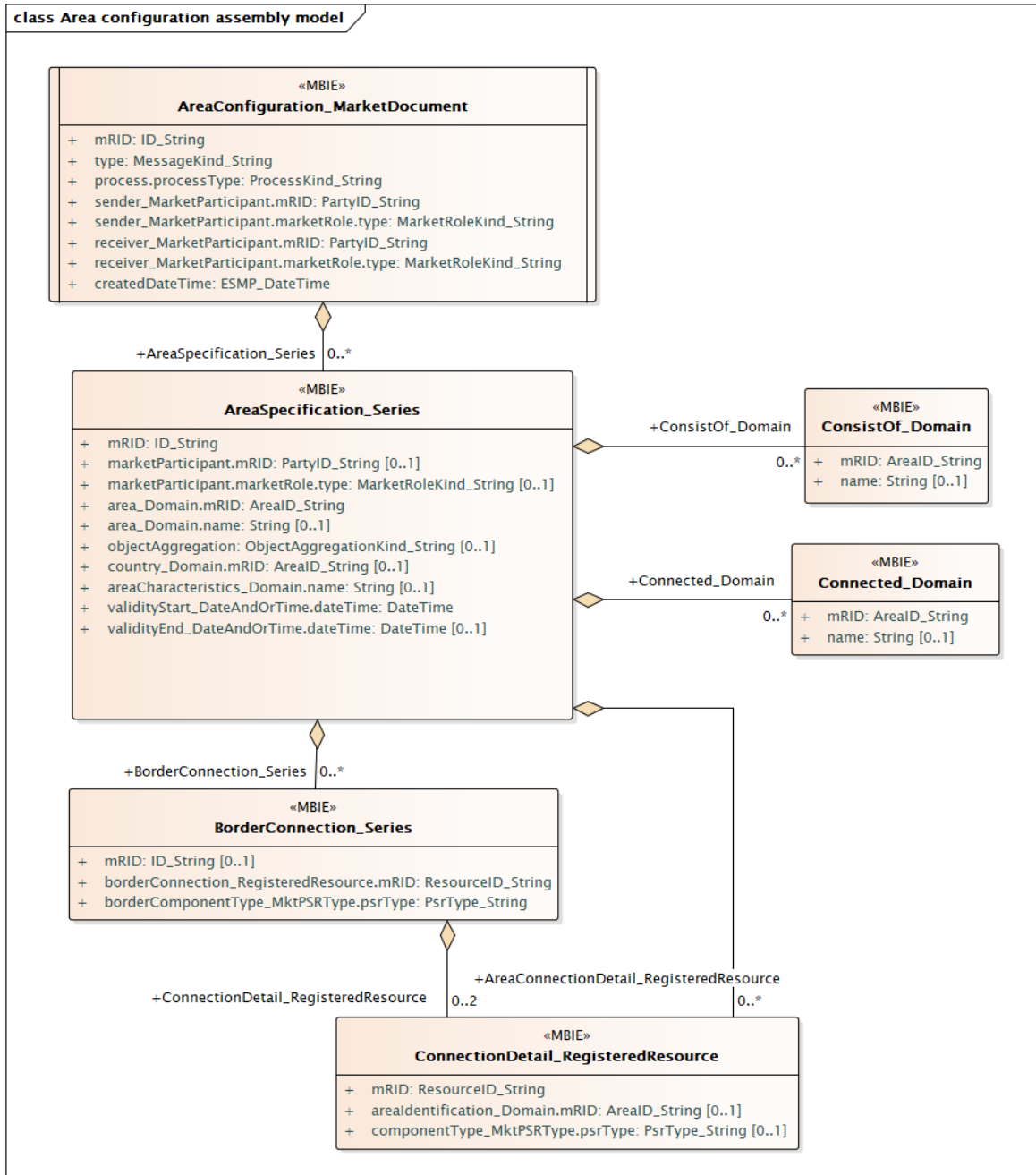


Figure 15: Class diagram (assembly model): IEC/CIM Area Configuration Market Document, v1.1

5.2.3 Attribute usage: IEC/CIM Area Configuration Market Document, v1.1

Attribute	Cl.	Code and description
<i>Area Configuration Market Document</i>		
mRID	[1]	The unique identification of the document being exchanged. Note: The maximum length of the mRID is 35 characters.
type	[1]	B35 Area Configuration Document Z06 Market connection points document
process.processType	[1]	<i>Currently used:</i> A01 Day-ahead A58 Reserve option market <i>Possible future use:</i> A02 Intraday (The area specification defined for the <i>day-ahead market</i> (A01, Day-ahead) is used today) A47 Manual frequency restoration reserve (replacing A30 Tertiary reserve process) A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process) A52 Frequency containment reserve (replacing A28 Primary reserve process)
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document.
sender_MarketParticipant.marketRole.type	[1]	A11 Market operator A34 Reserve Allocator A48 LFC Operator (replaces A04 System Operator)
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules.
receiver_MarketParticipant.marketRole.type	[1]	A08 Balance responsible party A11 Market operator A46 Balancing Service Provider A47 Energy Trader
createdDateTime	[1]	Date and time for creation of the document.
<i>AreaSpecification_Series</i>	[0..*]	
mRID	[1]	Unique ID of the Area Specification Series.
area_Domain.mRID	[1]	Unique ID of the area.
areaCharacteristics_Domain.name	[0..1]	
<i>BorderConnection_Series</i>	[0..*]	Dependency: Only used for “ B35 Area Configuration Document”.
mRID	[1]	The unique identification of the component.
borderComponentType_MktPSRType.PSRType	[1]	A01 Tieline A02 Line

Attribute	Cl.	Code and description
		A08 Busbar B23 Substation B24 Transformer
<i>ConnectionDetail_RegisteredResource</i>	[1..*]	Dependency: Always two repetitions for type = B35 (Area Configuration Document).
mRID	[1]	Unique ID of the Registered Resource (Border Component).
arealidentification_Domain.mRID	[0..1]	Identification of the Area.
componentType_PSRTYPE.PSRTYPE	[0..1]	<i>Component type:</i> A02 Line A08 Busbar B23 Substation B24 Transformer

Table 4: Attribute usage: IEC/CIM Area Configuration Market Document, v1.1

5.2.4 Dependency matrix for Area Configuration Document, v1.1

Area Configuration Market Document type	Process Type	Sender role	Receiver role	borderComponentType (Asset Type List)	componentType (Asset Type List)
B35 Area configuration document	A01	A11 A48	A08 A11 A46 A47	A01 A02 A08 B23 B24	A02 A08 B23 B24
	A58	A34	A08 A11 A46 A47	A01 A02 A08 B23 B24	A02 A08 B23 B24
Z06 Market connection points document	A01	A11 A48	A08 A11 A46 A47	A01 A02 A08 B23 B24	A02 A08 B23 B24

Table 5: Dependency matrix for NEG Area Configuration Market Document, v1.1

5.3 IEC/CIM Ediel Capacity Auction Specification Document

5.3.1 Class diagram (contextual model): Ediel Capacity Auction Specification Document

The Ediel Capacity Auction Specification Document is based on the IEC 62325-451-3 Ed.1 Amendment 1 Capacity auction specification document, see [2].

