# BRS

(Business Requirement Specification)

# Nordic operational system

A market model for data exchange

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|---|---|
| Business process: | Nordic operational system |
| Version: | 2.0.A |
| Status: | Approved by NMEG |
| Date: | February 17th, 2025 |

## Content

# 1 Introduction

## 1.1 Background

Today the Nordic TSOs exchange documents based on several different formats and standards, such as Ediel (DELFOR/MSCONS), NOIS XML documents based on ENTSO-E IGs, CIM IGs and Excel documents. In addition, the Nordic TSOs have communications towards other European countries, such as Germany, the Netherlands and Poland, using even more standards, such as NorNed xml and ENTSO-E standards.

For efficiency reasons the four Nordic TSOs have set up the NMEG (Nordic Market Expert Group) for migration of the document exchanges towards one common document standard, and later maintenance of the Nordic document exchanges. The aim is to define document exchange models that can be used for all document exchanges between the actors in the Nordic energy market, Nordic TSOs and Market Operators.

This document is a *Business Requirement Specification* (BRS) detailing the document exchanges related to operation of 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], together with the ebIX®, EFET and ENTSO-E Harmonised role model [2].

## 1.2 About Nordic Ediel BRSs

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

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

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

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

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

## 1.3 Nordic Energy Domain Model

A Nordic Energy Market Domain model, giving an overall overview of the structure and processes used in the Nordic Energy market, can be found at [12].

## 1.4 Project organisation

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

## 1.5 References

[1] ENTSO-E Electronic Data Interchange (EDI) Library

- Implementation Guides
- CIM XML schemas
- MADES specifications
- Etc.

[2] The Harmonised Role Model, ENTSO-E, ebIX® and EFET
[3] UN/CEFACT Unified Modelling Methodology (UMM)
[4] UN/CEFACT XML Naming and Design Rules (NDR)
[5] ebIX Modelling methodology and process models (EMD), see http://www.ebix.org/
[6] Ediel Implementation guides, see http://www.ediel.org/
[7] Ediel Common Nordic XML rules and recommendations, see http://www.ediel.org/
[8] Ediel BRS for the Nordic TSO Determine transfer capacity model, see http://www.ediel.org/
[9] Ediel BRS for the Nordic TSO Scheduling and Ancillary Services Process, see http://www.ediel.org/
[10] Ediel BRS for the Nordic Trading System, see http://www.ediel.org/
[11] Ediel BRS for the Nordic Balance Settlement and BRS for the Nordic Balance Settlement between NBS and TSOs/Market Operators, see http://www.ediel.org/
[12] Nordic Energy Market Domain Model, see http://www.ediel.org/
[13] Agreement regarding operation of the interconnected Nordic power system (System Operation Agreement) http://www.entsoe.eu/fileadmin/user_upload/_library/publications/nordic/operations/060613_entsoe_nordic_SystemOperationAgreement_EN.pdf
[14] NBM Implementation Guides, see https://nordic-balancing.pages.fifty.eu/information/index.html.

## 1.6 Terms and notations

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

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

Some abbreviations used:

| | |
|---|---|
| ACE OL | Area Control Error Open Loop |
| aFRR | Automatic frequency restoration reserve |
| BRP | Balance Responsible Party |
| BSP | Balancing Service Provider |
| DATCR | Direct Activated Tertiary Control Reserve |
| FCR-D | Frequency Containment Reserves for Disturbances |
| FCR-N | Frequency Containment Reserves for Normal operation |
| FRR | Frequency Restoration Reserve |
| mFRR | Manual Frequency Restoration Reserve |
| MOL | Merit Order List |
| NBM | Nordic Balancing Model |
| SATCR | Schedule Activated Tertiary Control Reserve |

## 1.7 Change log

| Ver/rel/rev | Changed by | Date | Changes |
|---|---|---|---|
| 2.0.A | Ove Nesvik | 20250217 | • Update of the BRS to include the following NBM processes:<br>  ○ ACE OL Point Value<br>  ○ ACE OL FiftyLocal<br>  ○ ACE OL Limits<br>  ○ ACE OL Historic<br>  ○ Problem-Statement-Document-TSO-<br>  ○ Measured Flow Point Value<br>  ○ Measured Flow Historic TSO<br>  ○ mFRR Activation TSO<br>  ○ SystemStatus TSO<br>  ○ SuspendAOFResult TSO<br>• Update of chapter 2, 3 and 4 accordingly.<br>• Addition of new chapter “5.7 Problem Statement Market Document”<br>• Addition of new chapter “5.8 NBM Status Market Document”<br>• Editorial corrections. |
| 1.7.B | Ove Nesvik | 20240112 | • Editorial corrections. |
| 1.7.A | Ove Nesvik | 20230626 | • Addition of NBM Measure processes and NBM Measurement Data Market Document.<br>• Changed the sequence of the processes described in chapter 2 to Measure, Situational Awareness, Activate and Report.<br>• Added a data exchange (document) from System Operator to Market Operator; “4.0 Activated or deactivated bids”<br>• Update the documents to be exchanged in chapter “2.3 Overview of information exchange between market actors”.<br>• Updated the definitions from the harmonised role model in chapter “4 Harmonised roles and domains used in Nordic operational system”.<br>• Removed the old ENTSO-E version (non-cim) of the ERRP Activation Document.<br>• Update chapter “5.2.3 Attribute usage: ERRP Activation Market Document”<br>• Addition of clarifying text. |
| 1.6.A | Ove Nesvik | 20220628 | • Addition of the new UseCase “Situational awareness” as part of the UseCase Operate.<br>• Addition of “Merit Order List”, “ESS Schedule (ACE OL Limits)” and “ACE OL Point value” documents, including update of Attribute usage.<br>• Replaced Resource Provider by Balancing Service Provider. |

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| | | | • Removed the role Market Operator from the Activate UseCase.<br>• Correction of spelling and addition of clarifying text, such as:<br>  ○ Update of references and related links.<br>  ○ Addition of abbreviations in chapter "1.5 Terms and notations". |
| 1.5.A | Ove Nesvik | 20210702 | • Replace the code "**Z69** Metered frequency" with "**C57** Metered frequency"<br>• Added reporting of FCR and FRR.<br>• Using Enterprise Architect instead of MagicDraw artefacts.<br>• Update to latest Harmonised Role Model |
| 1.4.A | Ove Nesvik | 20200831 | • Removal of Document Type **Z15**<br>• Removal of Process Type code **A29** and **A30**<br>• Addition of role code "**A46** Balancing Service Provider" in all documents |
| 1.3.A | Ove Nesvik | 20200604 | • Replaced Process Type **A30** with **A47** in Balancing Market Document<br>• Addition of **A46** Balancing Service Provider in all documents<br>• Addition of new Process Type Codes for ERRP Activation document (CIM version):<br>  **A47** Manual frequency restoration reserve (to replace A30)<br>  **A51** Automatic frequency restoration reserve (to replace A29)<br>• The following Process Type Codes for ERRP Activation document (CIM version) are marked for deprecation: **A29**, **A30.**<br>• Correction of spelling errors.<br>• Addition of Balancing Market Document (IEC/CIM 62325-451-6 Balancing Market Document Ed. 2.1), see chapter 5.2.1.<br>• Added Price Report to the MOL Responsible in the sequence diagram in chapter 2.3 (new arrow 29)<br>• Added MOL Responsible to the UseCase diagram and the activity diagram in chapter 3.2.<br>• Addition of clarifying text and correction of spelling errors.<br>• Updated roles and domains to version 2019-01 of the HRM [2]. |
| 1.2.A | Ove Nesvik | 20180618 | • Update of cardinalities for ERRP Activation Document (ENTSO-E version).<br>• Addition of ERRP Activation Document (CIM version).<br>• Addition of process area "Report".<br>• Addition of Metered frequency (**Z69**) and **Hz** in the Publication Document.<br>• Addition of clarifying text and correction of spelling errors. |

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| 1.1.D | Ove Nesvik | 20170704 | Addition of cardinalities in the attribute tables. |
| 1.1.C | Ove Nesvik | 20170704 | • Textual corrections: removed Nord Pool and eSett logos on the front page.<br>• Addition of Reason code “A95 Complementary information” together with Reason Text. |
| 1.1.B | Ove Nesvik | 20170213 | • Textual corrections:<br>  ○ Updated logos on the front page.<br>  ○ Replaced Nord Pool and NPS with Market Operator.<br>  ○ Replaced Elspot with Day-ahead.<br>  ○ Replaced Elbas with Intraday.<br>  ○ Updated NTC and NEG member list.<br>• 2.3 Overview of information exchange between market actors (sequence diagram):<br>  ○ Addition of “Price report” from Market Operator to Reconciliation Responsible.<br>• NEG ECAN Publication Document:<br>  ○ Addition of “A38 Reconciliation Responsible” as Receiver Role. |
| 1.1.A | Ove Nesvik | 20161018 | • NEG ECAN Publication Document:<br>  ○ Addition of Business Type “B23 Consumption imbalance price”.<br>• ERRP Activation Document:<br>  ○ Addition of Document Type “A36, Deactivation document”.<br>  ○ Addition of Business Type “A12 Secondary control”.<br>  ○ Update related dependency matrix.<br>• Textual corrections. |
| 1.0.A | Ove Nesvik | 20151118 | First official version. |

# 2 Overview of the Nordic energy market domain

## 2.1 Operate in the overall context (Domain model)

The Domain model describes the core 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.

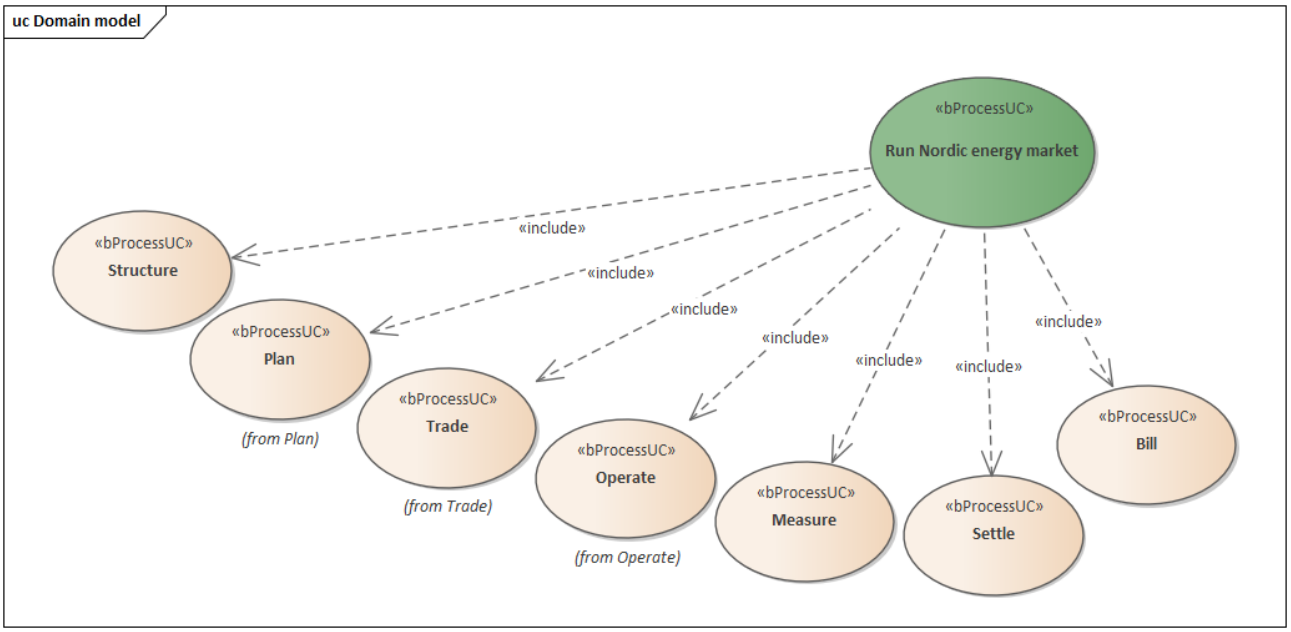


**Figure 1:** UseCase diagram: Domain model

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:

- **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 operational system process* is a part of the process area *Operate*.

For a more elaborated description of the processes include in the domain model, see [9].

## 2.2 Breakdown of the operational phase

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

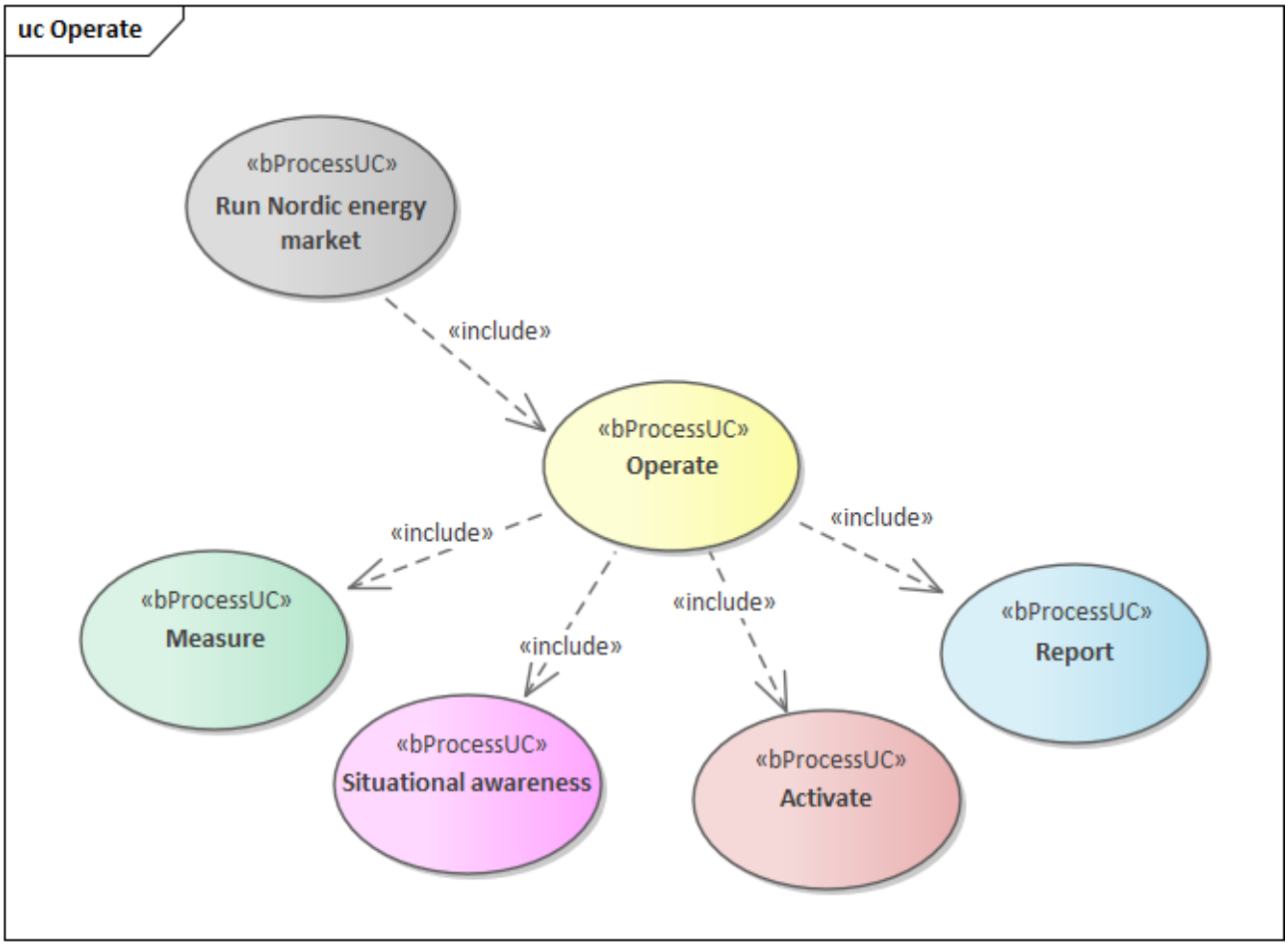


**Figure 2:** UseCase diagram: The Nordic operational system process

The Business Area Operate outlined in **Figure 2**, concerns principally the Measure, Situational Awareness, Activate and Report processes.

In the rest of this document the green, purple, red and blue UseCases, i.e., Measure, Situational Awareness, Activate and Report are further elaborated.

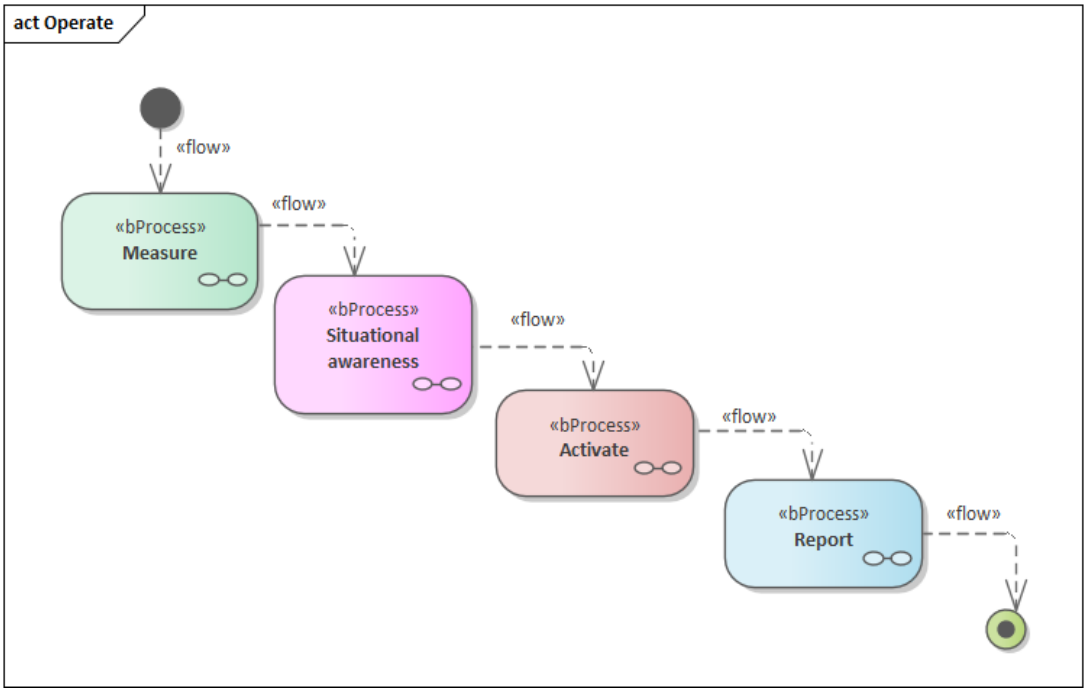


**Figure 3:** Activity diagram: The Nordic operational system process

The Measure, Situational Awareness, Activate and Report processes are parts of the Balance Regulation Market. An activation is always within a Bidding Zone.

