BRS
(Business Requirement Specification)

Nordic Scheduling and Ancillary Services Processes

A market model for data exchange

Business process:	Nordic Schedules document exchange
Version:	4.0.B
Status:	Approved by NMEG
Date:	June 18th, 2025

CONTENT

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 schedules, prognosis and reserve resources (ancillary services) in the Nordic countries. The focus of the document is the business aspects of the document exchanges. The basis for the BRS is among others ENTSO-E Implementation Guides [1], the ebIX®, EFET and ENTSO-E Harmonised role model [6]and relevant IEC standards.

1.2 About Nordic Ediel BRSs

The NMEG Ediel Business Requirement Specifications (BRSs) describes business processes where data is exchanged between market participants in the Nordic energy market based on the UN/CEFACT Modelling Methodology (UMM). A BRS is a tool that helps the participants in the Nordic energy market to implement effective and harmonised data-exchange processes. The Ediel BRSs can be seen as a framework designed to improve communication between stakeholders, reduce development time, and minimise errors.
The Nordic Ediel BRSs covers all aspects of a business requirement specification for a specific data-exchange process and purpose, including functional requirements, non-functional requirements (partly), UseCases, and data flows.
NMEG Ediel BRSs will as far as possible be based on already available standards and best practices, such as:

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

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

1.3 Nordic Energy Domain Model

A Nordic Energy Market Domain model, giving an overall overview of the structure and processes used in the Nordic Energy market, can be found in [9].

1.4 NMEG - Nordic Market Expert Group

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

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, see http://www.iec.ch/:

- Part 351 CIM European market model exchange profile
- 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] NBS BRS (combined NBS BRS and NBS BRS for TSO-MO), see https://ediel.org/nordic-balance-settlement-nbs/

[4] BRS for Nordic Trading System, see https://ediel.org/common-ediel-documents/

[5] BRS for Determine Transfer Capacity, see https://ediel.org/common-ediel-documents/

[6] The Harmonised Role Model from ebIX®, EFET and ENTSO-E, see ENTSO-E

[7] UML Profile for UN/CEFACT's Modelling Methodology (UMM), Base Module 2.0., (http://www.unece.org/tradewelcome/un-centre-for-trade-facilitation-and-e-business-uncefact/outputs/technical-specifications/uncefact-modelling-methodology-umm.html.

[8] Nordic Ediel Group, Common Nordic XML rules and recommendations, see https://ediel.org/common-ediel-documents/

[9] Nordic Energy Market Domain Model, see https://ediel.org/common-ediel-documents/

[10] 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

1.6 Terms and notation

In this document the term Ancillary services is used for services needed to maintain a stable power system, typically used for instant handling of changes in consumption and outages in generation and transmission.

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.

The term Market schedules is used instead of the ENTSO-E term Schedules when this is applicable and Operational schedules is used instead of the ENTSO-E term Resource schedules when this is applicable.

The terms TSO and System Operator are used interchangeably in this document. The term TSO or System Operator may include the Market Operator.

In this document, the term Corridor is used for a group of power cables/lines, which is the same as the term Connecting line.

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
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

1.7 Change log

Ver/rel/rev	Changed by	Date	Changes
4.0.B	Ove Nesvik	20250618	• Addition of new Business type "**ZA5** Expected imbalance" to the ERRP Planned Resource Schedule Document.
4.0.A	Ove Nesvik	20250516	• Update of the BRS to include the following NBM processes: ○ ACE OL Limits ○ Imbalance Forecast ○ Flows AOF ○ Total Planned Flow-TSO ○ Planned Flow Power Plan Trade TSO ○ Planned flow Day aheadTSO ○ Planned Flow Intraday TSO ○ Planned Flow mFRR TSO ○ Loop Transit solved in Planned Flow Agreed Supportive Power(ASP) TSO ○ Planned Flow Agreed Supportive Power(ASP) TSO ○ Planned Flow Period Shift-Adjustment TSO ○ Planned Flow Replacement acivationReserveTSO ○ Planned Flow Period Shift-Adjustment TSO ○ Expected-countertrade-TSO ○ Plan Production TSO ○ Forecast Total Consumption ○ Production Forecast TSO ○ Total Planned Flow-TSO • Update of chapter 2, 3, 4 and 5 accordingly, including addition of new chapter"5.7 Exchange planned flow" • Editorial corrections.
3.4.A	Ove Nesvik	20241017	• Addition of new chapters "5.5 Process area: Exchange of dynamic HVDC-run-profiles" and "6.5 HVDC Profile Market Document" and update of the rest of the BRS accordingly. • Update of chapter "4 Harmonised roles used in "Exchange schedules" to be in line with the lates Harmonised Electricity Market Role Model.
3.3.B	Ove Nesvik	20240628	• Replaced the Business Type Codes **A10** and **A12** with **A95** and **A96** in chapter "6.2.7. Attribute usage ERRP Planned Resource Schedule Document, Ancillary services schedule" • Addition of clarifying text.
3.3.A	Ove Nesvik	20230626	• Addition of code **A46 (**Balancing Service Provider) as sender role in the ERRP Planned Resource Schedule Document
3.2.A	Ove Nesvik	20230309	• Alignment of roles used in sequence diagrams in chapter "3.2.1 3.2.1 Overview of Nordic Scheduling Process" and sender/receiver roles in the attribute usage tables. • Addition of clarifying text.