The document is used in the following exchanges:

- **Table 1:** ENTSO-E documents used in the Nordic trading system:
 - 1.1, Auction Specification
 - 2.1, Auction specification
 - 3.0, Auction specification

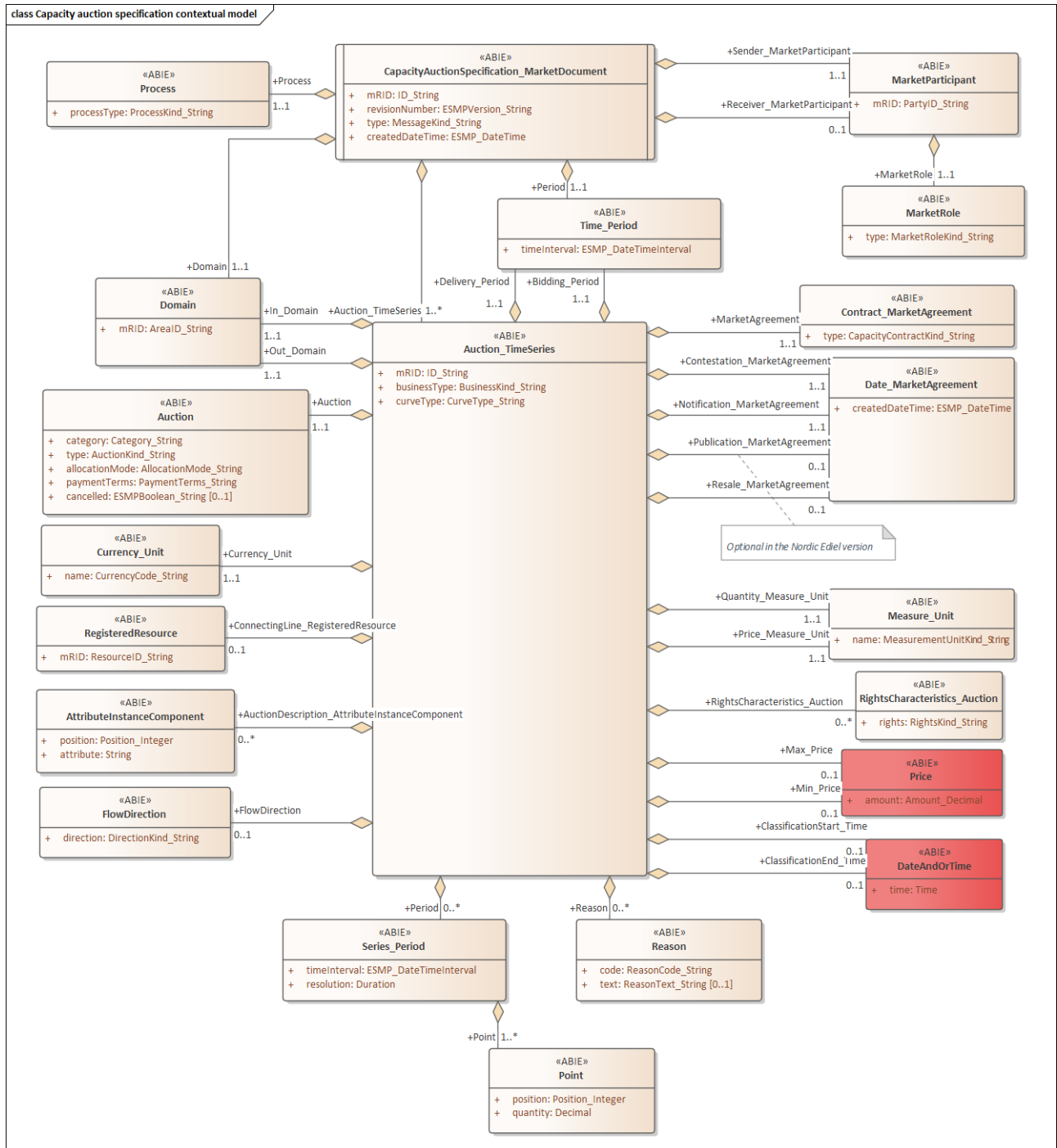


Figure 16: Class diagram (contextual model): Ediel Capacity Auction Specification Document

5.3.2 Class diagram (assembly model): Ediel Capacity Auction Specification Document

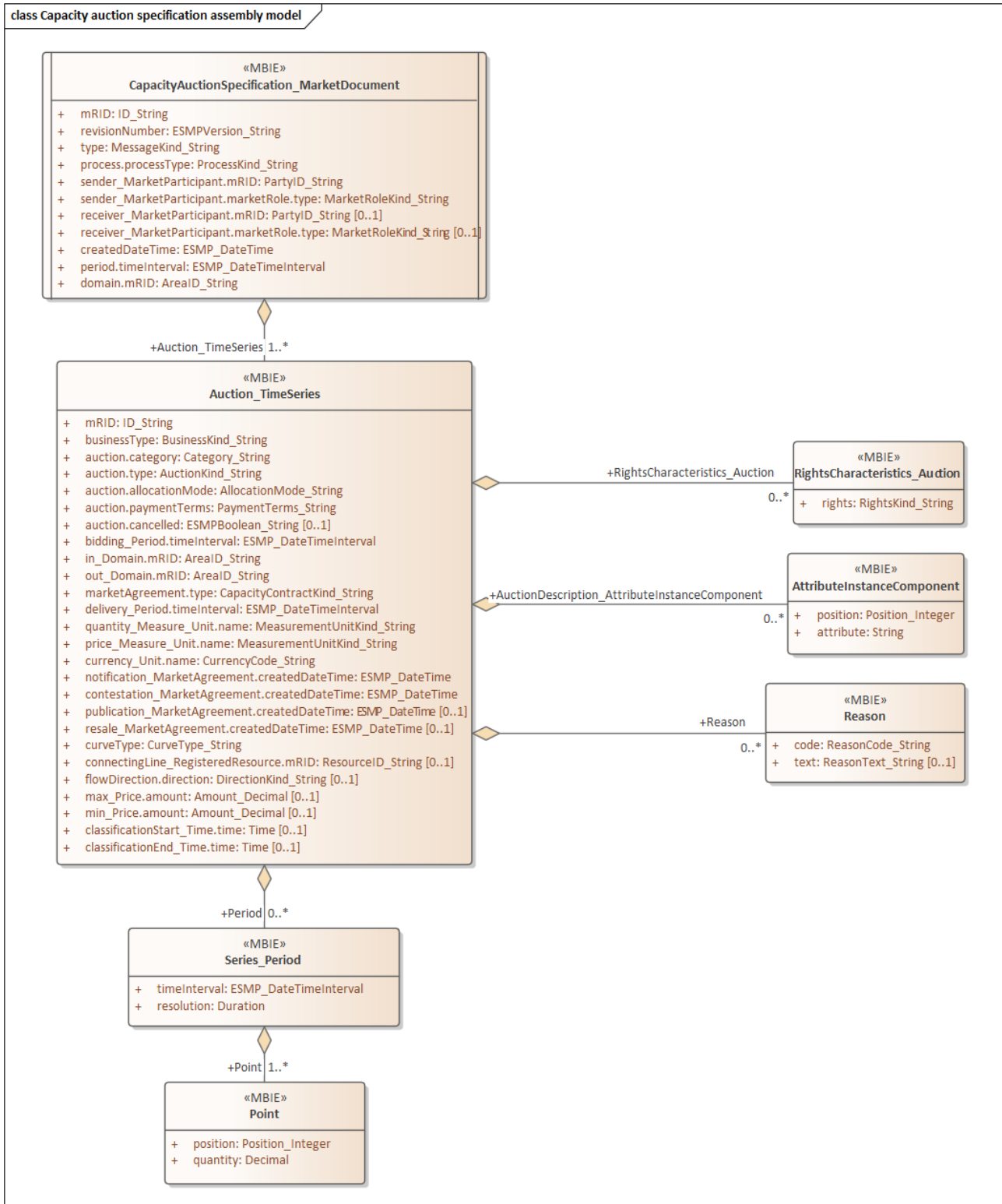


Figure 17: Class diagram (assembly model): Ediel Capacity Auction Specification Document