## 2.3 Overview of information exchange between market actors

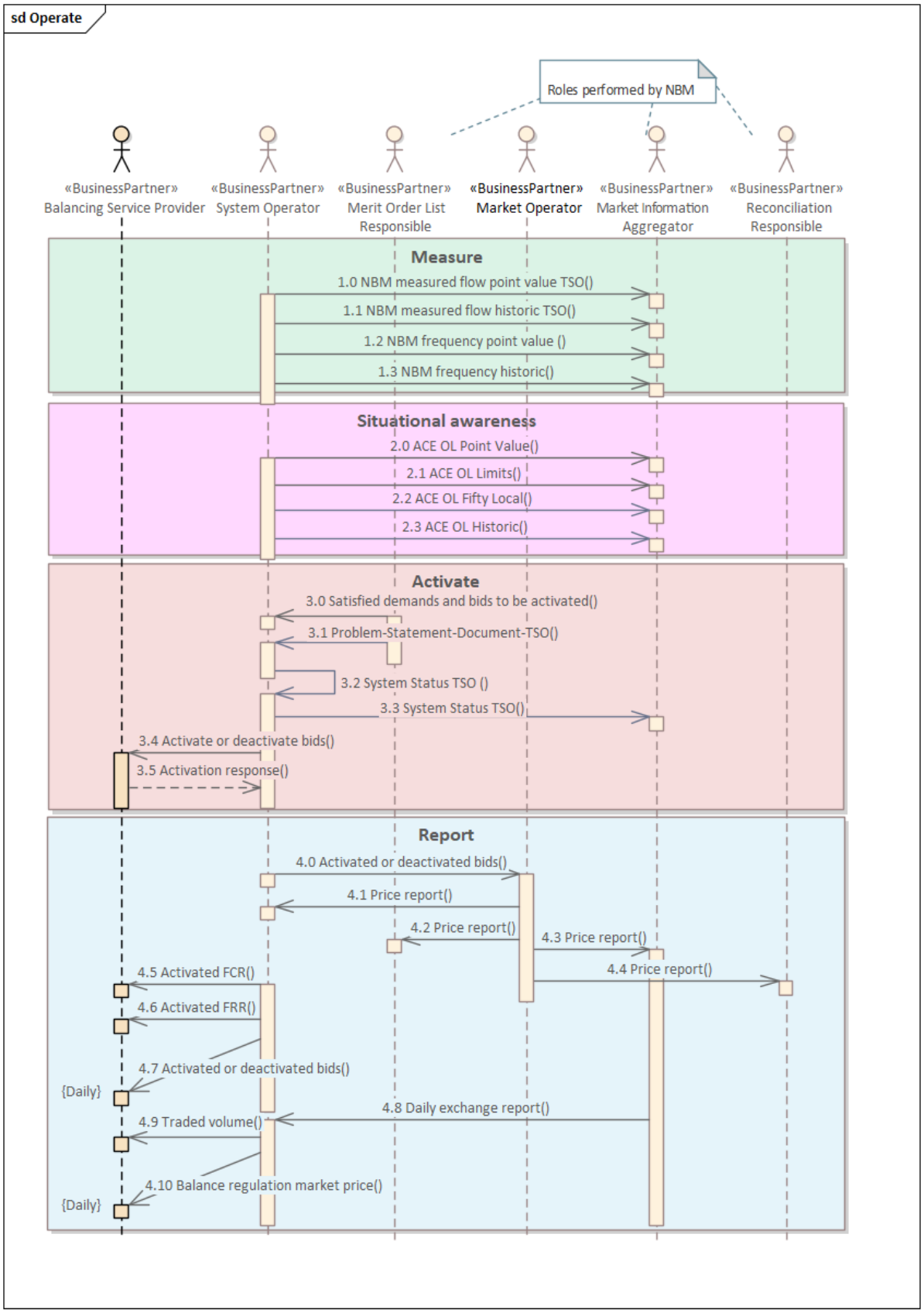


**Figure 4**: Sequence diagram: Information exchange overview for “operational markets”

| Process area | Content | Where to find detailed description |
|---|---|---|
| Measure | 1.0 NBM measured flow point value TSO | NBM Measurement Data Market Document (CIM based NBM document), see 5.5.3 |
| | 1.1 NBM measured flow historic TSO | NBM Measurement Data Market Document (CIM based NBM document), see 5.5.3 |
| | 1.2 NBM frequency point value | NBM Measurement Data Market Document (CIM based NBM document), see 5.5.3 |
| | 1.3 NBM frequency historic | NBM Measurement Data Market Document (CIM based NBM document), see 5.5.3 |
| Situational awareness | 2.0 ACE OL Point Value | ACE OL Market Document (IEC/CIM based), see 5.3.3 |
| | 2.1 ACE OL Limits | ESS Schedule Document from IEC62325-451-2 Ed.2 (ACE OL Limits), see 5.4.3 |
| | 2.2 ACE OL Fifty Local | ACE OL Market Document (IEC/CIM based), see 5.3.4 |
| | 2.3 ACE OL Historic | ACE OL Market Document (IEC/CIM based), see 5.3.4 |
| Activation | 3.0 Satisfied demands and bids to be activated | Merit Order List Document (IEC/CIM 62325-451-7, Ed. 1), see 5.1.3 |
| | 3.1 ProblemStatement Document (TSO) | Problem Statement Market Document (IEC62325-451-5 Ed.2), see 5.7.3 |
| | 3.2 System Status (TSO) | NBM Status Market Document (CIM based NBM document), see 5.8.3 |
| | 3.3 System Status (TSO) | NBM Status Market Document (CIM based NBM document), see 5.8.3 |
| | 3.4 Activate or deactivate bids (Status = A10, Ordered) | ERRP Activation Document (IEC/CIM 62325-451-7 Activation Document version 6.0), see 5.2.3 |
| | 3.5 Activation response (Status = A07, Activated or A09, cancelled) | |
| Reporting | 4.0 Activated or deactivated bids | Merit Order List Document (IEC/CIM 62325-451-7, Ed. 1), see 5.1.3 |
| | 4.1 Price report | Balancing Market Document (IEC/CIM 62325-451-6, Ed. 2.1), see 5.6.3 |
| | 4.2 Price report | |
| | 4.3 Price report | |
| | 4.4 Price report | |
| | 4.5 Activated FCR | ERRP Activation Document (IEC/CIM 62325-451-7 Activation Document version 6.0), see 5.2.3 |
| | 4.6 Activated FRR | |
| | 4.7 Activated or deactivated bids | |
| | 4.8 Daily exchange report | Balancing Market Document (IEC/CIM 62325-451-6, Ed. 2.1), see 5.6.3 |
| | 4.9 Traded volume | |
| | 4.10 Balance regulation market price | |

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

**Figure 4** shows the main electronic documents exchanged between the Balancing Service Providers, TSOs (System Operators), MOL Responsible (Merit Order List Responsible), Market Operator, Market information aggregator and the Reconciliation Responsible. Reporting to the Imbalance settlement responsible is shown in a separate BRSs [11].

Trade on mFRR CM (Capacity Market) and EAM (Energy Activation Market), and aFRR CM and EAM, are document in the NMEG BRS for the Nordic trading system [10].

Measured flow, sum of all measured flow and frequency on an interconnector between bidding zones, consists of Real time values (PT10S) and Historical values which can be more accurate (corrected) than real time values.

After the bids have been received the bids may be activated. Each activated bid is reported back to the Balancing Service Provider in question and reported to the Market Operator. Daily, after the operational phase, the activated and deactivated bids, and Balance regulation market prices are distributed to the Balancing Service Providers.

After activation, the System Operator continuously (every 10 seconds) informs the Market Information Aggregator (NBM) of real-time Area Control Error Open Loop (ACE OL) Point Values and the ACEOL Limits document, the latter whenever the limit for warnings and alarms changes.

Summaries of traded volumes for consumption and production per Bidding area may be sent from the TSO to the Balancing Service 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 Balancing Service Providers must be, or be contracted with, a Balance Responsible Party, which is responsible for consumption, production, or both.

# 3 Process areas within Nordic operational system

## 3.1 Process area: Measure

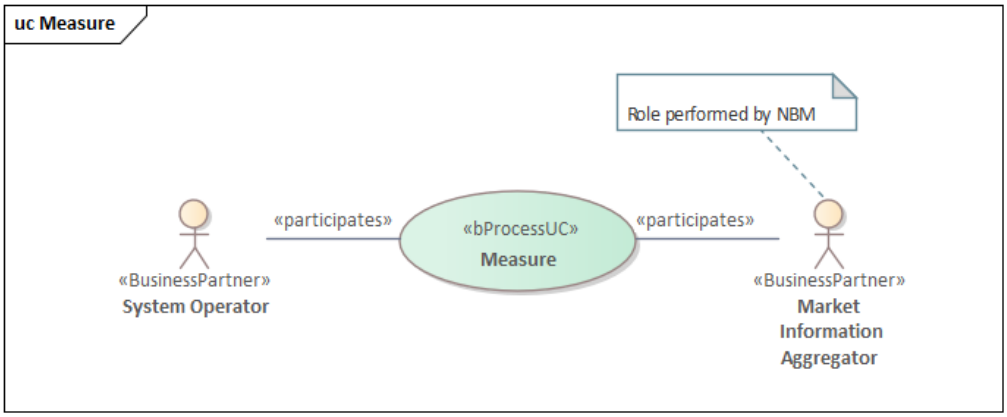


**Figure 5:** UseCase diagram: Measure

**Figure 5** shows the Measure process and the participating actors. The Business process is further described below.

Measured flow is sum of all measured flow on an interconnector between Bidding Zones. It consists of Real time values (PT10S) and Historical values which can be more accurate (corrected) than real time values.

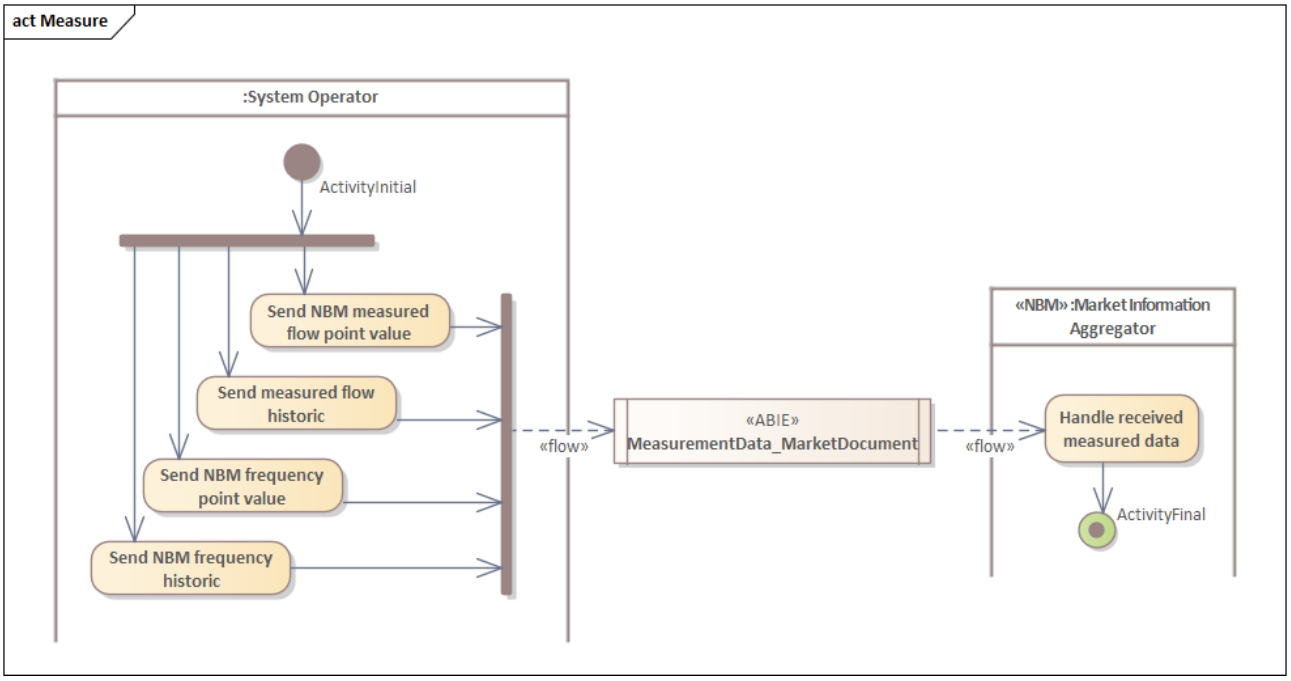


**Figure** 6: Activity diagram: Measure

## 3.2 Process area: Situational awareness

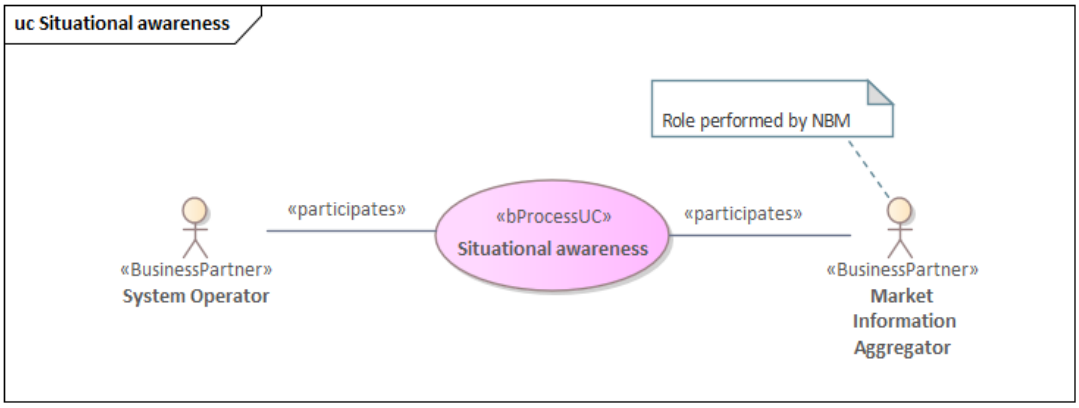


**Figure 7:** UseCase diagram: Situational awareness

**Figure 7** shows the process Situational awareness and the participating actors. The Business process is further described below.

In the Situational awareness process, the System Operator informs the Market Information Aggregator (NBM) of real-time Area Control Error Open Loop (ACE OL) Point Values. The ACE OL Point values are sent by a 10-second resolution per Bidding Zone and represents the imbalance of a Bidding Zone in the power system without automatic Frequency Restoration Reserve (aFRR) and manual Frequency Restoration Reserves (mFRR). ACE OL is the imbalance before any operator balancing actions.

ACE OL Historic values can be requested for 6 minutes, three hours or one week back in time.

Further the ACE OL Limits document is sent whenever the limit for warnings and alarms changes. The ACE OL limits are used for visualisation when ACE OL exceed or goes below certain values within a bidding zone. The ACE OL limits are sent infrequent, i.e. the distribution may range from e.g. 3 months down to every 15 minutes. ACE OL Limits are given by Time Series for each Bidding Zone within a TSO area of responsibility.

Fifty local (real time) values are the measured flow on an interconnector between two Bidding Zones. The values are sent every 10 seconds.

Historic real time values can be requested for 6 minutes, three hours or one week back in time.