5.3.3 Attribute usage: Ediel Capacity Auction Specification Document

Attribute	Cl.	Code and description
Ediel Capacity Auction Specification Document		
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1
type	[1]	A51 Capacity Auction Specification Document
process.processType	[1]	A47 Manual frequency restoration reserve (replacing A30 Tertiary reserve process) A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process) A52 Frequency containment reserve (replacing A28 Primary reserve process) A58 Reserve option market
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document.
sender_MarketParticipant.marketRole.type	[1]	A11 Market operator A34 Reserve Allocator
receiver_MarketParticipant.mRID	[0..1]	Identification of the party who is receiving the schedules. Required except when used for “general publication”.
receiver_MarketParticipant.marketRole.type	[0..1]	A08 Balance responsible party A46 Balancing Service Provider Required except when used for “general publication”.
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	[1]	The domain that covers the time series in the document.
Auction Time Series	[1..*]	
mRID	[1]	Unique ID of the auction.
businessType	[1]	A01 Production A04 Consumption A12 Secondary control (used for Frequency Restoration Reserve, aFRR) A95 Frequency containment reserve A97 Manual frequency restoration reserve C25 Frequency bias C26 Frequency Containment Reserve-Normal (FCR-N) C27 Frequency Containment Reserve-Disturbance (FCR-D)
auction.category	[1]	The product category of an auction. A04 Hourly
auction.type	[1]	A01 Implicit

Attribute	Cl.	Code and description
auction.allocationMode	[1]	A01 Order by price with pro rata A03 First come – First served
auction.paymentTerms	[0..1]	A01 Pay as bid A02 Pay as cleared Usage: see dependency matrix below.
auction.cancelled	[0..1]	A01 True A02 False Only required if a cancellation, i.e., if cancelled, the content shall be “ A01 = true”.
bidding_Period.timeInterval	[1]	The beginning and ending date and time of the bidding period within which Capacity Traders can submit a bid to the Transmission Capacity Allocator.
in_Domain.mRID	[1]	Bidding Zone as defined for the relevant market. The Bidding Zone must be within the Domain (see header).
Out_Domain.mRID	[1]	Same as In Area
marketAgreement.type	[1]	A01 Daily A02 Weekly A03 Monthly A07 Intraday contract
delivery_Period.timeInterval	[1]	This information provides the start and end date and time when the energy is consumed or produced.
quantity_Measure_Unit.name	[1]	MAW MW
price_Measure_Unit.name	[1]	See ENTSO-E code list
currency_Unit.name	[1]	Any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner RUB Russian Ruble SEK Swedish Kronor
Notification_MarketAgreement.createdDateTime	[1]	The date and time related to conditions of the agreement. The date and time of the creation of the agreement. --- The date and time that the participants will be notified of the results prior to the contestation period.
Contestation_MarketAgreement.createdDateTime	[1]	The date and time related to conditions of the agreement. The date and time of the creation of the agreement. --- The period in which contestations may be provided starts with the notification date time and ends with the contestation date and time. If there is no possibility of contestation both dates and times must be the same.
curveType	[1]	A01 Sequential fixed size block A03 Variable sized Block A04 Overlapping breakpoint A05 Non-overlapping breakpoint

Attribute	Cl.	Code and description
flowDirection.direction	[0..1]	A01 Up A02 Down A03 Up and down Dependent on market. Note: Added for the Nordic countries.
Max_Price.amount	[0..1]	Dependent on market. Usage: see dependency matrix below. Note: Added for the Nordic countries.
Min_Price.amount	[0..1]	Dependent on market. Usage: see dependency matrix below. Note: Added for the Nordic countries.
classificationStart_Time.time	[0..1]	Start and End time within a day for the time frame relevant for the Auction Identification in question. Note: Added for the Nordic countries.
classificationEnd_Time	[0..1]	End time within a day for the time frame relevant for the Auction Identification in question. Note: Added for the Nordic countries.
Period	[0..*]	
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: <p style="text-align: center;">PnYnMnDnHnMnS.</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 style="text-align: center;">E.g., PT1H or PT60M</p>
Point	[1..*]	
position	[1]	The position of the observation in a time series.
quantity	[1]	The quantity for the interval in question.
Reason (Time Series level)	[0..1]	The Reason class provides coded and optionally textual information, such as: <ul style="list-style-type: none"> • description of the auction and its market rules, to clarify information that is not formally defined (e.g., the time constraints for a peak product). • description that is necessary to completely describe a change to the auction specification or its eventual cancellation.

Attribute	Cl.	Code and description
Reason.code	[1]	A code providing the information in respect to a change or cancellation of an auction. 999 Errors not specifically identified (used for changes and/or cancellation). A95 Complementary information (textual description of the auction).
Reason.text	[0..1]	Textual explanation of the reason code. Shall be used for error code 999 .

Table 6: Usage of NEG Auction Specification Document, version 1.1

5.3.4 Dependency matrix for Ediel Capacity Auction Specification Document

Process type	businessType	marketAgreement. Type	auction. Payment-Terms	max_ Price. Amount	min_ Price. Amount
A52 Frequency containment reserve	C25 Frequency bias	A01 Daily	A02		
	A95 Frequency containment reserve	A01 Daily A02 Weekly A03 Monthly A07 Intraday contract	A01 A02		
	C26 Frequency Containment Reserve-Normal (FCR-N)				
	C27 Frequency Containment Reserve-Disturbance				
A51 Automatic frequency restoration reserve	A12 Secondary control	A02 Weekly	A01 A02		
A47 Manual frequency restoration reserve	A01 , Production A02 Internal trade A04 , Consumption A97 , Manual frequency restoration reserve	A07 Intraday contract	N/A		
A58 Reserve option market	A01 , Production A02 Internal trade A04 , Consumption	A01 Daily A02 Weekly	A02		

Table 7: Dependency matrix for NEG Auction Specification Document, version 1.1

5.4 IEC/CIM Reserve Bid Document (IEC/CIM 62325-451-7 Reserve Bid Document)

The IEC/CIM 62325-451-7 Reserve Bid Document Reserve bid document is taken from the draft ENTSO-E 62325-451-7 package, see [1].