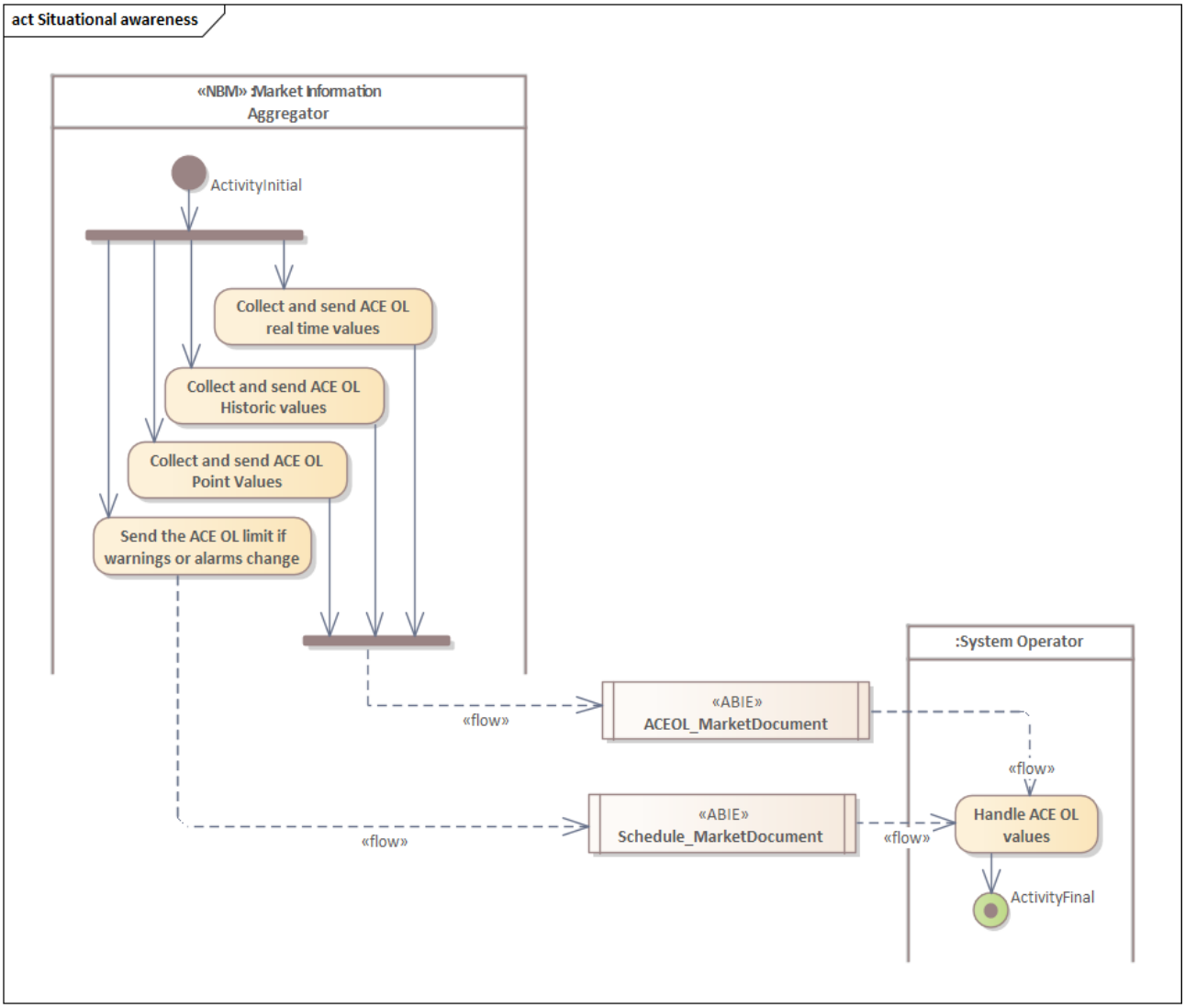


**Figure** 8: Activity diagram: Situational awareness

## 3.3 Process area: Activate

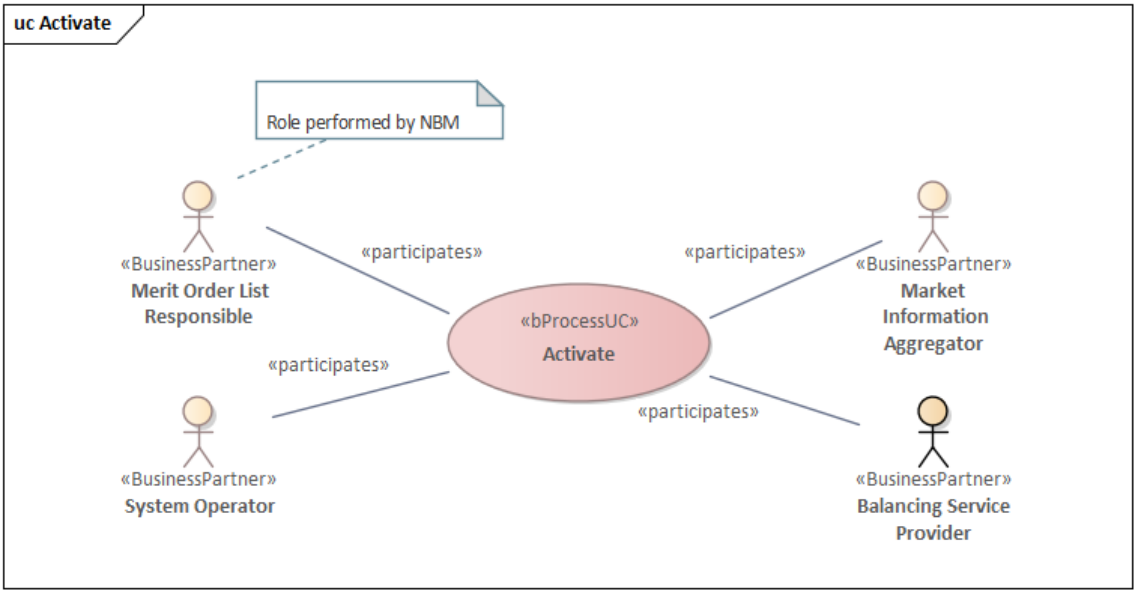


**Figure 9:** UseCase diagram: Activate

**Figure 9** shows the process Activate and the participating actors. The Business process is further described below.

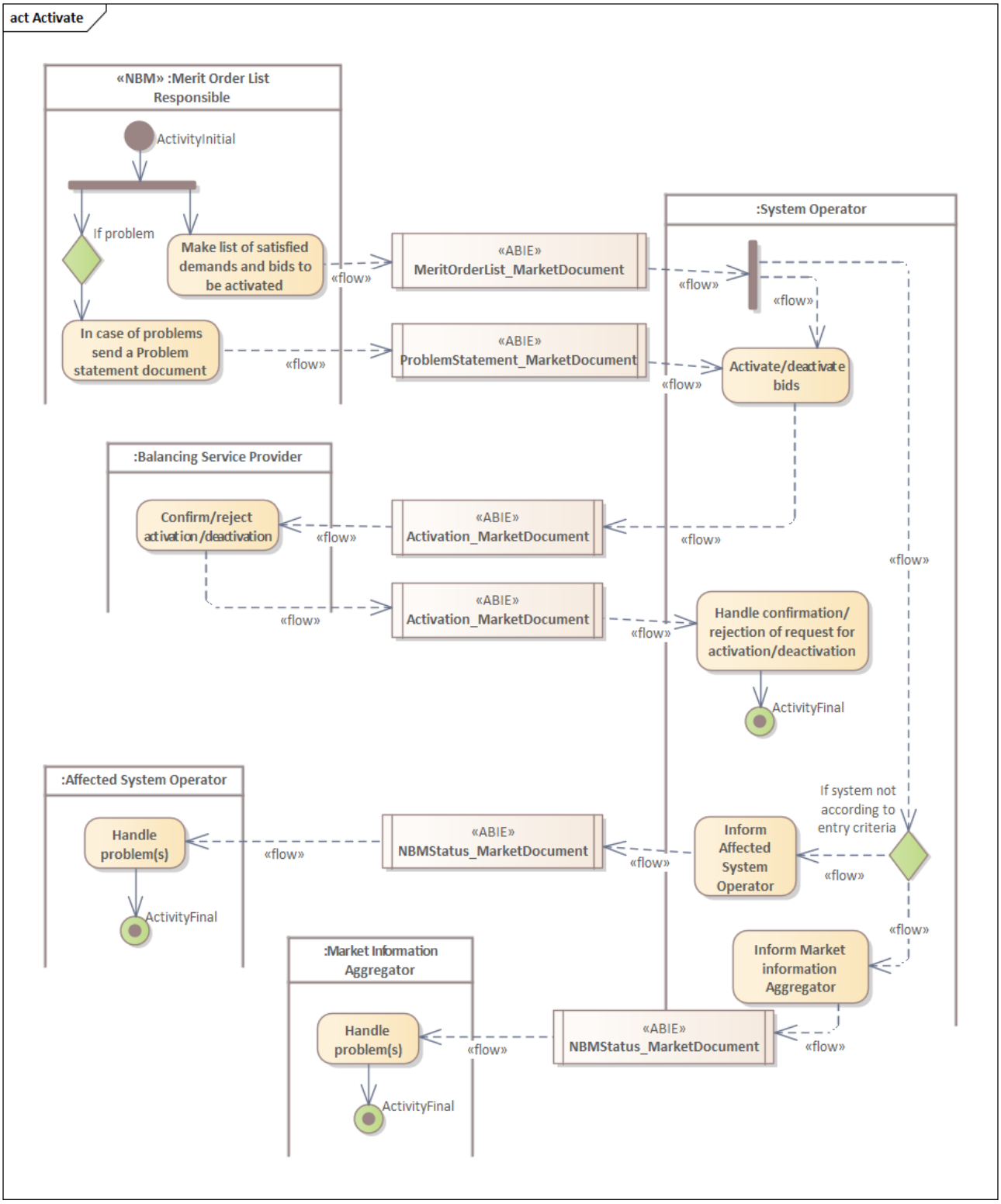


**Figure 10:** Activity diagram: The Nordic activation process

The Balance regulation market is a tool for the TSOs and must be able to manage 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. In practice, this means that only producers and large consumers are bidding actively. All other participants remain passive. An overview of how the trading of balancing services across borders is facilitated within Nordic countries can be found in [10].

Before the activities in **Figure 10**, bids are collected, accumulated, and presented for the TSO by the MOL Responsible (NBM), 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 TSOs 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 TSO activates up or down regulation according to the lowest bids.
2. The national TSO forwards all the bids to the MOL Responsible.
3. When there is a need to perform balance regulation, and provided there are no network restrictions, the operator checks with the MOL Responsible list of sorted bids (e.g., NBM) 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 TSO with the cheapest unused bid.
    - A Problem statement document can be used for escalation, trouble shooting, cooperation area problem, expected data not received and failure.
    - Status information should be exchanged between TSOs to prevent and handle incidents.
        - The status exchange is important part of having a common understanding of synchronous area situation for operators at all TSOs. The status exchange shall warn/inform operators that there is a non-normal situation in a control area. The status exchange should have a severity indication when something occurs, and an indication when situation is back to normal.

Related documents are defined, according to the UMM [3], in chapter 5, Business Entity View (Business Data View), Nordic operational system.

In the Nordic market NBM act as MOL responsible. In fallback scenarios, the TSO has a Market Operator role for their own area. The latter is however not reflected in the sequence and activity diagrams in this BRS.

Tertiary reserve is a rescheduling action used for the restoration of Primary and Secondary reserve and to cater for a high rate of change of demand or generation, demand forecast errors or short-term plant losses.

Two types of Tertiary reserve activation are possible:

- Schedule Activated Tertiary Control 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 Tertiary Control 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.

In Denmark (for emergency in DK2), Finland, Norway, and Sweden the DATCR type is used for activations in the *Balance regulation market*. Except for emergency in DK2, Denmark uses SATCR.

### *3.3.1 Process for activations*

1. The TSO orders an activation by sending an activation request to a Balancing Service Provider
2. The Balancing Service Provider sends an acknowledgement that the activation request was received
3. The Balancing Service Provider sends an activation response to confirm that the activation order has been noted
4. The TSO sends an acknowledgement that the activation response was received
5. The Balancing Service Provider activates the requested resource according to the confirmed order

6. Optionally the Balancing Service Provider may send an updated activation response in case there is a deviation between the actual activation and the activation request
7. Optionally the TSO sends an acknowledgement that the updated activation response was received and approved

### *3.3.2 Handling of activations*

Balance regulation market activations are ordered for up to one hour at a time but may be recurring. Continuation of recurring activations may be sent as an activation order prior to each new hour.

#### 3.3.2.1 Handle new activations and stopped activations

An activation is new if:

- the activation document refers to a bid that is currently not in an activated state

An activation is stopped if:

- the activation document refers to a bid that is currently in an activated state
- end time is less than a given time according to local market rules

New and stopped activations must be presented to the Balancing Service Provider for confirmation before the activation response is sent to the TSO.

#### 3.3.2.2 Handle recurring activations

To avoid unnecessary interruptions for the Balancing Service Provider because of hourly recurring activations, an automatic process can take care of these activations. The alternative to such a process is a manual intervention from the Balancing Service Provider every hour to confirm activation response.

An activation is "recurring" if all the following holds true:

- the activation document has the same order ID as a previous activation, but an updated version number
- the activation document refers to a bid that is currently in an activated state
- start time is equal to the end time of the current bid activation
- end time is increased from the last activation document
- end time is further ahead than a given time according to local market rules

If a recurring activation has not been received 15 minutes before the current end time of the activation, e.g., 15 minutes before the new hour, the activation should be stopped at the current end time.

### *3.3.3 Business rules – Activation Response*

- The activation response must refer to a specific activation request (by ID and version)
- The Activation Time Series Class must be equal to the activation request except for Status (Balancing Service Provider, Business Type, Acquiring Area, Connecting Area, Measure Unit, Direction, Resource Object must be the same as requested)
- Quantity of the power block cannot be changed
- Start time (ST) may be adjusted if the start time is closer than a given time according to local market rules from the ordering time (OT, the time the order was sent).
- End time (ST) may be adjusted if the start time is closer than a given time according to local market rules from the ordering time.

## 3.4 Process area: Report

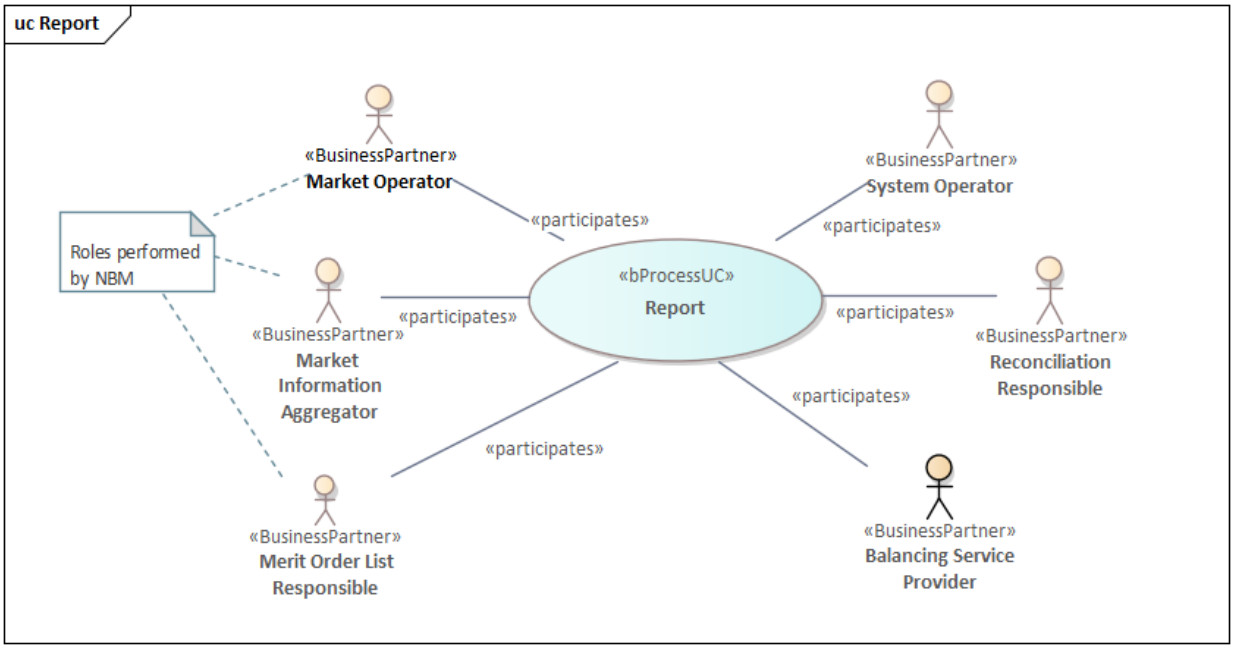


**Figure 11:** UseCase diagram: Report

**Figure 11** shows the process *Activate* and the participating actors. The *Business process* is further described below.

After the operational day, the following are reported for FCR:

- The System Operator shall report to the BRP, which supplies FCR involved in the balancing capacity trade for FCR-N after the end of the delivery day:
  - Average frequency per quarter (Hz).
  - Activated FCR-N balance energy (amount in EUR and net energy per hour and Scheduling Area, separately for production and consumption).
  - Binding procured FCR-N balance capacity (power per Scheduling Area, separate for production and consumption).
- The System Operator shall report to the BRP, which delivers FCR involved in the trade in FCR-D after the end of the delivery day:
  - Average frequency per quarter (Hz).
  - Activated FCR-D balance energy (net energy per hour and Scheduling Area, separate for production and consumption).
  - Binding planned FCR-D balance capacity (power per Scheduling Area, separate for production and consumption).

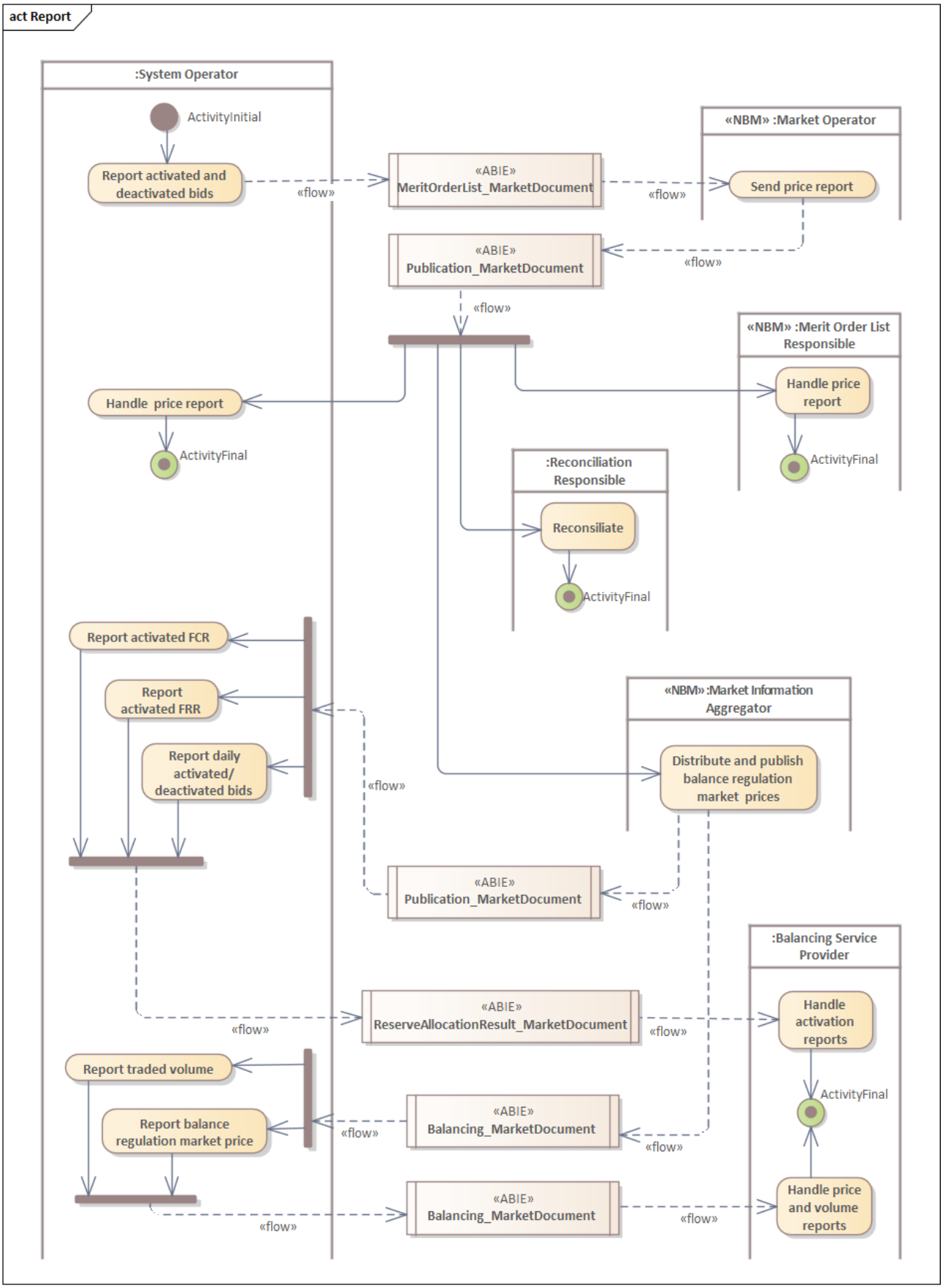


**Figure 12:** Activity diagram: Report

# 4 Harmonised roles and domains used in Nordic operational system

In **Figure 13** and in definitions below the relevant parts of the ebIX®, EFET and ENTSO-E Harmonised role model are outlined.

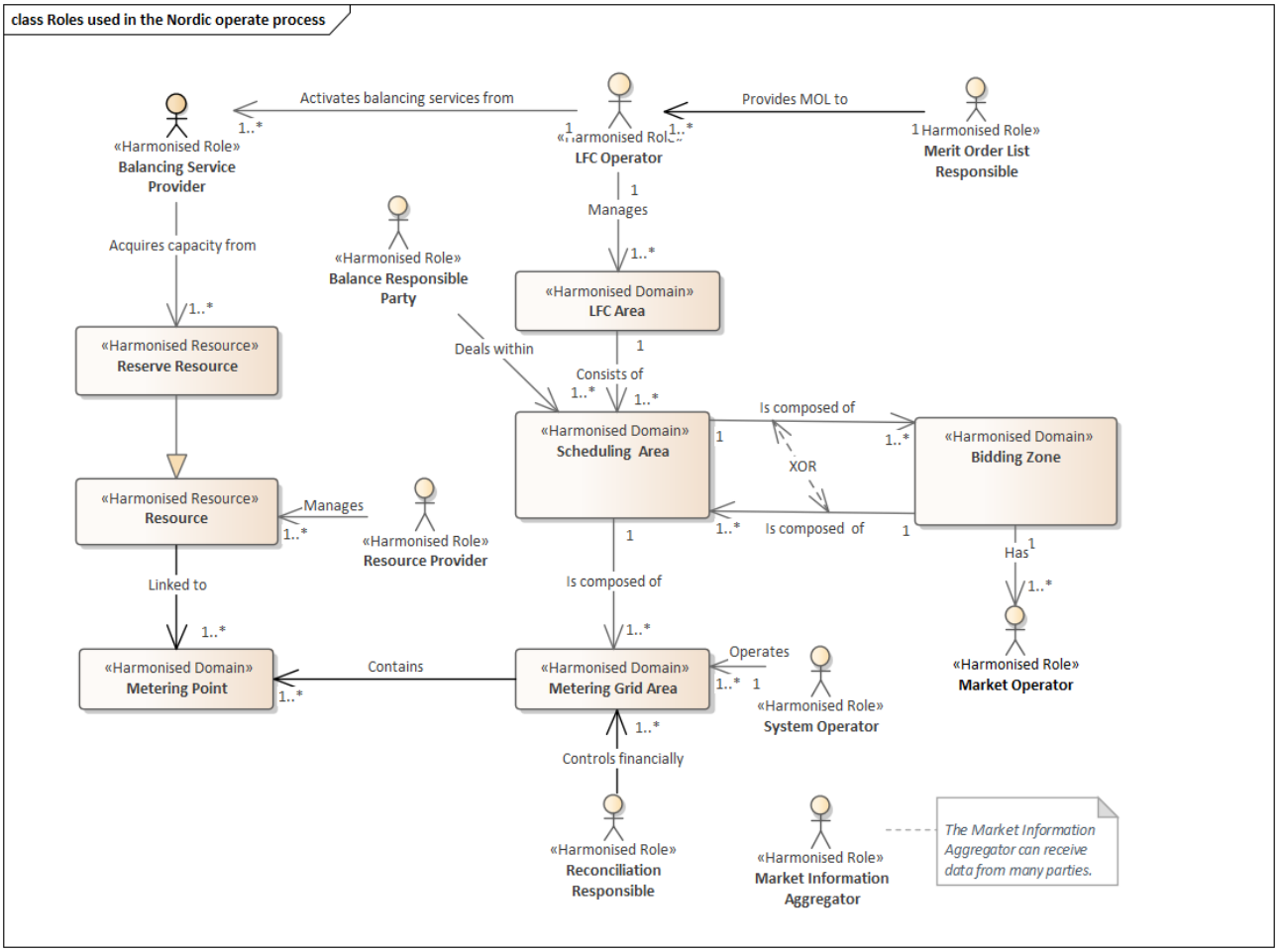


**Figure 13:** Outline of the Harmonised role model within the scope of the Nordic operational system

## 4.1 Roles from the ebIX®, EFET and ENTSO-E Harmonised role model HRM)

### *4.1.1 Balance Responsible Party*

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.

**Note:**
Based on Electricity Balancing - Art.2 Definitions.

**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.

### *4.1.2 Balancing Service Provider*

A party with reserve-providing units or reserve-providing groups able to provide balancing services to one or more LFC Operators.

**Additional information:**
Based on Electricity Balancing - Art.2 Definitions.

### *4.1.3 LFC Operator*

Responsible for the load frequency control for its LFC Area or LFC Block.