The document is used in the following exchanges:

- **Table 1:** ENTSO-E documents used in the Nordic trading system:
 - 1.2, aFRR bids
 - 2.2, Reserve option bids
 - 3.1, Frequency activated reserves bids
 - 4.0, Balance regulation bids
 - 4.1, Balance regulation bids

5.4.1 Class diagram: Reserve Bid Document contextual model

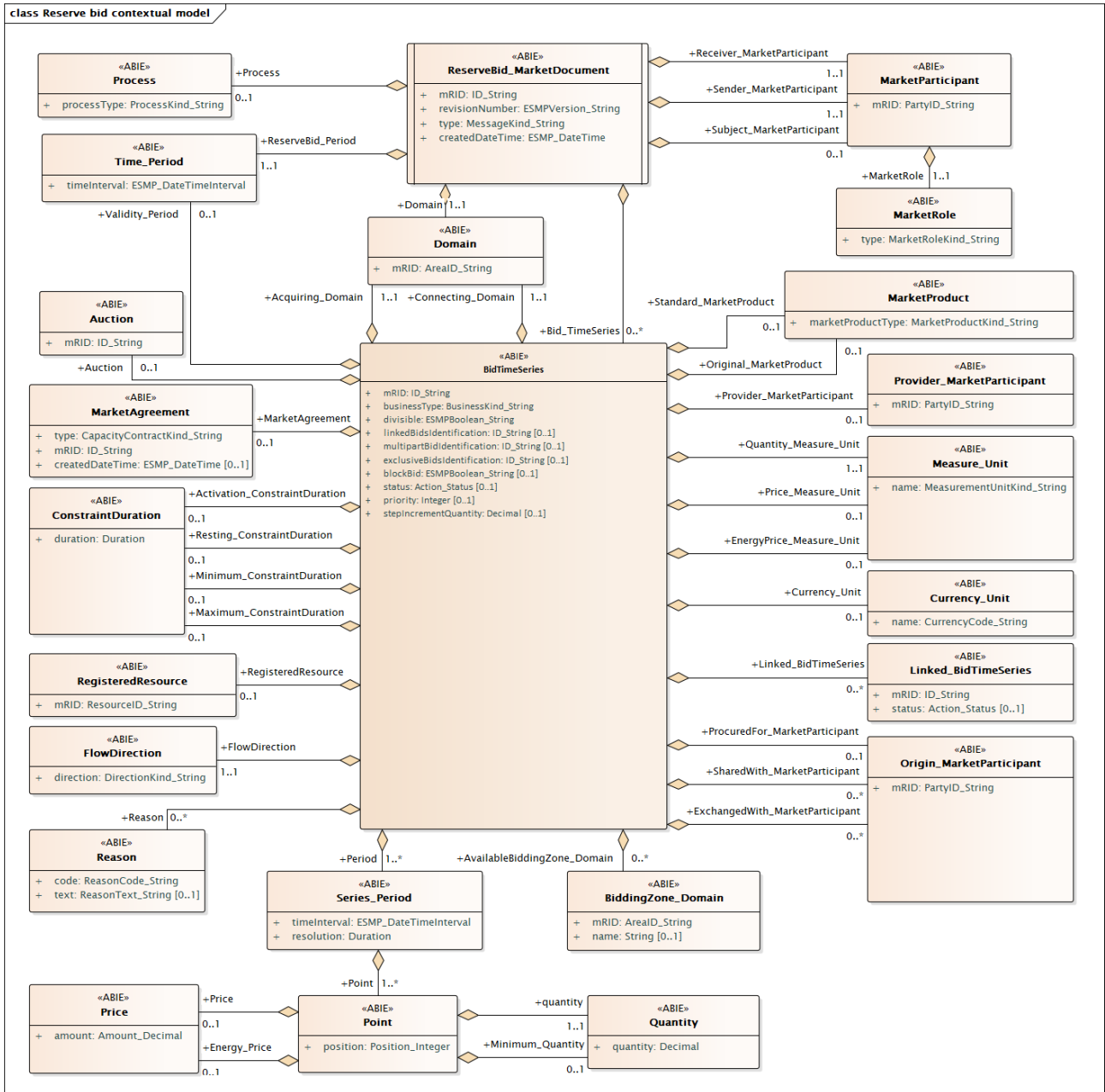


Figure 18: Class diagram: Reserve Bid Document contextual model

5.4.2 Class diagram: Reserve Bid Document assembly model

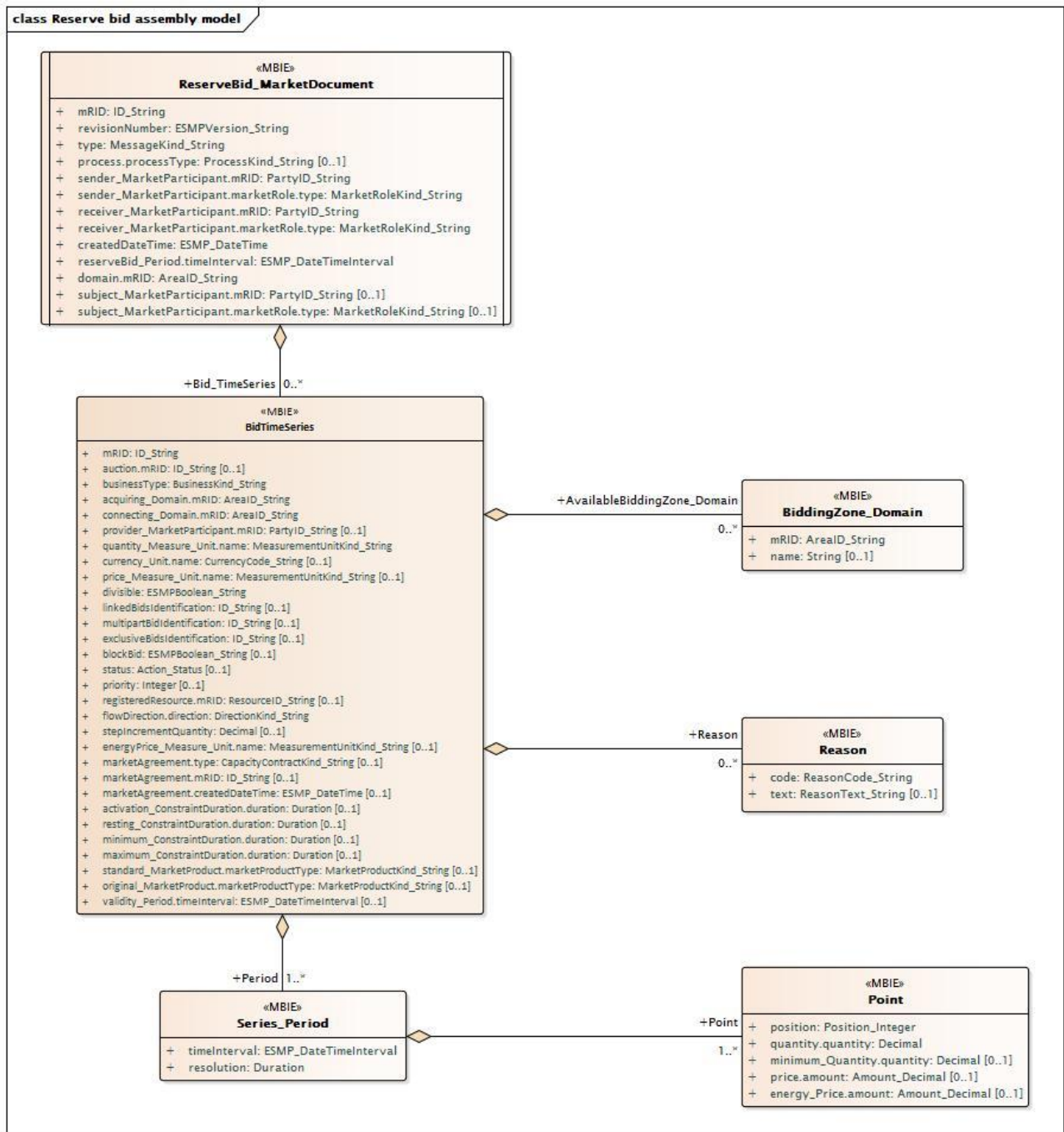


Figure 19: Class diagram: Reserve Bid Document assembly model

5.4.3 Attribute usage: Reserve Bid Document

Attribute	Cl.	Code and description
<i>Reserve Bid Document</i>		
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1.
type	[1]	A24 Bid document A37 Reserve Bid document
process.processType	[1]	A47 Manual frequency restoration reserve (replacing A30 Tertiary reserve process) A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process) A52 Frequency containment reserve (replacing A28 Primary reserve process) A58 Reserve option market
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document.
Sender_MarketParticipant.marketRole.type	[1]	A08 Balance responsible party A39 Data Provider A46 Balancing Service Provider
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules.
receiver_MarketParticipant.marketRole.type	[1]	A11 Market operator (TSOs) A34 Reserve Allocator A35 Merit Order List (MOL) Responsible (NOIS)
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	[1]	National or Nordic area (in the future).
subject_MarketParticipant.mRID	[1]	The party responsible for the bid.
subject_MarketParticipant.marketRole.type	[1]	A08 Balance responsible party A46 Balancing Service Provider
<i>Bid Time Series</i>	[1..*]	
mRID	[1]	Unique ID of the bid.
auction.mRID	[1]	<i>Auction identification from the connected Auction specification document if available, else a code identifying the auction or market (to be defined when implemented).</i>