**Additional information:**
This role is typically performed by a TSO.

### *4.1.4 Market information aggregator*

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.

**Note:**
The Market Information Aggregator may receive information from any market participant that is relevant for publication or distribution.

### *4.1.5 Market operator*

A party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity.

**Additional information**:

1) The definition above is based on Regulation on the internal market for electricity (EU) 2019/943:
2) A more detailed description:

   A party that provides a service of collecting offers to sell and bids to buy electricity and matching these offers and bids in order to determine a market price at the clearing point. This activity can be conducted in the forward, days-ahead and/or intraday timeframes, and can be combined with transmission capacity allocation in the context of market coupling.

   This is usually an energy/power exchange or platform.

### *4.1.6 Merit Order List (MOL) 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.

#### 4.1.7 Reconciliation Responsible

A party that is responsible for reconciling, within a Metering Grid Area, the volumes used in the imbalance settlement process for profiled Accounting Points and the actual measured quantities.

**Note:**
The Reconciliation Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.

#### 4.1.8 Resource Provider

A role that manages a resource and provides production/consumption schedules for it, if required.

#### 4.1.9 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 electricity.

**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).

### 4.2 Domains from the ebIX®, EFET and ENTSO-E Harmonised role model HRM)

#### 4.2.1 Bidding Zone[1]

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

**Source:** Commission Regulation (EU) 543/2013.

#### 4.2.2 LFC Area

A part of a synchronous area or an entire synchronous area, physically demarcated by points of measurement at interconnectors to other LFC Areas, operated by one or more TSOs fulfilling the obligations of load-frequency control.

**Source:** System Operation Guideline, Commission Regulation (EU) 2017/1485.

#### 4.2.3 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.

[1] In the Nordic countries the Bidding Zone and the Scheduling Area will be the same

### 4.2.4 Metering Point

An entity where energy products are measured or computed.

### 4.2.5 Reserve Resource

A resource technically pre-qualified using a uniform set of standards to supply reserve capabilities to a System Operator and is associated with one or more tele-measuring devices.

**Additional information:**
This is a type of Resource.

### 4.2.6 Resource

A market representation of an asset or a group of assets related to the energy industry.

**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.

### 4.2.7 Scheduling Area[2]

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

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

**Source:** System Operation Guideline, Commission Regulation (EU) 2017/1485.

**Additional information:**
This covers both Imbalance Area and Imbalance Price Area from the Electricity Balancing Guideline (2017/2195).

[2] In the Nordic countries the Bidding Zone and the Scheduling Area will be the same

# 5 Business Entity View (Business Data View), Nordic operational system

## 5.1 Merit Order List Document (IEC/CIM 62325-451-7, Ed. 1)

The Merit Order List Document is developed by ENTSO-E/WG-EDI, see [1].

### *5.1.1 Class diagram: Merit Order List Document contextual model*

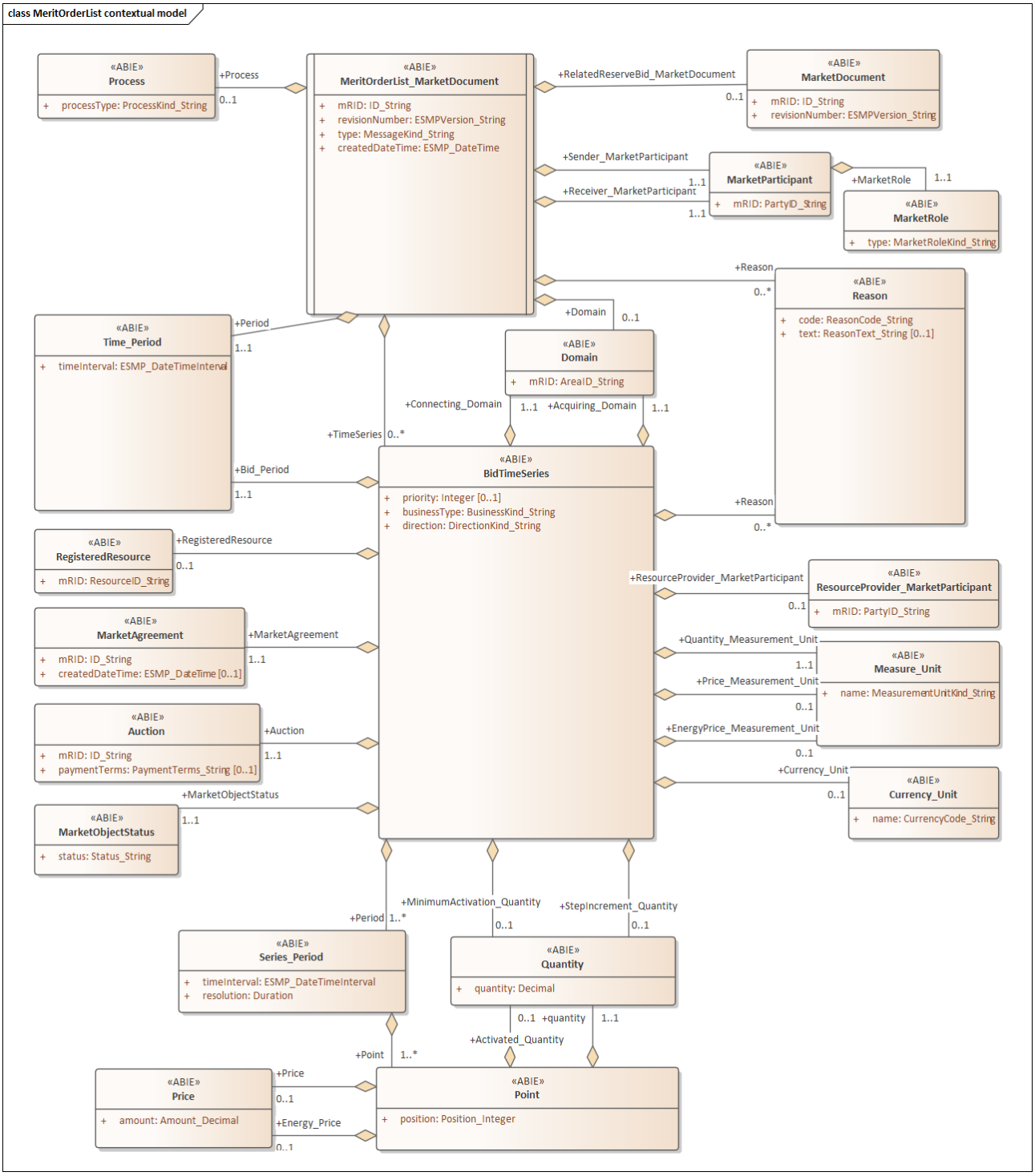


**Figure 14:** Class diagram: Merit Order List Document contextual model

### 5.1.2 Class diagram: Merit Order List Document assembly model

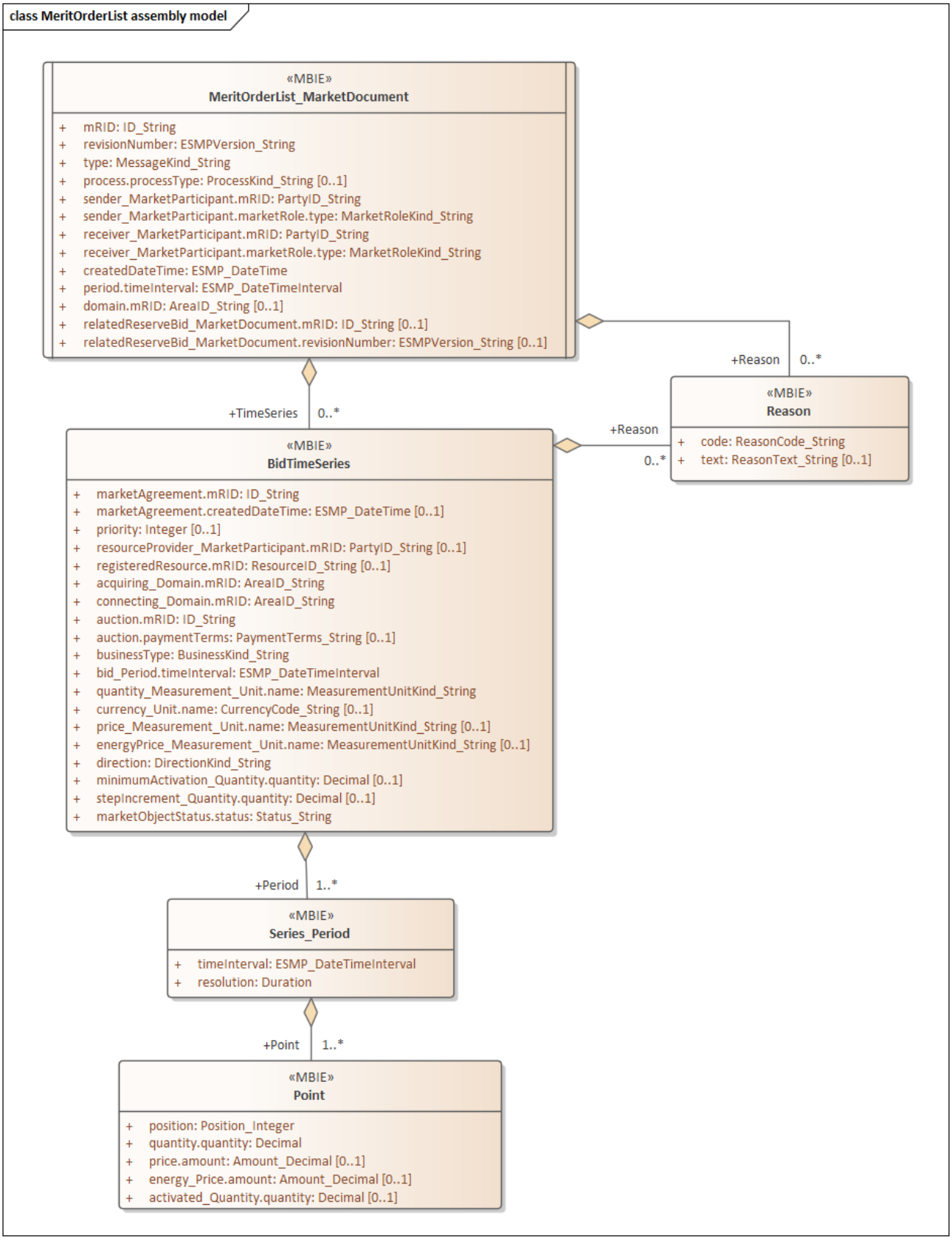


**Figure 15:** Class diagram: Merit Order List Document assembly model

### *5.1.3 Attribute usage: Merit Order List Document*

The Merit Order List Document is used in the following exchanges:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 3.0, Satisfied demands and bids to be activated
  - 4.0, Activated or deactivated bids

| Attribute | Cl. | Code and description |
|---|---|---|
| ***MeritOrderList_MarketDocument*** | | |
| mRID | [1] | Unique identification of the document.<br>Global uniqueness is easily achieved by using a UUID for the mRID. It is strongly recommended to do this. |
| revisionNumber | [1] | The identification of the version that distinguishes one evolution of a document from another. |
| type | [1] | **A66** Final MOL |
| process.processType | [1] | **A60** mFRR with scheduled activation |
| sender_MarketParticipant.mRID | [1] | Identification of the party who is sending the document. |
| sender_MarketParticipant.<br>marketRole.type | [1] | **A35** MOL responsible<br>**A04** System Operator |
| receiver_MarketParticipant.mRID | [1] | Identification of the party who is receiving the schedules. |
| receiver_MarketParticipant.<br>marketRole.type | [1] | **A04** System Operator<br>**A11** Market operator |
| createdDateTime | [1] | Date and time for creation of the document. |
| period.timeInterval | [1] | This information provides the start and end date and time of the time interval covered in this document. |
| domain.mRID | [1] | The EIC identification of the Control Area<br>**10Y1001A1001A796** (Denmark)<br>**10YFI-1--------U** (Finland)<br>**10YNO-0--------C** (Norway)<br>**10YSE-1--------K** (Sweden) |
| ***BidTimeSeries*** | **[1..*]** | |
| marketAgreement.mRID | [1] | The unique identification of the bid. |
| resourceProvider_MarketParticipant.<br>mRID | [0..1] | The identification of the Balancing Service Provider. |
| registeredResource.mRID | [0..1] | The unique identification of a resource. |
| acquiring_Domain.mRID | [1] | The unique identification of the Bidding Zone where the product is being delivered. |
| connecting_Domain.mRID | [1] | The unique identification of the Bidding Zone where the Resource is located. |
| auction.mRID | [1] | A fixed value identifying the auction:<br>**MFRR_ENERGY_ACTIVATION_MARKET** |
| businessType | [1] | **B74** Offer<br>**B75** Need |
| bid_Period.timeInterval | [1] | The beginning and ending date and time of the period covered by the tender. |

| Attribute | Cl. | Code and description |
|---|---|---|
| quantity_Measurement_Unit.name | [1] | **MAW** Megawatt |
| currency_Unit.name | [1] | **EUR** Euro |
| price_Measurement_Unit.name | [1] | **MWH** Megawatt hour |
| energyPrice_Measurement_Unit.name | [0..1] | **MWH** Megawatt hour |
| direction | [1] | **A01** UP<br>**A02** DOWN |
| marketObjectStatus.status | [1] | **A06** Available (the offer has not been activated)<br>**A10** Ordered (the offer has been activated)<br>**A33** Not satisfied (i.e. The need cannot be satisfied by the common platform) |
| ***Reason (BidTimeSeries level)*** | **[0..*]** | |
| code | [1] | **A95** Complementary information |
| text | [1] | The textual explanation corresponding to the reason code. |
| | **[1..*]** | ***Series_Period***<br>The time interval and resolution for a period associated with a TimeSeries. |
| timeInterval | [1] | The start and end time of the period. |
| resolution | [1] | The definition of the number of units of time that compose an individual step within a period. |
| ***Point*** | **[1]** | The Point information associated with a given Series_Period within a TimeSeries. |
| position | [1] | Fixed 1. |
| quantity.quantity | [1] | The quantity for the interval in question with a resolution in Megawatt |
| price.amount | [1] | The power price for each unit of quantity. |
| energy_Price.amount | [0..1] | The offered price.<br>Not used for demands. |
| activated_Quantity.quantity | [0..1] | The quantity that has been activated for the interval in question. |

**Table 2:** Attribute usage of Merit Order List Document

## 5.2 ERRP Activation Document (IEC/CIM 62325-451-7 Activation Document version 6.0)

The *ERRP Activation Document* is developed by ENTSO-E/WG-EDI, see [1].

### *5.2.1 Class diagram: ERRP Activation Document contextual model*

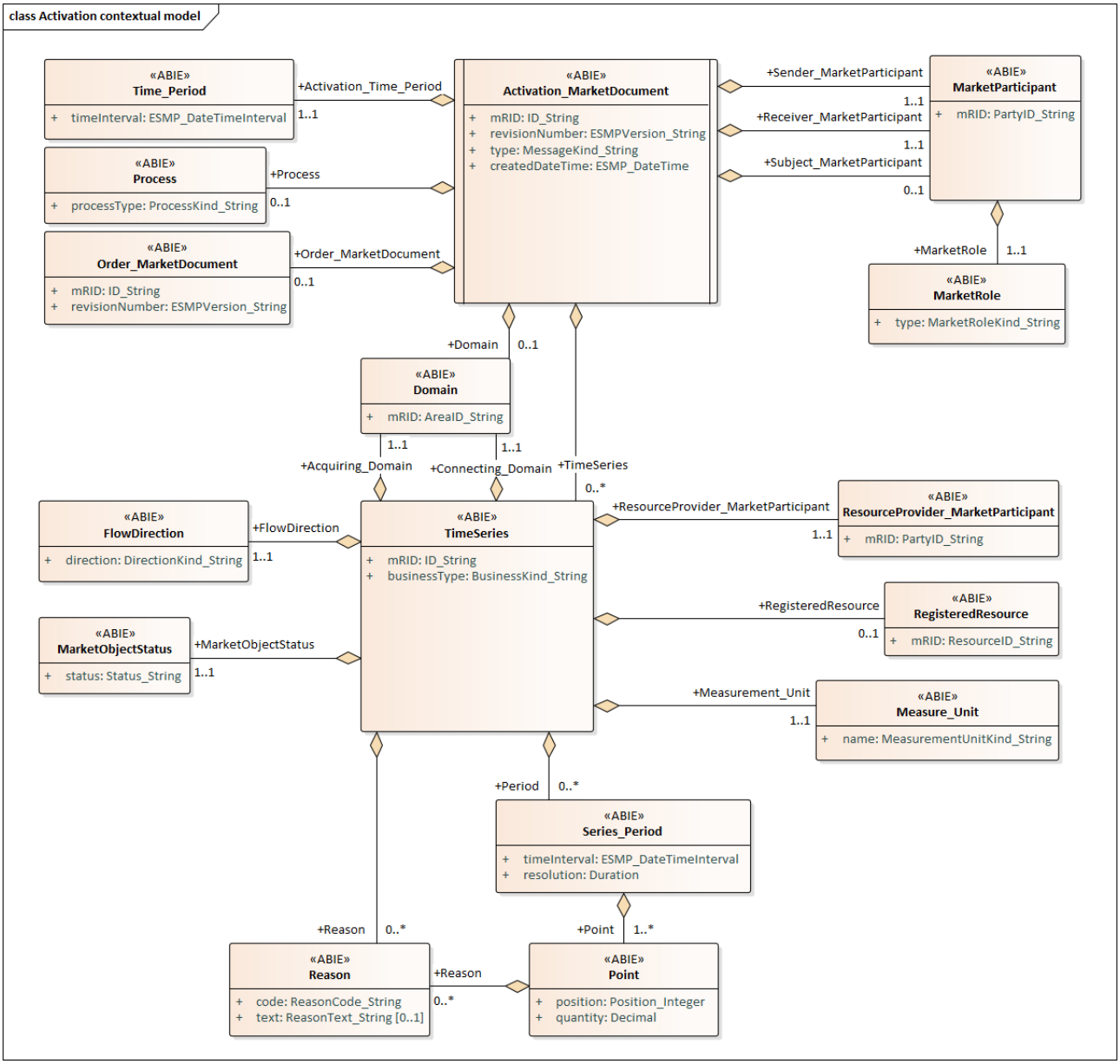


**Figure 16:** Class diagram: ERRP Activation Document contextual model

### *5.2.2 Class diagram: ERRP Activation Document assembly model*

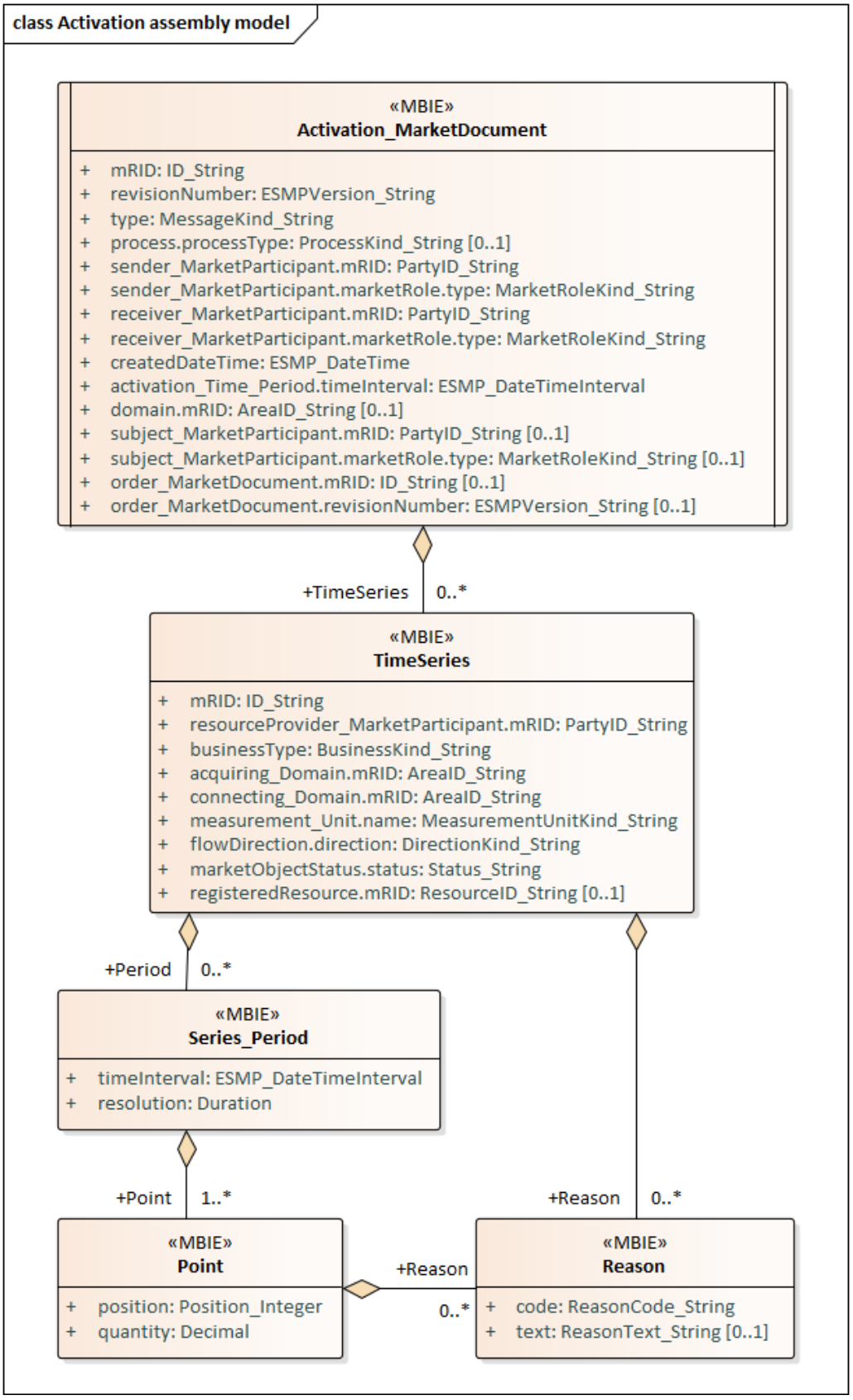


**Figure 17:** Class diagram: ERRP Activation Document assembly model

### *5.2.3 Attribute usage: ERRP Activation Document*

The ERRP Activation Document is used in the following exchanges:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 3.4, Activate or deactivate bids (Status = A10, Ordered)
  - 3.5, Activation response
    (Status = A07, Activated or A09, cancelled)
  - 4.5, Activated FCR
  - 4.6, Activated FRR
  - 4.7, Activated or deactivated bids