Attribute	Cl.	Code and description
businessType	[1]	A01 Production A04 Consumption A12 Secondary control (aFRR, Frequency Restoration Reserve (earlier LFC)) A95 Frequency containment reserve A97 Manual frequency restoration reserve B74 Offer B75 Need B91 Flexible need C25 Frequency bias C26 Frequency Containment Reserve-Normal (FCR-N) C27 Frequency Containment Reserve-Disturbance (FCR-D) Z35 Commercial Z36 Reserve Z49 Commercial production Z50 Commercial wind production Z51 Commercial consumption
acquiring_Domain.mRID	[1]	The area where the resource is contracted for use.
connecting_Domain.mRID	[1]	The area where the resource is located.
quantity_Measure_Unit.name	[1]	MAW megawatt (mW) The unit of measurement used for the quantities expressed within the time series. It is recommended that this be always expressed in megawatts (code MAW).
currency_Unit.name	[0..1]	Any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner RUB Russian Ruble SEK Swedish Kronor The currency used for the monetary amount expressed within the time series. Required if a price is stated.
price_Measure_Unit.name	[0..1]	MWH MWh KWH kWh MAWMW KWT kW The unit of measurement used for the price expressed within the time series (e.g., MWh or kW per unit). Required if a price is stated.
divisible	[1]	A01 Yes A02 No
blockBid	[0..1]	A01 Yes A02 No
registeredResource.mRID	[0..1]	E.g., Station Group or Regulation object. Usage: see dependency matrix below.
flowDirection.direction	[1]	A01 Up A02 Down A03 Up and down

Attribute	Cl.	Code and description
energyPrice_Measure_Unit.name	[0..1]	The unit of measurement used for the price of energy expressed within the time series. (MW per unit (code MAW), MWh per unit (code MWH), etc.). A Measure Unit Energy Price is required only if there is an Energy Price specified.
marketAgreement.type	[0..1]	A01 Daily A02 Weekly A03 Monthly A07 Intraday contract Usage must be specified when implemented.
marketAgreement.mRID	[0..1]	Optional element. Usage must be specified when implemented.
activation_ConstraintDuration.duration	[0..1]	The time needed before a regulation is effective. Number of minutes for up or down regulation. Only used in the Balance regulation market. Required used if the unit has this constraint
resting_ConstraintDuration.duration	[0..1]	The time between the end of activation and the start of the next activation. Number of minutes for the resting time. Only used in the Balance regulation market. Required used if the unit has this constraint.
minimum_ConstraintDuration.duration	[0..1]	The minimum time a regulation can be effective. Number of minutes an up or down regulation at least must be effective. Only used in the Balance regulation market. Required used if the unit has this constraint.
maximum_ConstraintDuration.duration	[0..1]	The maximum time a regulation can be effective. Number of minutes an up or down regulation maximum can be effective. Only used in the Balance regulation market. Required used if the unit has this constraint.
<i>Series_Period</i>	[1..*]	
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: PnYnMnDnHnMnS. 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., PT1H , PT60M or PT15M
<i>Point</i>	[1..*]	

Attribute	Cl.	Code and description
position	[1]	The position of the observation in a time series.
quantity	[1]	The quantity for the interval in question.
minimum_Quantity.quantity	[0..1]	Dependent on national rules.
price.amount	[0..1]	The price expressed for each unit of quantity. Usage must be specified when implemented.
energy_Price.amount	[0..1]	The price of the energy if used. Usage must be specified when implemented.

Table 8: Attribute usage of Reserve Bid Document

5.4.4 Dependency matrix for Reserve Bid Document

type	process.processType	businessType	Registered Resource. mRID
A24 Bid document	A47 mFRR (replacing A30 Tertiary reserve process)	Z35 Commercial	✓
		Z36 Reserve	
		Z49 Commercial production	
		Z50 Commercial wind production	
A24 Bid document	A51 aFRR (replacing A29 Secondary reserve process)	Z51 Commercial consumption	Optional
		A95 Frequency containment reserve	
		A97 Manual frequency restoration reserve	
		A12 Secondary control (A time series concerning secondary reserve) (aFRR)	
A24 Bid document	A52 FCR (replacing A28 Primary reserve process)	C25 Frequency bias	Optional
		C26 FCR-N	
		C27 FCR-D	
A24 Bid document	A58 Reserve option market	A01 Production	Not used
		A04 Consumption	
A37 Reserve Bid document	A47 mFRR	B74 Offer	Optional
		B75 Need	
		B91 Flexible need	