| Attribute | Cl. | Code and description |
|---|---|---|
| ***Activation_MarketDocument*** | | |
| mRID | [1] | Unique identification of the document. |
| revisionNumber | [1] | Fixed 1. |
| type | [1] | For request:<br>**A39** SATCR activation<br>**A40** DATCR activation (normal activations based on MOL)<br>**Z37** Faster than standard FAT<br>**Z38** Faster than standard deactivation time<br>**Z39** Slower than standard FAT (applicable only in Denmark)<br>**Z40** Period shift activation<br>**Z41** Production smoothing (applicable only in Norway)<br>**Z43** Disturbance reserve<br>**Z44** Other non-standard<br><br>For response:<br>**A41** Activation response |
| process.processType | [1] | *New codes:*<br>**A47** Manual frequency restoration reserve<br>**A51** Automatic frequency restoration reserve |
| sender_MarketParticipant.mRID | [1] | Identification of the party who is sending the document. |
| sender_MarketParticipant.<br>marketRole.type | [1] | Sender of request:<br>**A04** System Operator<br><br>Sender of response:<br>**A27** Resource Provider<br>**A33** Information receiver<br>**A46** Balancing Service Provider |
| receiver_MarketParticipant.mRID | [1] | Identification of the party who is receiving the schedules. |
| receiver_MarketParticipant.<br>marketRole.type | [1] | Receiver of response:<br>**A04** System Operator<br><br>Receiver of request:<br>**A27** Resource Provider<br>**A33** Information receiver<br>**A46** Balancing Service Provider |
| createdDateTime | [1] | Date and time for creation of the document. |
| activation_Time_Period.timeInterval | [1] | The beginning and ending date and time of the activation time interval. |
| domain.mRID | [1] | National Area. |

| | | |
|---|---|---|
| subject_MarketParticipant.mRID | [0..1] | Identification of the party for whom the bid document is submitted. |
| subject_MarketParticipant. marketRole.type | [0..1] | **A46** Balancing Service Provider (BSP) |
| order_MarketDocument.mRID | [0..1] | Unique identification of the activation order "Activation ID". The same Activation id is used in the request and the response. |
| order_MarketDocument. revisionNumber | [0..1] | The version of the activation order. Incremented with one for each transmission of the document from the System Operator. The same version is used in the request and the response. |
| ***Time Series*** | **[1..*]** | |
| mRID | [1] | Reference to relevant bid or an "Move of planned production ID (normal time series ID)". |
| resourceProvider_ MarketParticipant.mRID | [1] | The identification of the Balancing Service Provider or Resource Provider related to the contract identification. |
| businessType | [1] | **A01** Production<br>**A04** Consumption<br>**A96** Automatic frequency restoration reserve<br>**A97** Manual frequency restoration reserve |
| acquiring_Domain.mRID | [1] | **10Y1001A1001A91G** The EIC identification of the Nordic Market Area |
| connecting_Domain.mRID | [1] | Bidding Zone. |
| measurement_Unit.name | [1] | **MAW** MW |
| flowDirection.direction | [1] | **A01** Up<br>**A02** Down |
| marketObjectStatus.status | [1] | *Only in the request:*<br>**A10** Ordered (The quantities in the time series are to be activated)<br>*Only in the response:*<br>**A07** Activated (*The quantities in the time series have been activated*), i.e., confirmation<br>**A09** Cancelled (*The tender indicated in the time series has been completely cancelled. In this case the resources are no longer available to all Acquiring TSOs*), i.e., rejection.<br>**A11** Unavailable |
| registeredResource.mRID | [0..1] | Identification of the resource that is used to supply energy capabilities to the TSO.<br>Mandatory in Denmark, Norway and Sweden. Optional in Finland. |
| ***Reason (TimeSeries Level)*** | **[0..1]** | |
| code | [1] | **A95** Complementary information<br>**B22** System regulation<br>**B23** Frequency regulation<br>**B49** Balancing<br>**B59** Unavailability of reserve providing unit<br>**999** Errors not specifically identified<br>**Z57** Auction Run ID, Unique identification of a given auction<br>The code **A95** may be used to transmit extra information related to a bid. |

| | | |
|---|---|---|
| text | [0..1] | To be used together with Reason code **A95** or **Z57**. |
| ***Series_Period*** | **[1..*]** | |
| timeInterval | [1] | The start and end date and time of the time interval of the period in question. |
| resolution | [1] | The time resolution is always the difference between the Time Interval End and the Time Interval Start. |
| ***Point*** | **[1]** | |
| position | [1] | The position of the observation in a time series – Always 1. |
| quantity | [1] | The quantity for the interval in question. |

**Table 3:** Usage of ERRP Activation Document

### 5.2.4 Dependency matrix for ERRP Activation Document

| Document Type | Process Type | Business Type | Reason |
|---|---|---|---|
| **A39** SATCR activation | **A47** Manual frequency restoration reserve | **A97** Manual frequency restoration reserve | Not used |
| **A40** DATCR activation | **A47** Manual frequency restoration reserve | **A97** Manual frequency restoration reserve | Dependent on national rules |
| **Z37** Faster than standard FAT | **A47** Manual frequency restoration reserve | **A97** Manual frequency restoration reserve | **B22** System regulation<br>**B49** Balancing<br>**Z57** Auction Run ID |
| **Z38** Faster than standard deactivation time | **A47** Manual frequency restoration reserve | **A97** Manual frequency restoration reserve | **B22** System regulation<br>**B49** Balancing<br>**Z57** Auction Run ID |
| **Z39** Slower than standard FAT (applicable only in Denmark) | **A47** Manual frequency restoration reserve | **A97** Manual frequency restoration reserve | **B22** System regulation<br>**B49** Balancing<br>**Z57** Auction Run ID |
| **Z40** Period shift activation | **A47** Manual frequency restoration reserve | **A97** Manual frequency restoration reserve | **B22** System regulation<br>**B49** Balancing<br>**Z57** Auction Run ID |
| **A41** Activation response | **A51** Automatic frequency restoration reserve | **A12** Secondary control (FRR-A, earlier LFC) | Not used |
| | **A47** Manual frequency restoration reserve | **A01** Production<br>**A04** Consumption<br>**A97** Manual frequency restoration reserve | |

**Table 4:** Dependency matrix for ERRP Activation Document

## 5.3 ACE OL Market Document (IEC/CIM based)

The *ACE OL Document* is developed by NBM, see [1].

### *5.3.1 Class diagram: ACE OL Market Document contextual model*

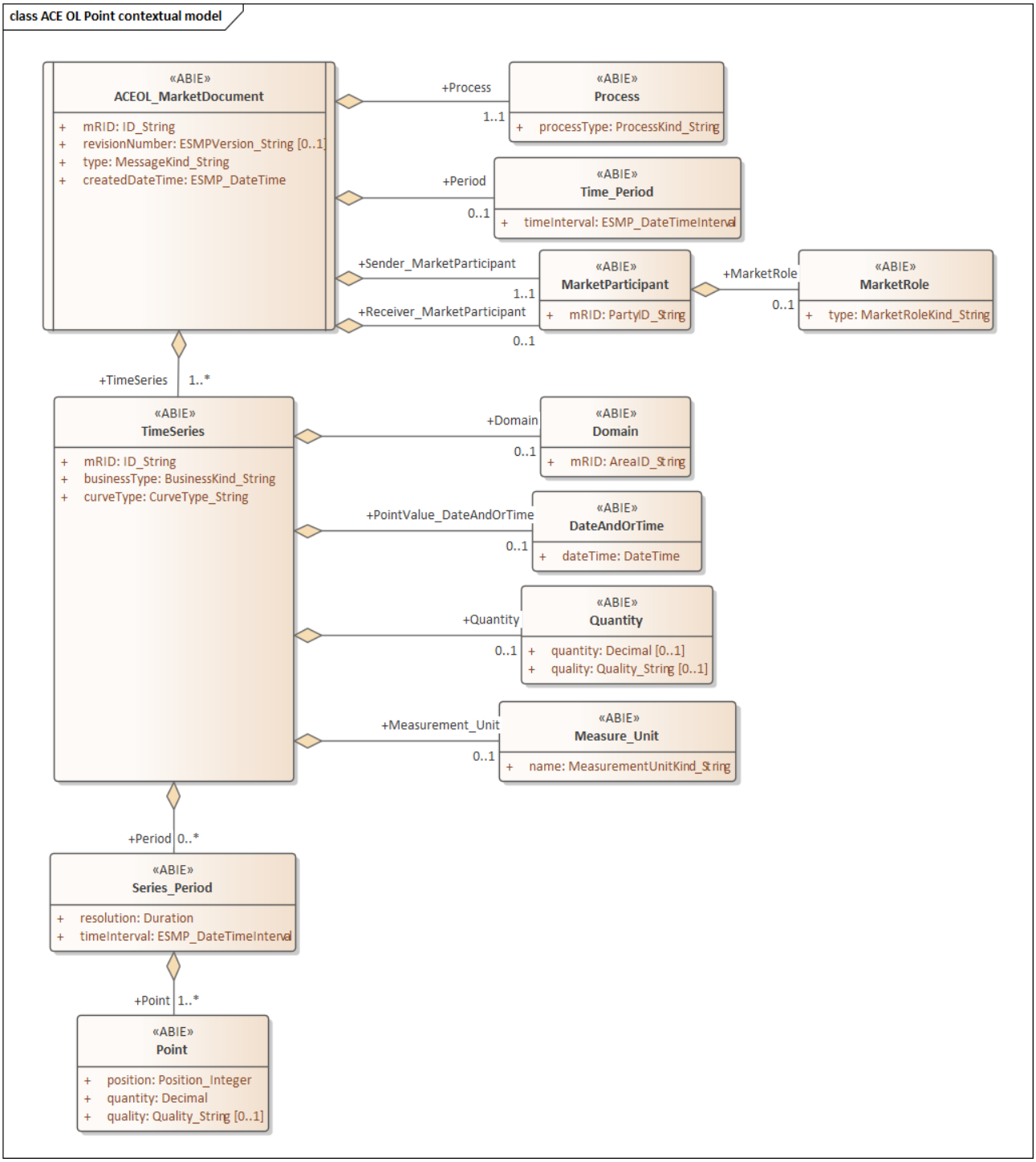


**Figure 18:** Class diagram: ACE OL Market Document contextual model

### *5.3.2 Class diagram: ACE OL Market Document assembly model*

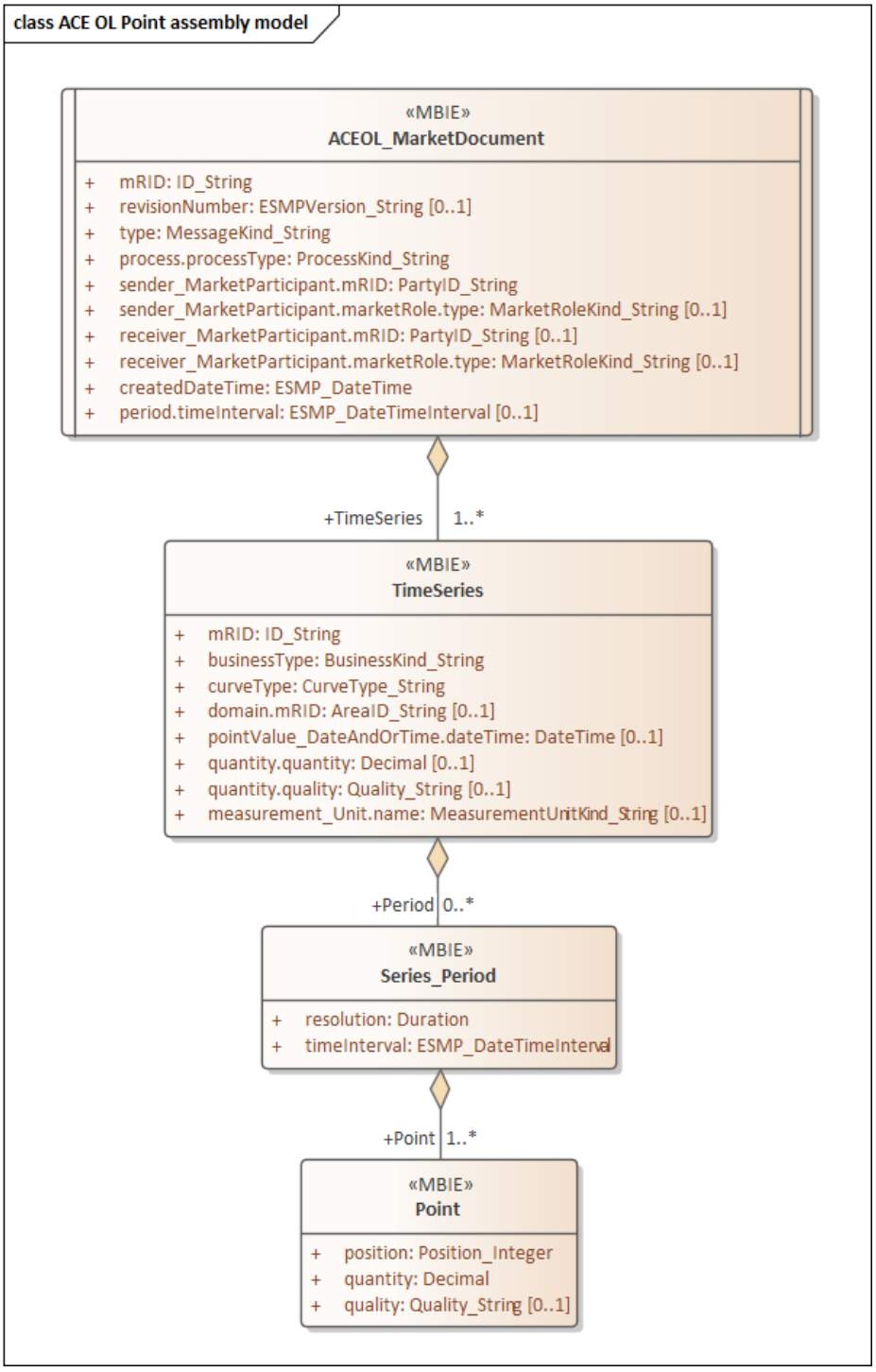


**Figure 19:** Class diagram: ACE OL Market Document assembly model

### *5.3.3 Attribute usage: ACE OL Point Value Document*

The ACE OL Point Value" Document is used in the following exchange:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 2.0, ACE OL Point Value

| Attribute | Cl. | Code and description |
|---|---|---|
| ***ACEOL_MarketDocument*** | | |
| mRID | [1] | Unique identification of the document.<br>Global uniqueness is easily achieved by using a UUID for the mRID. It is strongly recommended to do this. |
| revisionNumber | [0..1] | Fixed 1. |
| type | [1] | **Z35** ACE OL |
| process.processType | [1] | **Z12** ACE OL real-time |
| sender_MarketParticipant.mRID | [1] | Identification of the party who is sending the document. |
| createdDateTime | [1] | The date and time of the creation of the document. |
| ***Time Series*** | **[1..*]** | |
| mRID | [1] | Unique ID of the time series. |
| businessType | [1] | **Z27** ACE OL (Area Control Error Open Loop) |
| curveType | [1] | **A02** Point |
| domain.mRID | [1] | Bidding zone for ACE OL. |
| pointValue_DateAndOrTime.dateTime | [1] | Point value date and time.<br>Only used when processType=**Z12**. |
| quantity.quantity | [1] | Value of ACE OL.<br>Only used when processType=**Z12**.<br>Unit type is implicitly **MW**. |
| quantity.quality | [0..1] | May be used, and only when processType=**Z12**.<br>**A01** Adjusted<br>**A02** Not available<br>**A03** Estimated<br>**A04** As provided<br>**A05** Incomplete<br>**A06** Calculated |

**Table 5:** Attribute usage of ACE OL Point Value Document

### 5.3.4 Attribute usage: ACE OL "Fifty Local" and "Historic" Documents

The ACE OL "Fifty Local" and "Historic" Documents are used in the following exchanges:

- Table 1: ENTSO-E documents used in the Nordic operational system:
  - 2.2, ACE OL Fifty Local
  - 2.3, ACE OL Historic

| Attribute | Cl. | Code and description |
|---|---|---|
| *ACEOL_MarketDocument* | | |
| mRID | [1] | Unique identification of the document.<br>Global uniqueness is easily achieved by using a UUID for the mRID. It is strongly recommended to do this. |
| revisionNumber | [0..1] | Fixed 1. |
| type | [1] | **Z35** ACE OL |
| process.processType | [1] | **Z12** ACE OL real-time (Ace OL Fifty local)<br>**Z13** Corrected real time values (Ace OL historic) |
| sender_MarketParticipant.mRID | [1] | Identification of the party who is sending the document. |
| createdDateTime | [1] | The date and time of the creation of the document. |
| period.timeInterval | [0..1] | The start and end date and time for the time interval that is associated with this electronic document, and which is valid for the whole document. |
| *Time Series* | [1..*] | |
| mRID | [1] | Unique ID of the time series. |
| businessType | [1] | **Z27** ACE OL (Area Control Error Open Loop) |
| curveType | [1] | **A02** Point (Ace OL Fifty local and Ace OL historic)<br>**A03** Variable sized Block (Ace OL historic)<br>**A05** Non-overlapping breakpoint (Ace OL historic) |
| domain.mRID | [1] | Bidding zone for ACE OL, such as:<br>**DK1** 10YDK-1--------W<br>**DK2** 10YDK-2--------M<br>**FI** 10YFI-1--------U<br>**NO1** 10YNO-1--------2<br>**NO2** 10YNO-2--------T<br>**NO3** 10YNO-3--------J<br>**NO4** 10YNO-4--------9<br>**NO5** 10Y1001A1001A48H<br>**SE1** 10Y1001A1001A44P<br>**SE2** 10Y1001A1001A45N<br>**SE3** 10Y1001A1001A46L<br>**SE4** 10Y1001A1001A47J |
| pointValue_DateAndOrTime.dateTime | [0..1] | Date and time as per ISO 8601 YYYY-MM-DDThh:mm:ss.sssZ |
| quantity.quantity | [0..1] | The quantity value |
| quantity.quality | [0..1] | The description of the quality of the quantity |
| measurement_Unit.name | [0..1] | The identification of the formal code for a measurement unit (UN/ECE Recommendation 20) |
| *Series_Period* | [1..*] | |

| Attribute | Cl. | Code and description |
|---|---|---|
| timeInterval | [1] | The start and end date and time of the time interval of the period in question. |
| resolution | [1] | The definition of the number of units of time that compose an individual step within a period. |
| ***Point*** | **[1]** | |
| position | [1] | A sequential value representing the relative position within a given time interval. |
| quantity | [1] | The principal quantity identified for a point, i.e. value of ACE OL. Unit type: **MW** |
| Quality | [0..1] | The quality of the information being provided.<br>**A01** Adjusted<br>**A02** Not available<br>**A03** Estimated<br>**A04** As provided<br>**A05** Incomplete<br>**A06** Calculated |

**Table 6:** Attribute usage of ACE OL Point Value Document

### *5.3.5 Dependency matrix for ACE OL "Fifty Local" and "Historic" Documents*

| process. processType | curveType |
|---|---|
| **Z12** ACE OL real-time | **A02** Point |
| **Z13** Corrected real time values | **A02** Point<br>**A03** Variable sized Block<br>**A05** Non-overlapping breakpoint |

**Table 7:** Dependency matrix for ERRP Activation Document

## 5.4 ESS Schedule Document from IEC62325-451-2 Ed.2 (ACE OL Limits)

The ESS (ENTSO-E Scheduling System) Schedule Document is used for ACE OL Limits exchanges. The ACE OL limits is used for visualisation when ACE OL exceed or goes below certain values within a bidding zone. The ACE OL limits is sent infrequent, i.e. the distribution may range from e.g. 3 months down to every 15 minutes. ACE OL Limits are given by Time Series for each Bidding Zone within a TSO area of responsibility.

This chapter describes a Nordic subset of the document described in IEC 62325 framework for energy market communications, Part 451, see [1].

### *5.4.1 Class diagram: ESS Schedule Document contextual model*

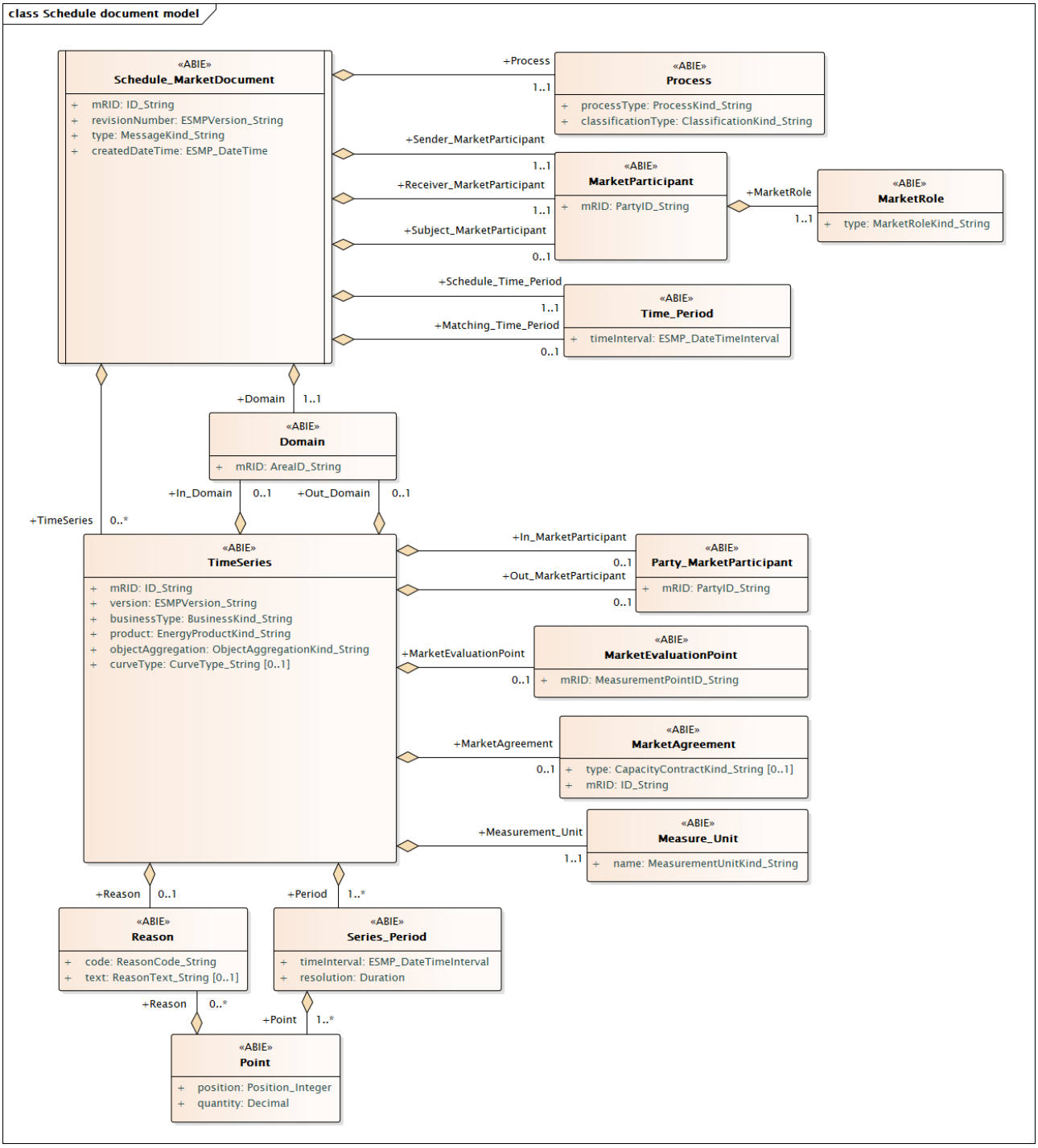


**Figure 20:** Class diagram: ESS Schedule Document contextual model

### 5.4.2 Class diagram: ESS Schedule Document assembly model

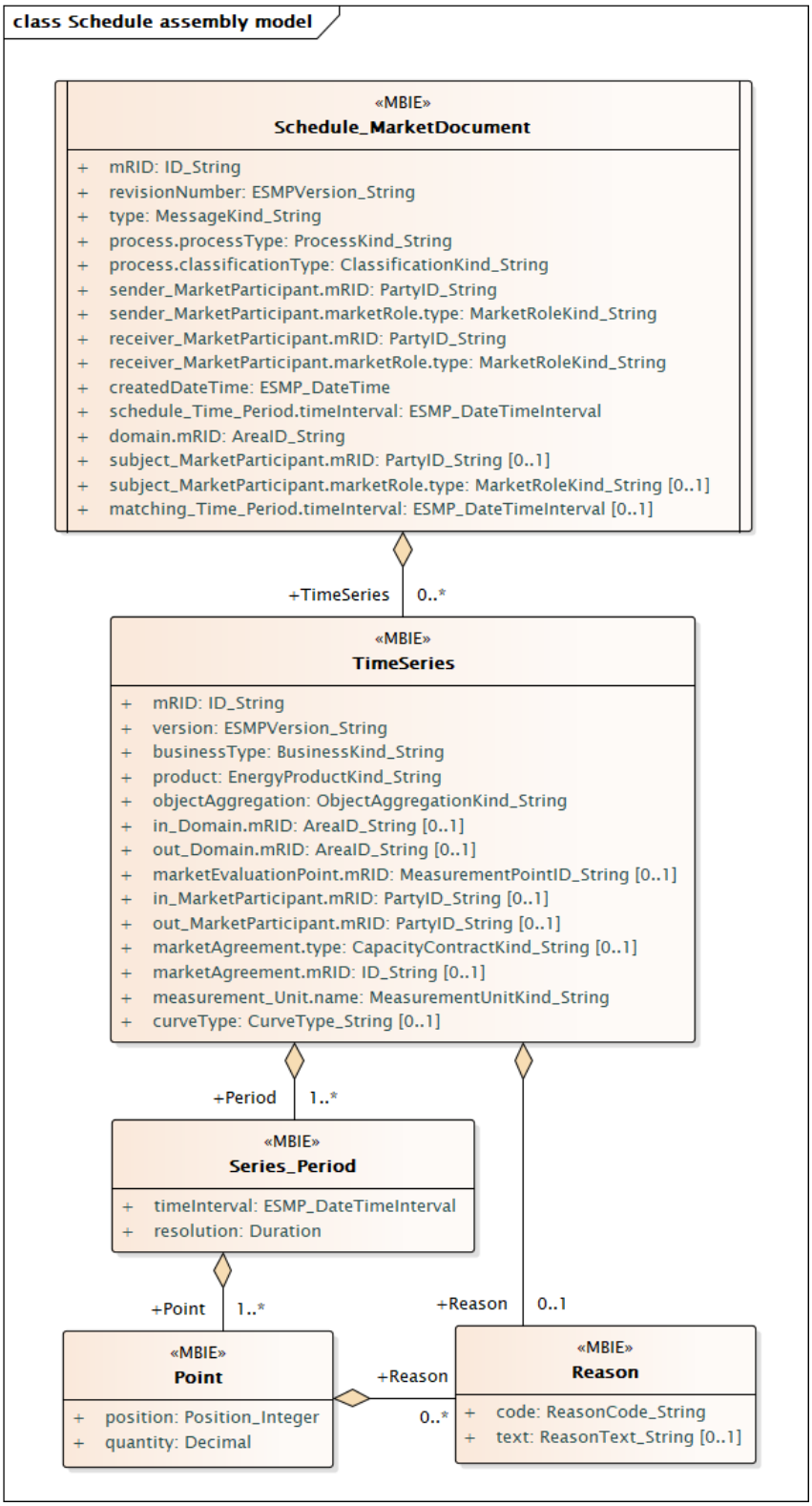


**Figure 21:** Class diagram: ESS Schedule Document assembly model

### *5.4.3 Attribute usage ESS Schedule Document, ACE OL Limits*

The ESS Schedule Document is used in the following exchange:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 2.1, ACE OL Limits

| IEC CIM Attribute | Cl. | Code and description |
|---|---|---|
| ***Schedule_MarketDocument*** | | |
| mRID | [1] | Unique identification of the document.<br>Global uniqueness is easily achieved by using a UUID for the mRID. It is strongly recommended to do this. |
| revisionNumber | [1] | The identification of the version that distinguishes one evolution of a document from another. |
| type | [1] | **Z36** Power Prognoses |
| process.processType | [1] | **Z12** ACE OL real-time |
| process.classificationType | [1] | **A01** Detail type |
| sender_MarketParticipant. mRID | [1] | Identification of the party who is sending the document. |
| sender_MarketParticipant. marketRole.type | [1] | **A32** Market information aggregator |
| receiver_MarketParticipant. mRID | [1] | Identification of the party who is receiving the schedules. |
| receiver_MarketParticipant.market Role.type | [1] | **A04** System Operator |
| createdDateTime | [1] | Date and time for creation of the document. |
| schedule_Time_Period. timeInterval | [1] | This information provides the start- and end- date and time of the time interval covered in this document. |
| domain.mRID | [1] | The EIC identification of the Control Area<br>**10Y1001A1001A796** (Denmark)<br>**10YFI-1--------U** (Finland)<br>**10YNO-0--------C** (Norway)<br>**10YSE-1--------K** (Sweden) |
| ***TimeSeries*** | [1..*] | |
| mRID | [1] | A unique identification of the time series. |
| version | [1] | Fixed 1 |
| businessType | [1] | **Z78** Upper Alert<br>**Z79** Upper Emergency<br>**Z80** Lower Alert<br>**Z81** Lower Emergency<br>**Z82** Upper Warning<br>**Z83** Lower Warning |
| product | [1] | **8716867000016** Active power |
| objectAggregation | [1] | **A01** Area |
| in_Domain.mRID | [1] | EIC code of area where the energy is going to |
| measurement_Unit.name | [1] | **MAW** MW |

| IEC CIM Attribute | Cl. | Code and description |
|---|---|---|
| curveType | [1] | **A03** Variable sized Block. |
| ***Series_Period*** | [1..*] | |
| timeInterval | [1] | The start and end time of the period. |
| 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:<br>PnYnMnDTnHnMnS.<br>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.<br>I.e. **PT1M** or **PT5M** |
| ***Point*** | [1..*] | |
| position | [1] | The position of the observation within the time series. Sequential value beginning with 1. |
| quantity | [1] | Quantity. |

**Table 8:** Usage of ESS Schedule Document, NBM schedules: ESS Schedule

## 5.5 NBM Measurement Data Market Document (CIM based NBM document)

The *NBM Measurement Data Market Document* is developed by NBM, see [14].

### *5.5.1 Class diagram: NBM Measurement Data Market Document (CIM based NBM document)*

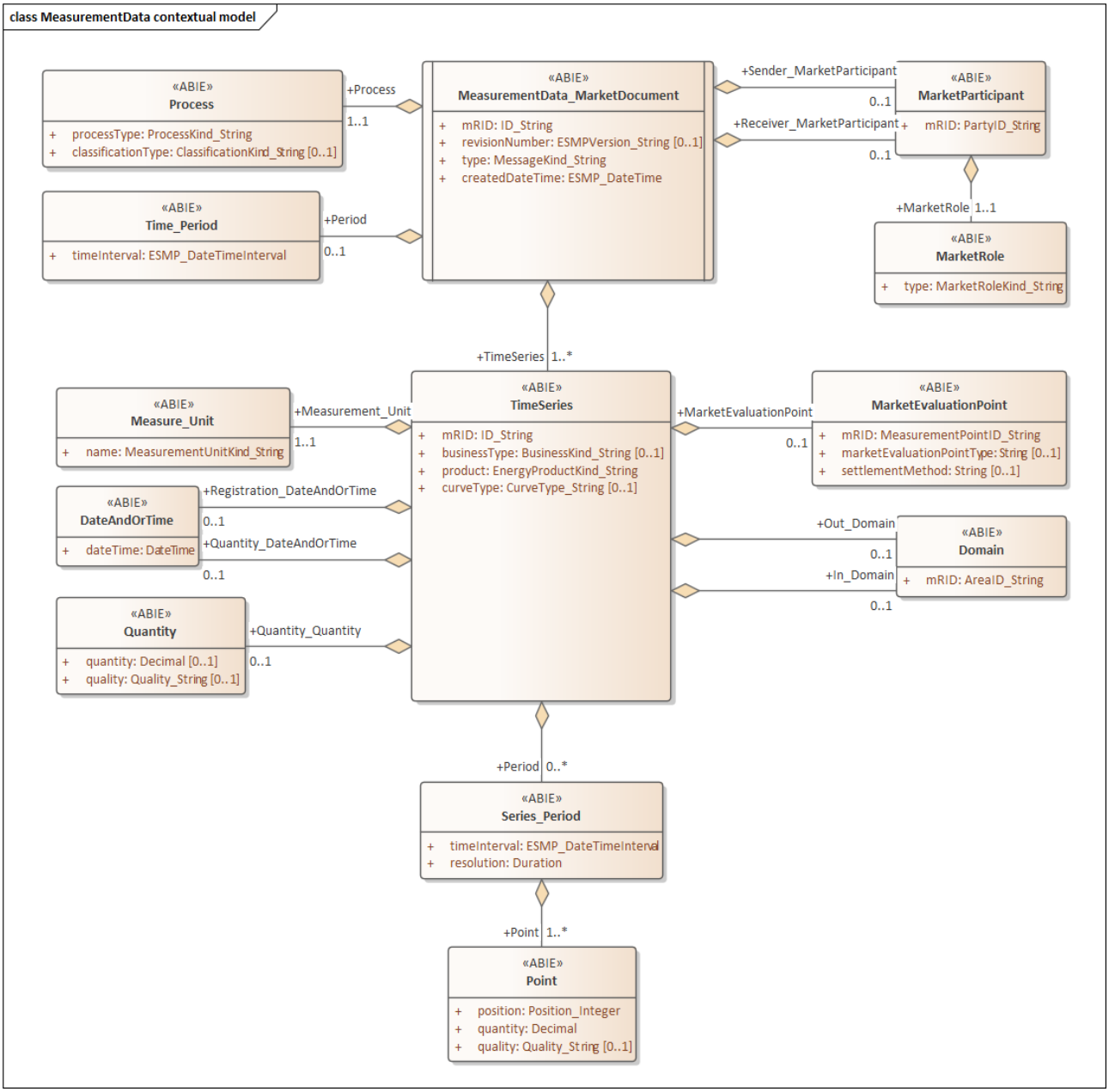


**Figure 22:** Class diagram: NBM Measurement Data Market Document (CIM based NBM document)

### *5.5.2 Class diagram: NBM Measurement Data Market Document (CIM based NBM document)*

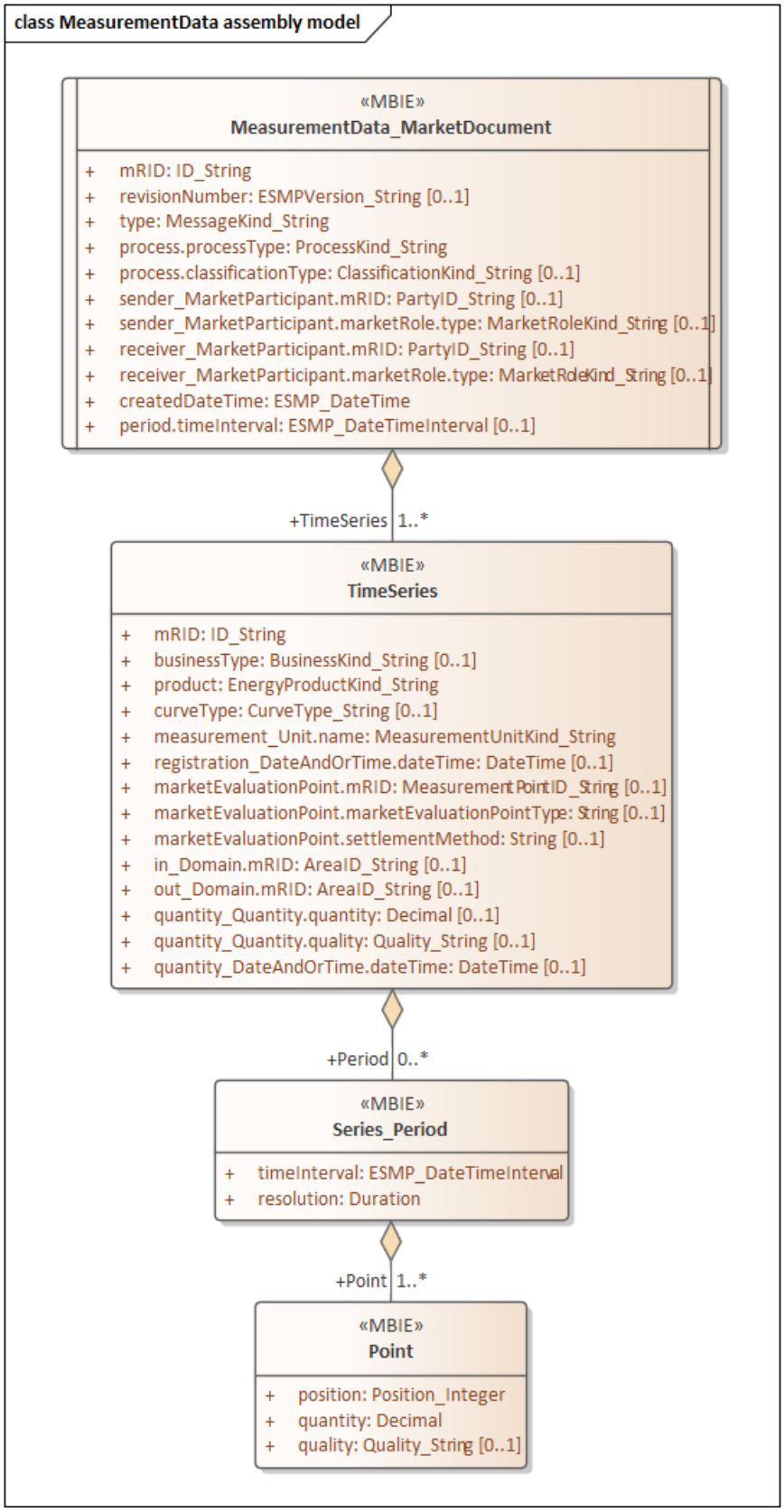


**Figure 23:** Class diagram: NBM Measurement Data Market Document (CIM based NBM document)

### *5.5.3 Attribute usage: NBM Measurement Data Market Document (CIM based NBM document)*

The NBM Measurement Data Market Document are used in the following exchanges:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 1.0, NBM measured flow point value TSO
  - 1.1, NBM measured flow historic TSO
  - 1.2, NBM frequency point value
  - 1.3, NBM frequency historic