Table 9: Dependency matrix for NEG ERRP Reserve Bid Document, version 1.0

5.5.2 Class diagram: Ediel Reserve Allocation Result Document assembly model

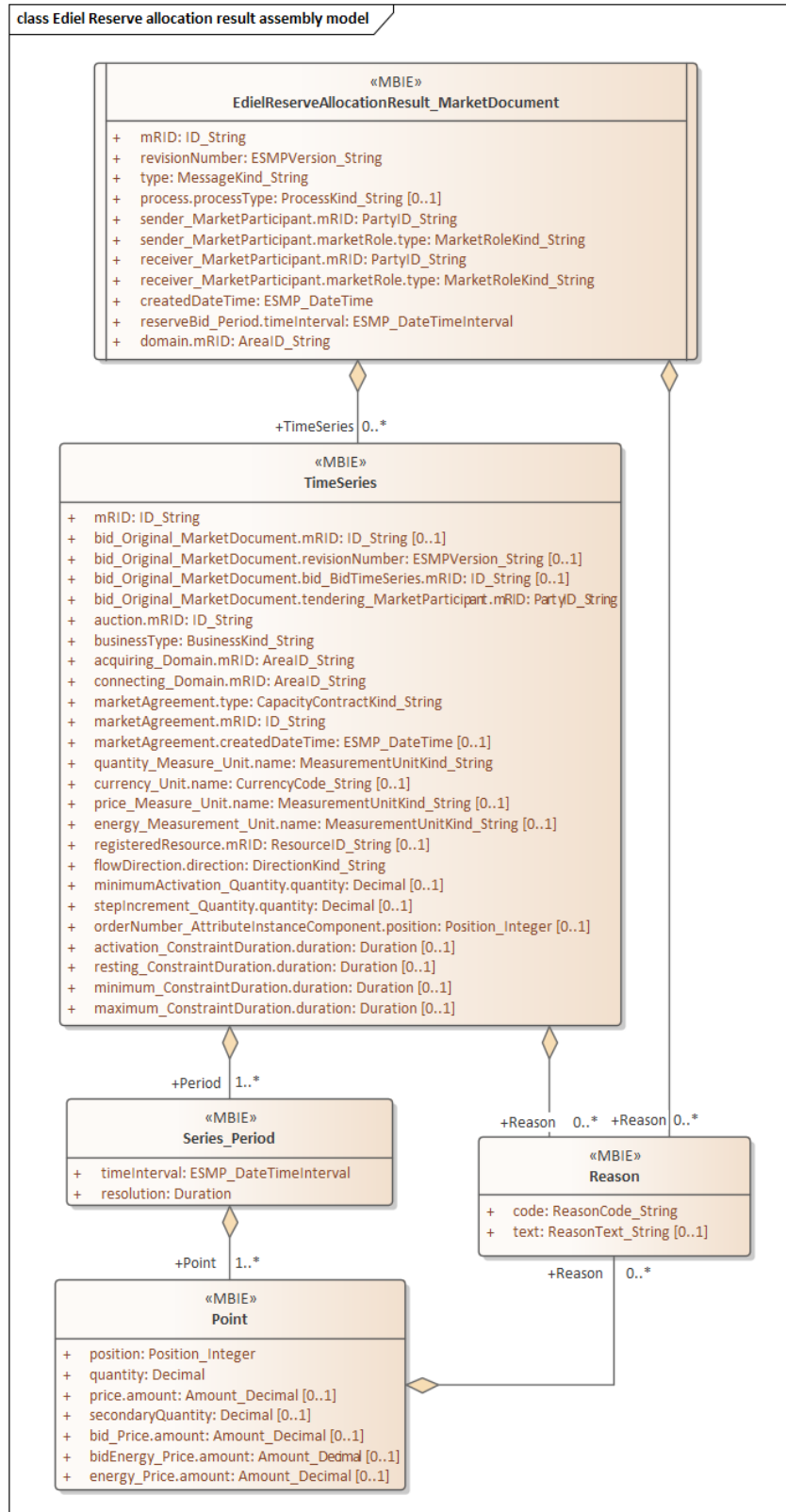


Figure 21: Class diagram: Ediel Reserve Allocation Result Document assembly model

5.5.3 Attribute usage: Ediel Reserve Allocation Result Document (CIM version)

Attribute	Cl.	Code and description
<i>Ediel Reserve Allocation Result Document</i>		
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1
type	[1]	A38 Reserve Allocation Result (Operational bids)
process.processType	[1]	A47 Manual frequency restoration reserve A51 Automatic frequency restoration reserve A52 Frequency containment reserve A58 Reserve option market A59 Internal trade reporting
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document.
Sender_MarketParticipant.marketRole.type	[1]	A11 Market operator (TSO) A34 Reserve Allocator
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules.
receiver_MarketParticipant.marketRole.type	[1]	A08 Balance responsible party A11 Market operator (NOIS) A46 Balancing Service Provider A48 LFC Operator (replaces A04 System Operator)
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	[1]	Nordic area, National Area, Bidding Zone.
<i>TimeSeries</i>	[0..*]	
mRID	[1]	The identification of the time series instance.
bid_Original_MarketDocument.mRID	[0..1]	Not used in the <i>Bilateral trade between LFC Operator</i> process. Note: Required in ENTSO-E version, but optional in the Nordic Ediel version.
bid_Original_MarketDocument.revisionNumber	[0..1]	Not used in the <i>Bilateral trade between LFC Operator</i> process. Note: Required in ENTSO-E version, but optional in the Nordic Ediel version.
bid_Original_MarketDocument.bid_TimeSeries.mRID	[0..1]	Not used in the <i>Bilateral trade between LFC Operator</i> process. Note: Required in ENTSO-E version, but optional in the Nordic Ediel version.
bid_Original_MarketDocument.tendering_MarketParticipant.mRID	[1]	The ID of the tendering party, i.e., LFC Operator or Balance responsible party. Usage must be specified when implemented.
auction.mRID	[1]	If there is no Auction Specification Document, the usage of the Auction ID must be specified by the implementation project.
businessType	[1]	A01 Production A04 Consumption A12 Secondary control (aFRR, Frequency Restoration Reserve (earlier LFC)) A95 Frequency containment reserve A97 Manual frequency restoration reserve C25 Frequency bias C26 Frequency Containment Reserve-Normal (FCR-N) C27 Frequency Containment Reserve-Disturbance (FCR-D)
acquiring_Domain.mRID	[1]	The area where the resource is contracted for use.

Attribute	Cl.	Code and description
connecting_Domain.mRID	[1]	The area where the resource is located.
marketAgreement.type	[1]	A01 Daily A02 Weekly A03 Monthly A06 Long term contract Usage must be specified when implemented.
marketAgreement.mRID	[1]	
quantity_Measure_Unit.name	[1]	MWH MWh MAW MW
currency_Unit.name	[1]	Any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner RUB Russian Ruble SEK Swedish Kronor
price_Measure_Unit.name	[0..1]	MWHMWh MAWMW Shall be used if a price is stated.
registeredResource.mRID	[0..1]	Relevant object within the market, e.g., Station group or Resource, see Table 11 below.
flowDirection.direction	[1]	A01 Up A02 Down A03 Up and down Usage: See Table 11 below.
Period	[1..*]	
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., PT1H or PT60M
Point	[1..*]	
position	[1]	Quantity
quantity	[1]	Quantity
price.amount	[0..1]	Price Usage must be specified when implemented.
Reason (Point level)	[0..*]	
code	[1]	A73 Bid accepted B09 Bid not accepted

Table 10: Attribute usage of Ediel Reserve Allocation Result Document

5.5.4 Dependency matrix for Ediel Reserve Allocation Result Document

process. processType	businessType	market Agreement. type	registered Resource.mRID	flow Direction. direction
A52 Frequency containment reserve (replacing A28 Primary reserve process)	C25 Frequency bias	A01	Not used	Not used
	A95 Frequency containment reserve			
	C26 FCR-N	A01 or A02	Dependent on national rules	Required
	C27 FCR-D	A01 or A02	Dependent on national rules	Required
A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process)	A12 aFRR	A02 or A03	Not used	Required
A47 Manual frequency restoration reserve (replacing A30 Tertiary reserve process)	A01 Production	A01	Not used	Required
	A97 Manual frequency restoration reserve			
	A04 Consumption	A01 or A06	Not used	Required
A58 Reserve option market	A01 Production	A01, A02 or A06	Not used	Required
	A04 Consumption		Not used	
A59 Internal trade reporting	A01 Production	A01	Not used	Not used
	A04 Consumption	A01	Not used	Not used

Table 11: Dependency matrix for Ediel Reserve Allocation Result Document

5.6 IEC/CIM Ediel Publication Document (ECAN)

The basis for the IEC/CIM Ediel Publication Document is the IEC62325-451-3 Ed.1 standard, see [2].

The document is used in the following exchanges:

- **Table 1:** ENTSO-E documents used in the Nordic trading system:
 - 1.4, aFRR summary report
 - 2.4, Reserve option market summary report
 - 3.4, Frequency activated reserves summary
 - 5.2, Bilateral trade report

5.6.1 Class diagram: Ediel Publication Document contextual model

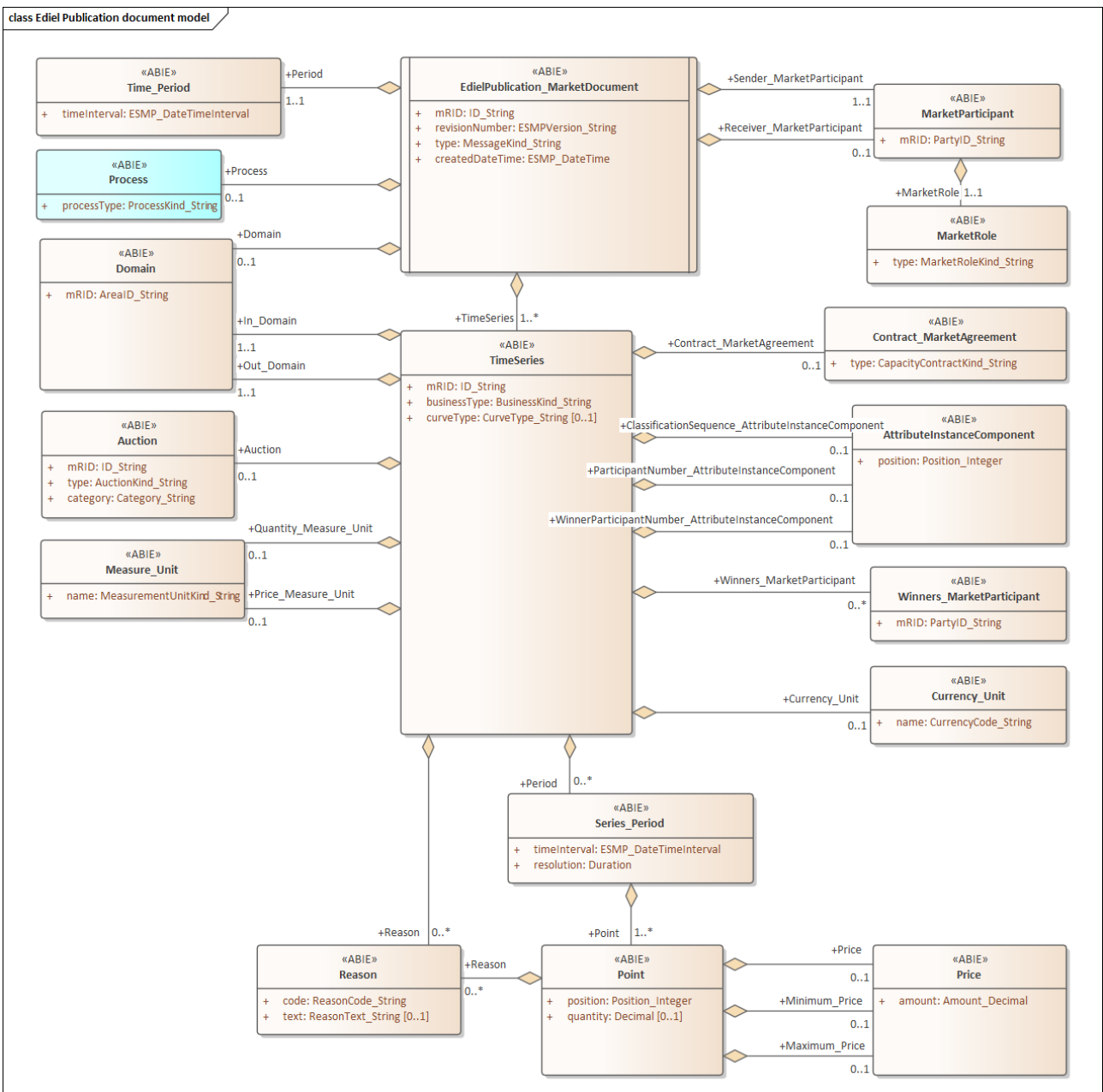


Figure 22: Class diagram: Ediel Publication Document contextual model

5.6.2 Class diagram: Ediel Publication Document assembly model

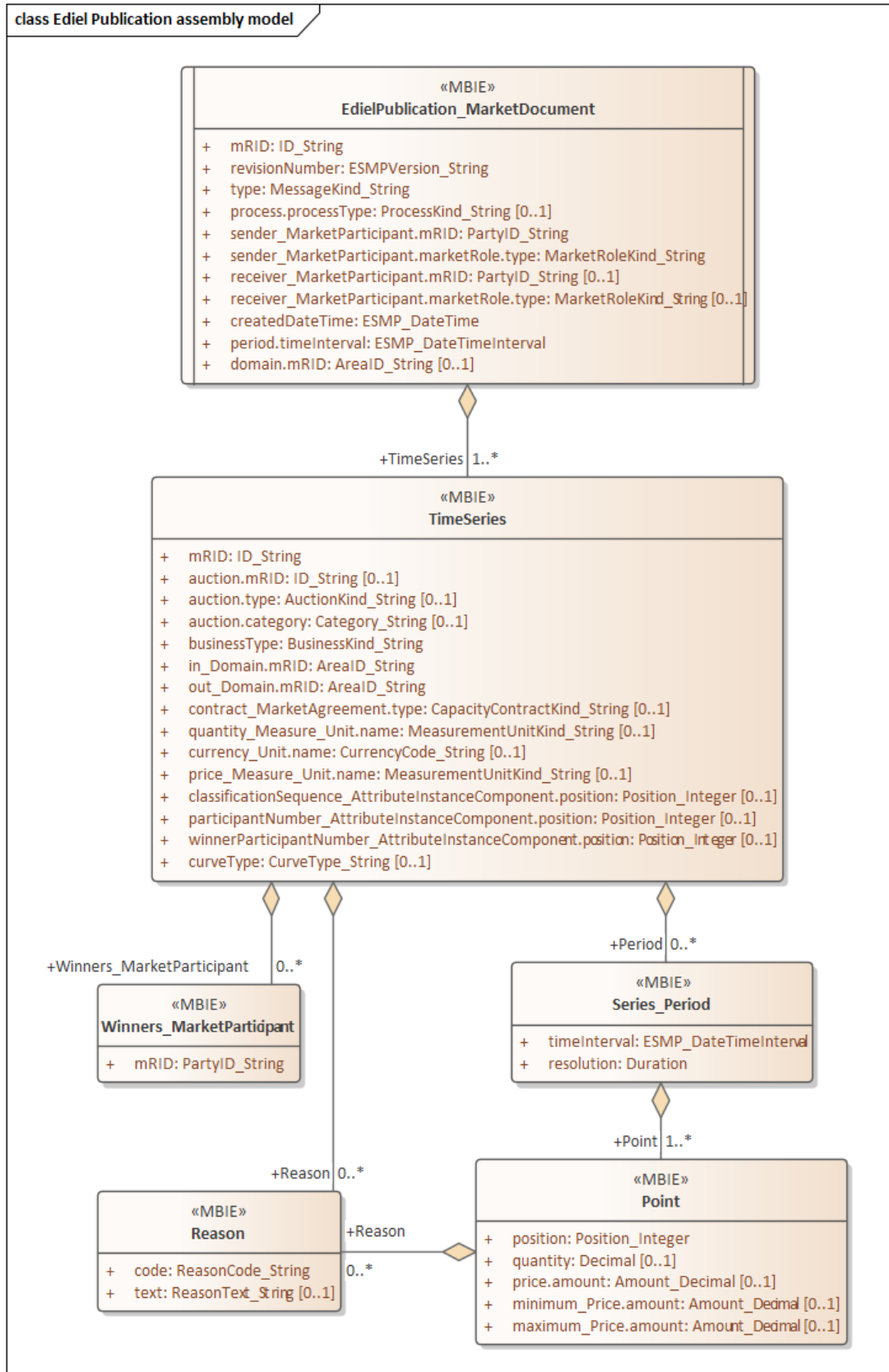


Figure 23: Class diagram: Ediel Publication Document assembly model

5.6.3 Attribute usage: Ediel Publication Document (CIM version)

Attribute	Cl.	Code and description
<i>Ediel Publication Document</i>		
mRID	[1]	Unique identification of the document.
revisionNumber	[1]	Fixed 1
type	[1]	A25 Allocation result A38 Reserve Allocation Result A44 Price document
process.processType	[1]	A01 Day-ahead A17 Schedule day - The process concerns the day ahead, intraday and eventually ex-post scheduling in a single document. The schedule will be transferred within the total position including historic information (The trade balance of a party at a given time) A19 Intraday accumulated A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process) A52 Frequency containment reserve (replacing A28 Primary reserve process) A58 Reserve option market A59 Internal trade reporting Note: This is a Nordic Ediel extension.
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document.
Sender_MarketParticipant.marketRole.type	[1]	A11 Market operator (or TSO)
receiver_MarketParticipant.mRID	[0..1]	Identification of the party who is receiving the schedules. Not used when the document is published at a web site.
receiver_MarketParticipant.marketRole.type	[0..1]	A08 Balance responsible party A11 Market operator (NOIS) A38 Reconciliation Responsible A46 Balancing Service Provider A47 Energy Trader (non-balance responsible party) A48 LFC Operator (replaces A04 System Operator) Not used when the document is published at a web site.
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, National Area, Bidding Zone.
<i>TimeSeries</i>	[1..*]	

Attribute	Cl.	Code and description
mRID	[1]	Unique ID of the time series.
businessType	[1]	A01 Production A04 Consumption A06 External trade without explicit capacity A08 Net internal trade (ENTSO-E definition: "Net internal trade - where the direction from out party (seller) to in party (buyer) is positive and the opposite direction is negative (with minus signs)") A12 Secondary control (A time series concerning secondary reserve) (aFRR , earlier LFC) A24 Total trade (ENTSO-E definition: "A time series concerning the total of both the internal and external trades) (Usage in Sweden: The trade balance of a party at a given time) A62 Spot Price C25 Frequency bias C26 Frequency Containment Reserve-Normal (FCR-N) C27 Frequency Containment Reserve-Disturbance (FCR-D)
in_Domain.mRID	[1]	Relevant area for the market.
out_Domain.mRID	[1]	The same area as "In-area" (Required in ECAN Publication Document).
contract_MarketAgreement.type	[0..1]	A01 Daily A02 Weekly A07 Intraday contract Usage must be specified when implementing.
quantity_Measure_Unit.name	[0..1]	MWH MWh Shall be used when a quantity is stated.
currency_Unit.name	[0..1]	Any valid ISO 3 letter currency code, such as: DKK Danish Kroner EUR EURO NOK Norwegian Kroner RUB Russian Ruble SEK Swedish Kronor Shall be used when a price is stated.
price_Measure_Unit.name	[0..1]	MWH MWh Shall be used when a price is stated.
<i>Series_Period</i>	<i>[0..*]</i>	
timeInterval	[1]	Time Interval.

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 style="text-align: center;">E.g., PT1H or PT60M</p>
<i>Point</i>	<i>[1..*]</i>	
position	[1]	<p>The relative position of a period within an interval</p> <p>Usage must be specified when implementing.</p>
quantity	[0..1]	<p>The quantity for the interval in question</p> <p>Usage must be specified when implementing.</p>
Price.amount	[0..1]	<p>The price expressed per currency per unit of price measure</p> <p>Usage must be specified when implementing.</p>