| Attribute | Cl. | Code and description |
|---|---|---|
| ***MeasurementData_MarketDocument*** | | |
| mRID | [1] | Unique identification of the document.<br>**UUID** is advised. |
| type | [1] | The coded type of a document.<br>**A45** Measurement Value Document |
| process.processType | [1] | The identification of the nature of process that the document addresses.<br>**A39** Synchronisation process<br>**Z13** Corrected real time values |
| process.classificationType | [0..1] | The classification mechanism used to group a set of objects together within a business process. The grouping may be of a detailed or a summary nature.<br>**A02** Summary Type |
| receiver_MarketParticipant.mRID | [0..1] | Identification of the party who is receiving the schedules.<br>50V000000000241J (NAP). |
| receiver_MarketParticipant. marketRole.type | [0..1] | The identification of the role played by a market player.<br>**A33** Information receiver |
| createdDateTime | [1] | Date and time for creation of the document. |
| ***Time Series*** | **[1..*]** | |
| mRID | [1] | Unique ID of the time series. |
| businessType | [1] | The identification of the nature of the time series.<br>*NBM:*<br>**A64** Meter Measurement data<br>=> Used when measure_Unit.name = MAW (dependency from: NBM Measured Flow Point Value TSO)<br>**C57** Metered frequency => Used when measure_Unit.name = HTZ |
| product | [1] | The identification of the nature of an energy product such as power, energy, reactive power, etc.<br>**8716867000016** Active power |
| curveType | [1] | The identification of the coded representation of the type of curve being described.<br>**A02** Point |

| Attribute | | Cl. | Code and description |
|---|---|---|---|
| measurement_Unit.name | | [1] | The identification of the formal code for a measurement unit (UN/ECE Recommendation 20).<br>**HTZ** Hertz (when businessType = **C57**)<br>**MAW** MW |
| in_Domain.mRID | | [1] | The unique identification of the domain, i.e. EIC code of area where the energy is going to. |
| out_Domain.mRID | | [1] | The unique identification of the domain, i.e. EIC code of area where the energy is coming from. |
| Only used for NBM Measured Flow Point Value TSO and NBM measured frequency | quantity_Quantity.quantity | [1] | *NBM Measured Flow Point Value TSO:*<br>The quantity value.<br>*NBM Measured Flow Historic TSO:*<br>Not used |
| | quantity_Quantity.quality | [0..1] | *NBM Measured Flow Point Value TSO:*<br>**A01** Adjusted<br>**A02** Not available<br>**A03** Estimated<br>**A04** As provided<br>**A05** Incomplete<br>**A06** Calculated<br>*NBM Measured Flow Historic TSO:*<br>Not used |
| | quantity_DateAndOrTime.dateTime | [1] | Date and time as per ISO 8601:<br>YYYY-MM-DDThh:mm:ss.sssZ. |

| Attribute | | Cl. | Code and description |
|---|---|---|---|
| Only used for NBM Measured Flow Historic TSO | ***Series_Period*** | **[1..*]** | |
| | timeInterval | [1] | The start and end date and time of the time interval of the period in question. |
| | resolution | [1] | The definition of the number of units of time that compose an individual step within a period.<br>The time resolution is always the difference between the Time Interval End and the Time Interval Start.<br>*NBM Measured Flow Point Value TSO:*<br>Not used.<br>*NBM Measured Flow Historic TSO:*<br>**PT10S** |
| | ***Point*** | **[1..*]** | |
| | position | [1] | The position of the observation in a time series. |
| | quantity | [1] | The quantity for the interval in question. |
| | quality | [0..1] | The quality of the information being provided. This quality may be estimated, not available, as provided, etc.<br>*NBM Measured Flow Point Value TSO:*<br>Not used.<br>*NBM Measured Flow Historic TSO:*<br>**A01** Adjusted<br>**A02** Not available<br>**A03** Estimated<br>**A04** As provided<br>**A05** Incomplete<br>**A06** Calculated |

**Table 9:** Attribute usage: NBM Measurement Data Market Document (CIM based NBM document)

### *5.5.4 Dependency matrix for NBM Measurement Data Market Document*

| Document Type | Process Type | Business Type | measurement_Unit.name |
|---|---|---|---|
| **A45** Measurement Value Document | **A39** Synchronisation process | **A64** Meter Measurement data | **MAW** MW |
| | | **C57** Metered frequency | **HTZ** Hertz |
| | **Z13** Corrected real time values | **A64** Meter Measurement data | **MAW** MW |

**Table 10:** Dependency matrix for ERRP Activation Document

## 5.6 Balancing Market Document (IEC/CIM 62325-451-6, Ed. 2.1)

The *Balancing Market Document* is developed by ENTSO-E/WG-EDI, see [1].

### *5.6.1 Class diagram: Balancing Market Document contextual model*

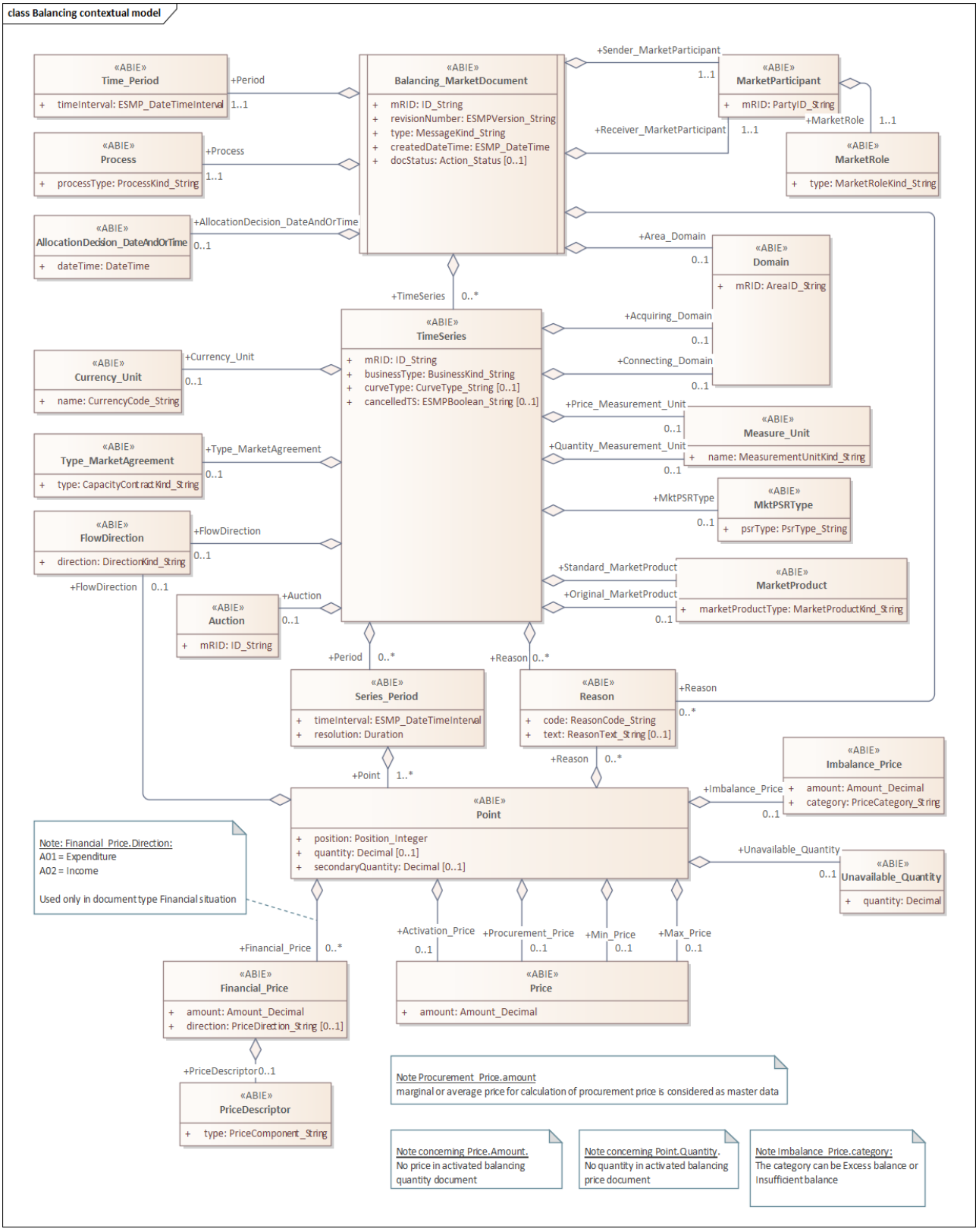


**Figure 24:** Class diagram: Balancing Market Document contextual model

### 5.6.2 Class diagram: Balancing Market Document assembly model

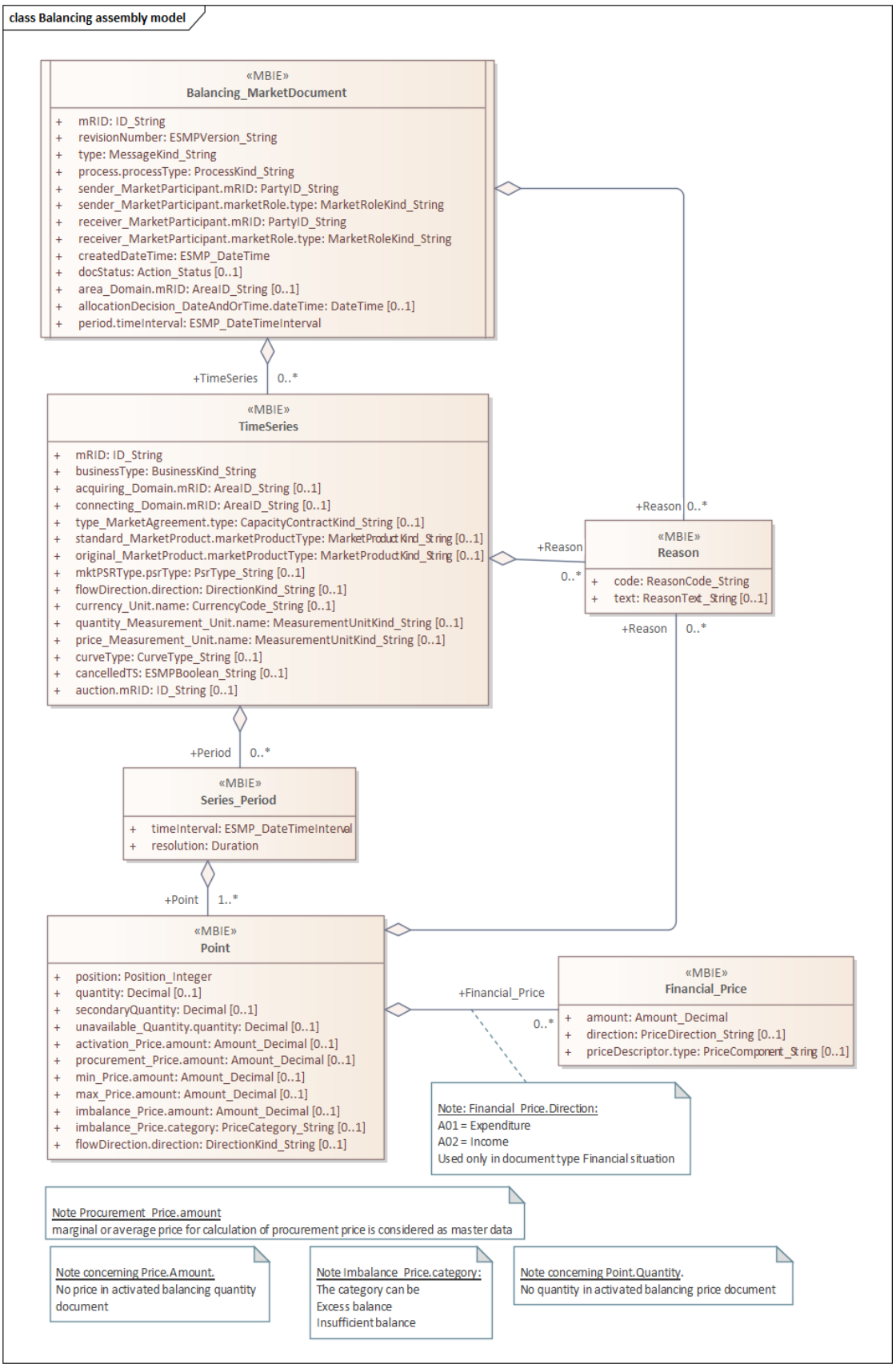


**Figure 25:** Class diagram: Balancing Market Document assembly model

### *5.6.3 Attribute usage: Balancing Market Document*

The Balancing Market Document is used in the following exchanges:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 4.1, Price report
  - 4.2, Price report
  - 4.3, Price report
  - 4.4, Price report
  - 4.8, Daily exchange report
  - 4.9, Traded volume
  - 4.10, Balance regulation market price

| Attribute | Cl. | Code and description |
|---|---|---|
| ***Balancing _MarketDocument*** | | |
| mRID | [1] | Unique identification of the document. |
| revisionNumber | [1] | Fixed 1. |
| type | [1] | **A38** Reserve Allocation Result (Operational bids)<br>**A44** Price document |
| process.processType | [1] | **A47** Manual frequency restoration reserve |
| 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 | [1] | Identification of the party who is receiving the schedules. |
| receiver_MarketParticipant. marketRole.type | [1] | **A04** System Operator<br>**A08** Balance responsible party<br>**A11** Market operator (NBM)<br>**A35** MOL Responsible<br>**A38** Reconciliation Responsible<br>**A46** Balancing Service Provider |
| createdDateTime | [1] | Date and time for creation of the document. |
| controlArea_Domain.mRID | [1] | Nordic Market Area, National Area or Bidding Zone. |
| period.timeInterval | [1] | The start and end date and time for a given interval. |
| ***Time Series*** | **[1..*]** | |
| mRID | [1] | Unique ID of the time series. |
| businessType | [1] | **A01** Production<br>**A04** Consumption<br>**B23** Consumption imbalance price (Balance regulation market price in dominant direction)<br>**C57** Metered frequency |
| acquiring_Domain.mRID | [1] | Relevant area for the market. |
| currency_Unit.name | [1] | Any valid ISO 3 letter currency code, e.g.:<br>**DKK** Danish Kroner<br>**EUR** EURO<br>**NOK** Norwegian Kroner<br>**RUB** Russian Rubel<br>**SEK** Swedish Kronor |

| Attribute | Cl. | Code and description |
|---|---|---|
| quantity_Measure_Unit.name | [0..1] | **MWH** MWh<br>**HTZ** Hz<br>Not used when only sending prices. |
| price_Measure_Unit.name | [0..1] | **MWH** MWh<br>Shall be used when sending a price, otherwise not used. |
| ***Series_Period*** | **[1..*]** | |
| timeInterval | [1] | The start and end date and time of the time interval of the period in question. |
| resolution | [1] | The time resolution is always the difference between the Time Interval End and the Time Interval Start. |
| ***Point*** | **[1..*]** | |
| position | [1] | The position of the observation in a time series. |
| quantity | [1] | The quantity for the interval in question. |
| activation_Price.amount | [0..1] | The price for the interval in question<br>Only used when sending prices |
| imbalance_Price.amount | [0..1] | The imbalance price used for Business Type **B69**<br>Only used when sending prices |

**Table 11:** Attribute usage of Balancing Market Document

### *5.6.4 Dependency matrix for Balancing Market Document*

| Balancing Market Document | | TimeSeries | | | |
|---|---|---|---|---|---|
| type | receiver_ MarketParticipant. marketRole.type | businessType | quantity_ Measure_ Unit.name | price_ Measure_ Unit.name | Imbalance Price |
| **A38** Reserve Allocation Result (Operational bids) | **A04** System Operator<br>**A08** Balance responsible party<br>**A11** Market operator (NBM)<br>**A35** MOL Responsible<br>**A38** Reconciliation Responsible<br>**A46** Balancing Service Provider | **A01** Production | **MWH** | **MWH** | |
| | | **A04** Consumption | **MWH** | **MWH** | |
| | | **B23** Consumption imbalance price (Balance regulation market price in dominant direction) | **MWH** | **MWH** | **Yes** |
| | | **C57** Metered frequency | **HTZ** | | |
| **A44** Price document | **A04** System Operator<br>**A08** Balance responsible party<br>**A11** Market operator (NBM)<br>**A35** MOL Responsible<br>**A38** Reconciliation Responsible<br>**A46** Balancing Service Provider | **A01** Production<br>**A04** Consumption<br>**B23** Consumption imbalance price (Balance regulation market price in dominant direction)<br>**C57** Metered frequency | | | |

**Table 12:** Dependency matrix for Balancing Market Document

## 5.7 Problem Statement Market Document (IEC62325-451-5 Ed.2)

The Problem Statement Market Document is developed by ENTSO-E/WG-EDI, see [1].

### *5.7.1 Class diagram: Problem Statement Market Document contextual model*

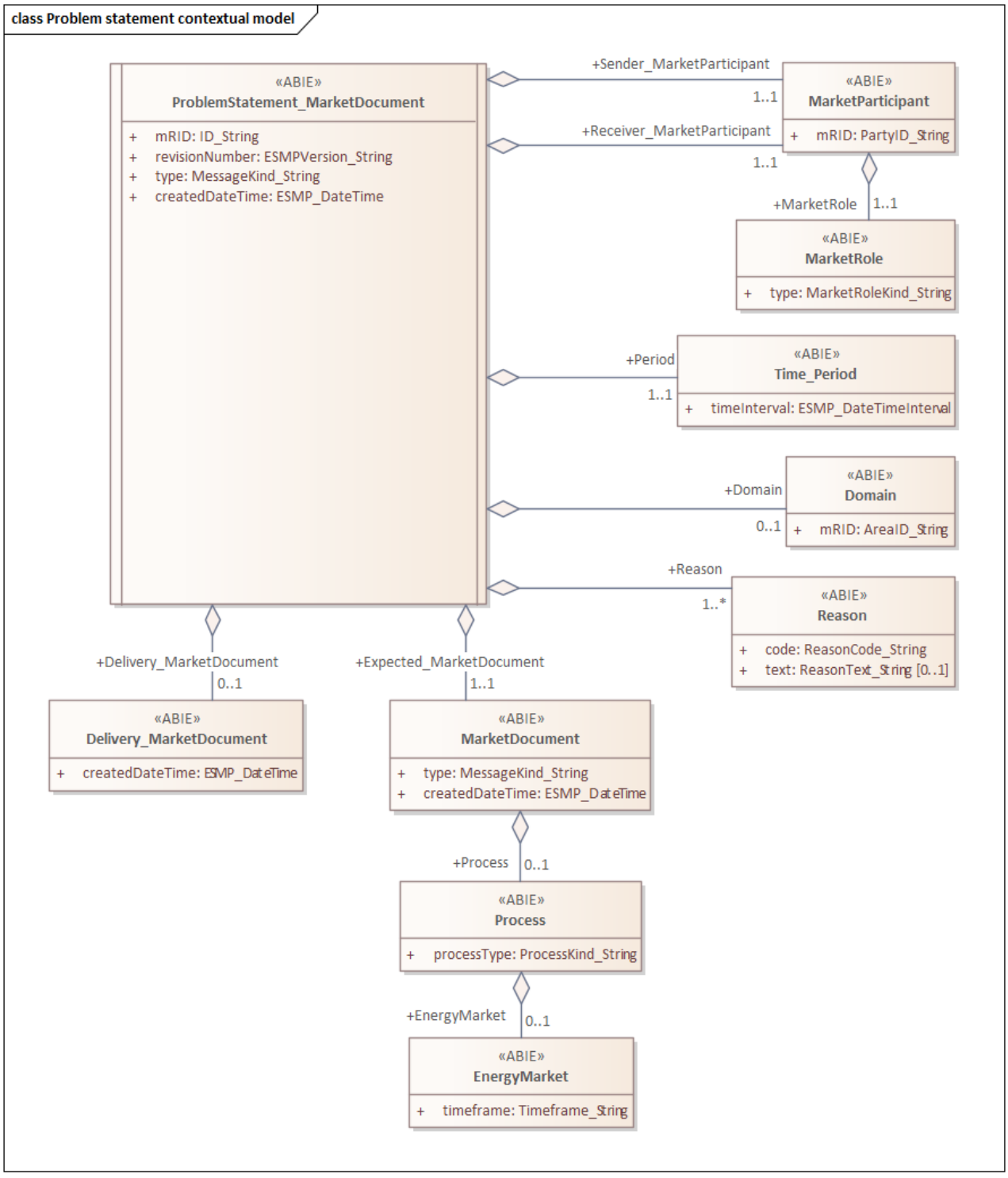


**Figure 26:** Class diagram: Problem Statement Market Document contextual model

### 5.7.2 Class diagram: Problem Statement Market Document assembly model

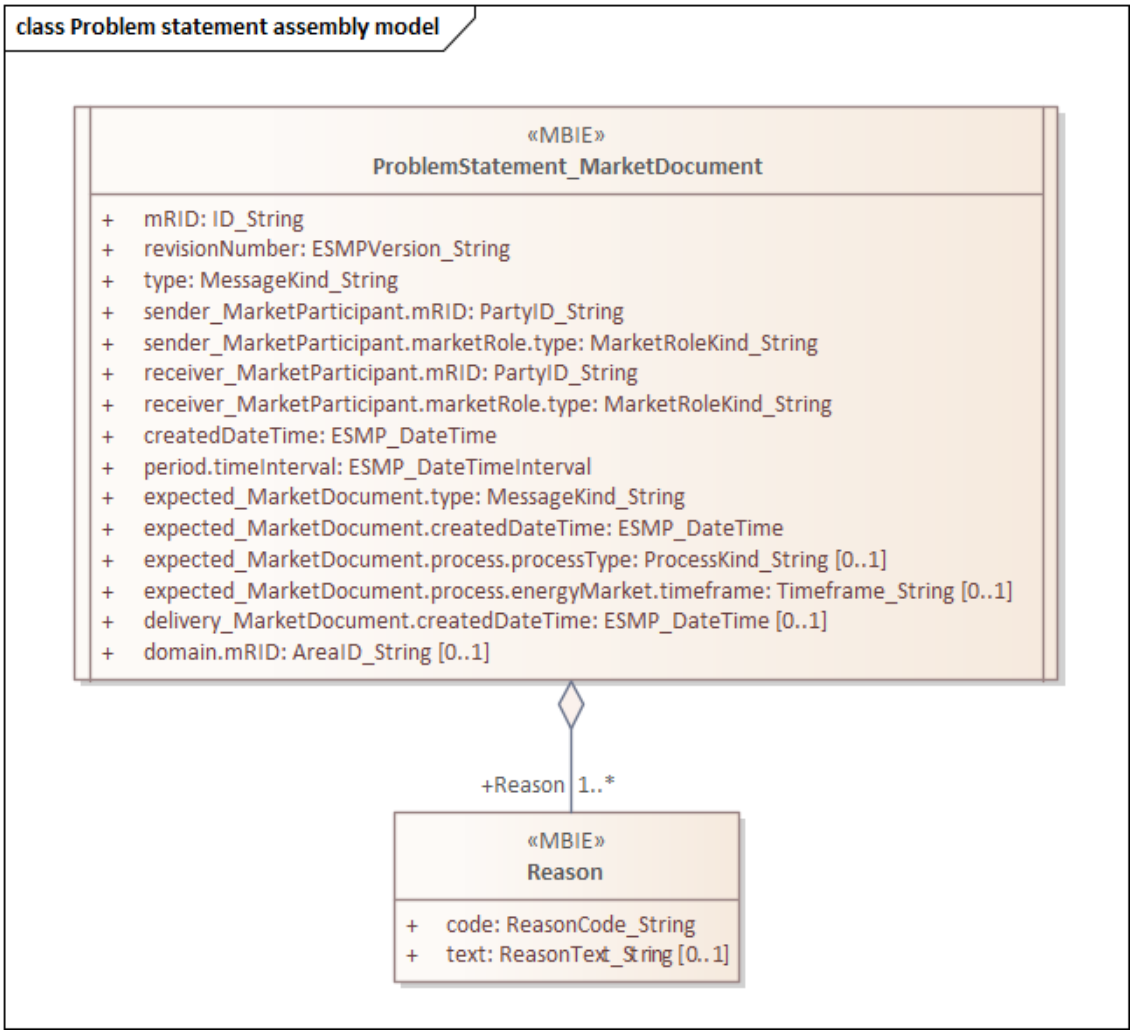


**Figure 27:** Class diagram: Problem Statement Market Document assembly model

### 5.7.3 Attribute usage: Problem Statement Market Document

The Problem Statement Market Document is used in the following exchange:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 3.1, ProblemStatement Document (TSO)

| Attribute | Cl. | Code and description |
|---|---|---|
| ***ProblemStatement _MarketDocument*** | | |
| mRID | [1] | Unique identification of the document.<br>**UUID** is advised. |
| revisionNumber | [1] | Fixed 1. |
| type | [1] | **A34** Escalation document<br>**A35** Trouble shooting document. |
| sender_MarketParticipant.mRID | [1] | Identification of the party who is sending the document, e.g. the document owner. |

| Attribute | Cl. | Code and description |
|---|---|---|
| sender_MarketParticipant. marketRole.type | [1] | **A35** MOL Responsible |
| receiver_MarketParticipant.mRID | [1] | Identification of the party who is receiving the document, e.g. the TSO. |
| receiver_MarketParticipant. marketRole.type | [1] | **A04** System Operator |
| createdDateTime | [1] | Date and time for creation of the document. |
| period.timeInterval | [1] | The start and end date and time for a given interval. |
| expected_MarketDocument.type | [1] | The coded type of the document expected (not received) or not received (escalation) document.<br>**A31** Agreed capacity<br>**A34** Escalation<br>**A35** Trouble shooting<br>**A66** Final MOL |
| expected_MarketDocument.createdDateTime | [0..1] | The date and time that the document was expected (not received) or not received (escalation). |
| expected_MarketDocument.process.processType | [1] | The process that the expected document is directed at.<br>This process is only to be defined if the expected document addresses a specific process otherwise it is optional.<br>**A47** Manual frequency restoration reserve |
| delivery_MarketDocument.createdDateTime | [1] | The date and time when the document is expected to be prepared for transmission by the application of the sender. |
| domain.mRID | [0..1] | The unique identification of the domain. |
| ***Reason*** | [1..*] | The reason for the transmission of the document. If needed, additional information may be provided in the reason text. |
| code | [1] | The motivation of an act in coded form.<br>**A91** Expected data not received<br>**B11** Cooperation area problem<br>**B18** failure |
| text | [1] | The textual explanation corresponding to the reason code, see AOF Nordic Libra. |

**Table 13:** Attribute usage Problem Statement Market Document

## 5.8 NBM Status Market Document (CIM based NBM document)

The *NBM Status Market Document* is developed by NBM, see [14].

### *5.8.1 Class diagram: NBM Status Contextual Model*

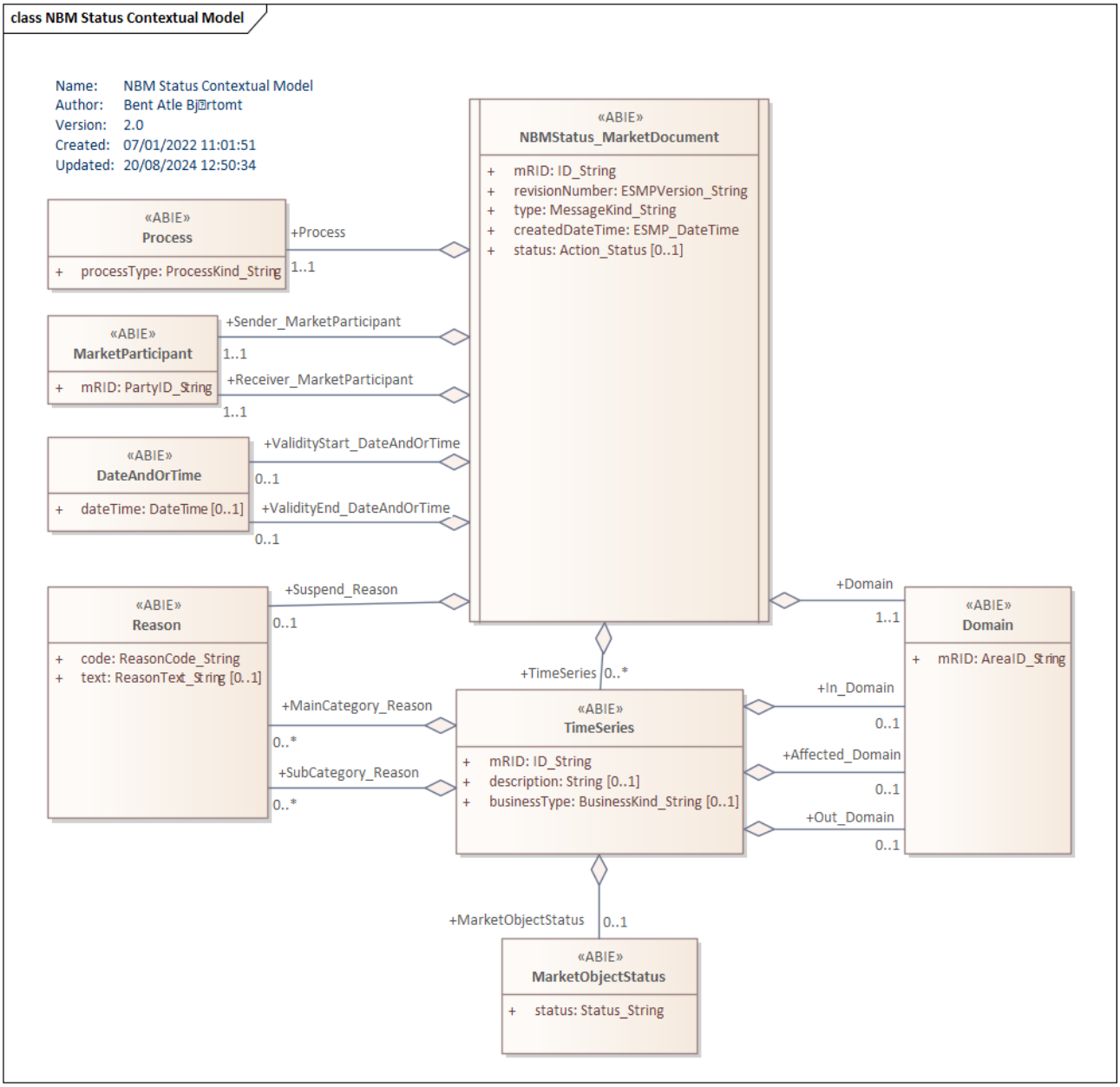


**Figure 28:** Class diagram: NBM Status Contextual Model

### 5.8.2 Class diagram: NBM Status assembly model

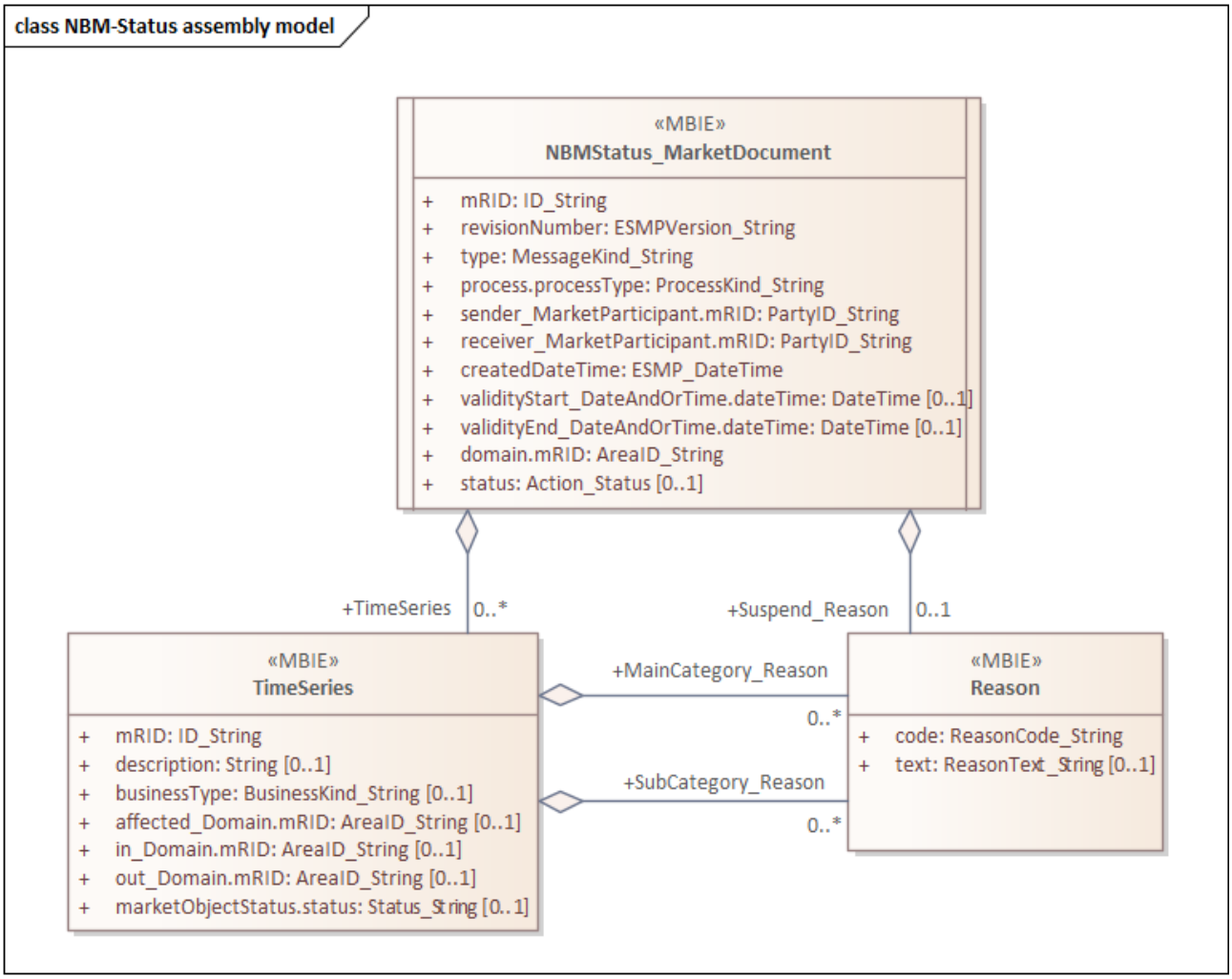


**Figure 29:** Class diagram: NBM Status assembly model

### *5.8.3 Attribute usage: NBM Status Market Document*

The NBM Status Market Document is used in the following exchanges:

- Table 1: ENTSO-E documents used in the Nordic operational system*:*
  - 3.2, System Status (TSO)
  - 3.3, System Status (TSO)

| Attribute | Cl. | Code and description |
|---|---|---|
| ***NBMStatus_MarketDocument*** | | |
| mRID | [1] | Unique identification of the document.<br>**UUID** is advised. |
| revisionNumber | [1] | Fixed 1. |
| type | [1] | **A34** Escalation document<br>**B32** Operational state document |
| process.processType | [1] | **A47** Manual frequency restoration reserve |
| sender_MarketParticipant.mRID | [1] | Identification of the party who is sending the document |
| sender_MarketParticipant.<br>marketRole.type | [1] | **A04** System Operator |
| receiver_MarketParticipant.mRID | [1] | Identification of the party who is receiving the document. |
| receiver_MarketParticipant.<br>marketRole.type | [1] | **A32** Market information aggregator<br>**A04** System Operator |
| createdDateTime | [1] | Date and time for creation of the document |
| validityStart_DateAndOrTime.dateTime | [0..1] | The status is valid from this validity start date and time |
| validityEnd_DateAndOrTime.dateTime | [0..1] | The status is valid until this validity end date and time |
| domain.mRID | [1] | The unique identification of the domain |
| status | [0..1] | **A34** Rejected<br>**A37** Confirmed |
| ***Time Series*** | **[0..*]** | |
| mRID | [1] | Unique ID of the time series. |
| affected_Domain.mRID | [0..1] | To be used when the status only concerns a Bidding Zone or an Area. Otherwise use in_Domain and out_Domain. |
| in_Domain.mRID | [0..1] | To be used when the status is used to indicate something between Bidding Zones or Areas. Otherwise use affected_Domain. |
| out_Domain.mRID | [0..1] | To be used when the status is used to indicate something between Bidding Zones or Areas. Otherwise use affected_Domain. |

| Attribute | Cl. | Code and description |
|---|---|---|
| marketObjectStatus.status | [1] | Following statuses are used according to NBM Local description:<br>**Z01** Warning (Yellow)<br>**Z02** Emergency (Red)<br>**Z03** Normal (Reset to normal)<br>Business rules:<br>• A status message can start as a *Yellow* (**Z01**)<br>• A Status Message can start as a *Red* (**Z02**) message or be changed from a *Yellow* (**Z01**) to a *Red* (**Z02**)<br>• A status message must end with a *Reset to normal* (**Z03**) |
| ***Suspend_Reason*** | **[1]** | |
| mainCategory_code | [1] | Local NBM reason codes, not public (NMEG/ENTSOE) Code:<br>**001** OK<br>**002** Missing AOF Result<br>**003** PSD<br>**004** Sanity Check failed<br>**005** Manual Override |
| mainCategory_text | [0..1] | The textual explanation corresponding to the reason code |
| ***MainCategory_Reason*** | **[1]** | |
| mainCategory_code | [1] | Local NBM reason codes, not public (NMEG/ENTSOE) Code:<br>**011** Data quality or IT malfunction<br>**012** Incident affecting balancing<br>**013** Incident in grid<br>**014** Status State<br>**015** General info<br>**051** ???<br>**052** ???<br>**053** ???<br>**054** ???<br>**055** ??? |
| mainCategory_text | [0..1] | Required when reason.code= **011** and **015** ,otherwise recommended. |
| ***Subcategory_Reason*** | [0..1] | |
| Subcategory code | [0..1] | 100/…/500… |
| Subcategory text | [0..1] | The textual explanation corresponding to the reason code |

**Table 14:** Attribute usage NBM Status Market Document

### *5.8.4 Dependency matrix for NBM Status Market Document*

| Document Type | Validity Start/End | Status | Time Series |
|---|---|---|---|
| **A34** Escalation document | • "Reset to normal" must be sent according to the entry criteria.<br>• validityEnd_DateAndOrTime.dateTime does not imply that you do not need to send "Reset to normal". | Not used | Required |
| **B32** Operational state document | Always 1 MTU | Required:<br>**A34** Rejected<br>**A37** Confirmed | Not used |

**Table 15:** Dependency matrix for NBM Status Market Document