Maximum_Price.amount	[0..1]	<p>Maximum Price</p> <p>Usage must be specified when implementing.</p> <p>Note: This is a Nordic Ediel extension.</p>
Minimum_Price.amount	[0..1]	<p>Minimum Price</p> <p>Usage must be specified when implementing.</p> <p>Note: This is a Nordic Ediel extension.</p>

Table 12: Attribute usage of Ediel Publication Document (CIM version)

5.6.4 Dependency matrix for Ediel Publication Document

Publication Document type	Process.Type	businessType	market Agreement. type
A25 Allocation result	A01 Day-ahead	A06 External trade without explicit capacity	Not used
		A08 Net internal trade	Not used
	A19 Intraday accumulated	A06 External trade without explicit capacity	Not used
		A08 Net internal trade	Not used
A17 Schedule day	A08 Net internal trade	Not used	
A38 Reserve Allocation Result (Operational bids)	A52 Frequency containment reserve (replacing A28 Primary reserve process)	C26 Frequency Containment Reserve-Normal (FCR-N)	A01 Daily A02 Weekly A07 Intraday contract
		C27 Frequency Containment Reserve-Disturbance (FCR-D)	
	A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process)	A12 Secondary control (A time series concerning secondary reserve) (aFRR , earlier LFC)	Not used
	A58 Reserve option market	A01 Production	Not used
		A04 Consumption	Not used
	A59 Internal trade reporting	A01 Production	Not used
A04 Consumption		Not used	
A44 Price document	A01 Day-ahead	A06 External trade without explicit capacity	Not used
	A19 Intraday accumulated	A06 External trade without explicit capacity	Not used
	A52 Frequency containment reserve (replacing A28 Primary reserve process)	C26 Frequency Containment Reserve-Normal (FCR-N)	Not used
		C27 Frequency Containment Reserve-Disturbance (FCR-D)	Not used
	A51 Automatic frequency restoration reserve (replacing A29 Secondary reserve process)	A12 Secondary control (A time series concerning secondary reserve) (aFRR , earlier LFC)	Not used
	A58 Reserve option market	A01 Production	Not used
		A04 Consumption	Not used
	A59 Internal trade reporting (Bilateral trade)	A01 Production	Not used
		A04 Consumption	Not used

Table 13: Dependency matrix for Ediel Publication Document

6 Business rules

6.1 General ground rules

The process flow assumes that a certain number of basic rules are respected. This does not include the specific rules that have been defined in an interchange agreement. These basic rules are:

1. The last valid document (latest Creation date) received before cut-off time is the valid document.
2. Reserve bids for the Balance Regulation Market can be changed until 45 minutes before the hour.
3. All version numbers shall be positive integer values and leading zeros shall be suppressed.
4. All documents received shall have an acknowledgement (acceptance, rejection, or errors).
5. All the times related to energy products in the documents are expressed in Coordinated Universal Time (the acronym of which is UTC) in compliance with ISO 8601. This is restricted to YYYY-MM-DDTHH:MMZ in order to remain in conformity with XML schema requirements.
6. All the time intervals in the documents are expressed in compliance with ISO 8601 This is restricted to YYYY-MM-DDTHH:MMZ/YYYY-MMDDTHH:MMZ. The time interval has an inclusive start time and an exclusive end time and is expressed in minutes (i.e., 00:00Z to 00:00Z is exactly a 24-hour period).
7. The time interval defined in the period class shall always be a multiple of its resolution.
8. Negative quantities for a time series are only permitted for certain categories of time series.
9. It is preferred that the quantity for a *Balance responsible* time series in a day-ahead and an intraday is given in power units' as the average value over the time interval.
10. Whenever a coded value within a document is associated with a coding scheme, the coding scheme must always be supplied. The coding scheme is an independent attribute with a size of 3 alphanumeric characters.
11. To cancel bids, the Bid Document shall be resubmitted with "0"-values in the quantity of the relevant time series.
12. One legal entity can be identified by different id's for different purposes, apart from in Sweden.
13. All the documents use UTF-8, hence supporting all Scandinavian characters.