Ver/rel/rev	Changed by	Date	Changes
3.1.A	Ove Nesvik	20220919	• Replaced Balance Responsible Party (BRP) with Balancing Service Provider (BSP). • Update of ERRP Planned Resource Schedule Document to latest version, which among others include Curve Type. • Table 8 “Attribute usage ERRP Planned Resource Schedule Document, NBM Detailed schedule” is merged with table 3 “6.1.3 Usage of ESS Schedule Document, NBM schedules: ESS Schedule”. • Update of ERRP Resource Schedule Confirmation Report to latest version, which among others include Curve Type.
3.0.A	Ove Nesvik	20210125	Complete recast of BRS, including: • Addition of CIM versions of all documents. • Removal of all “non-CIM documents”, except for the Outage document. • Addition of NBM related documents. • Updated codes to latest ENTSO-E versions, where applicable.

2 Planning

2.1 Planning 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.

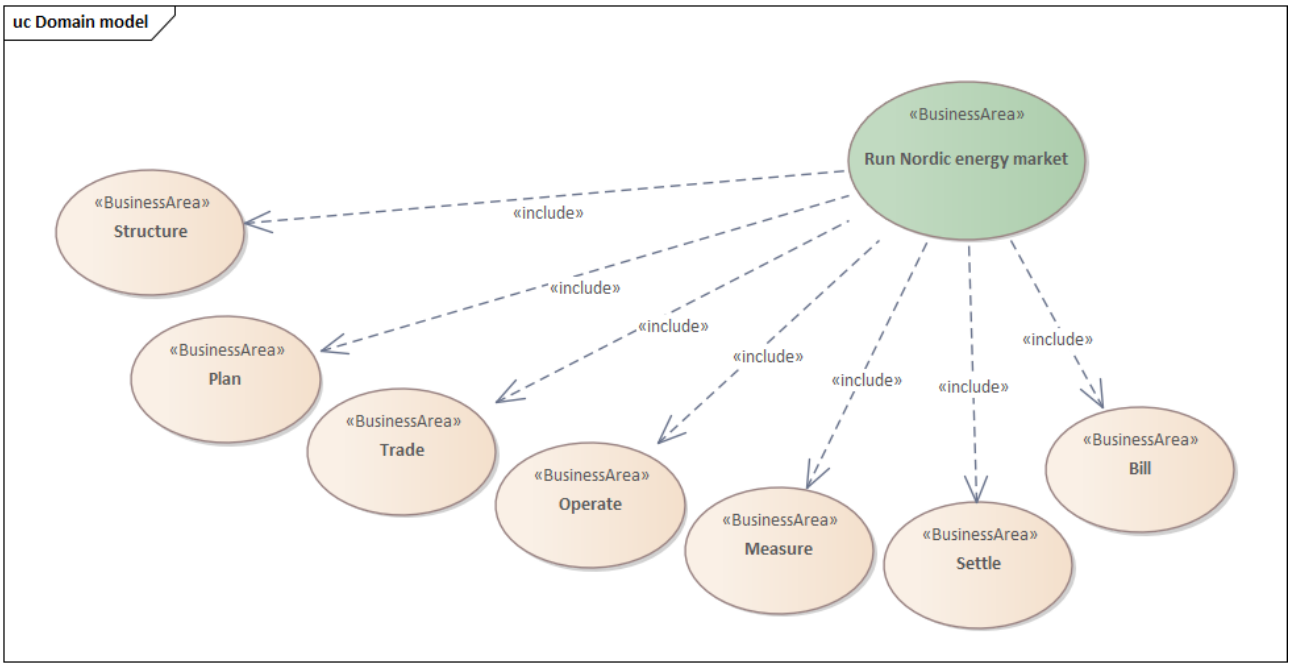

Figure 1: UseCase diagram: Domain model

The Nordic scheduling and ancillary services processes are part of the process area Plan.

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

2.2 Breakdown of the scheduling process within the planning phase

In the rest of this document the Business area (UseCase) Schedule from the Business area Plan is further elaborated.

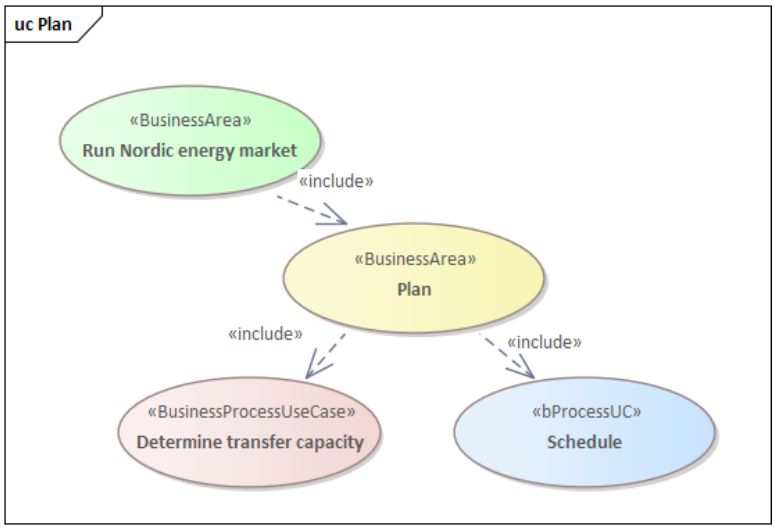

Figure 2: UseCase diagram: The Nordic planning process

The Determine transfer capacity process is documented in a separate BRS, see [5].

The Process area Plan, outlined in **Figure 2**, concerns principally schedules and prognosis supplied by the different Balancing Service Providers and the TSO for a given Scheduling Area or a group of Scheduling Areas. It also deals with the exchange of schedules between two Scheduling Areas via System Operators and the Market Information Aggregator. Some of the resulting schedules are afterwards sent to the Imbalance Settlement Responsible after validation, to be used in the Settlement process. Furthermore, the planning phase, include exchanges related to Reserve resources and Publication of outages.

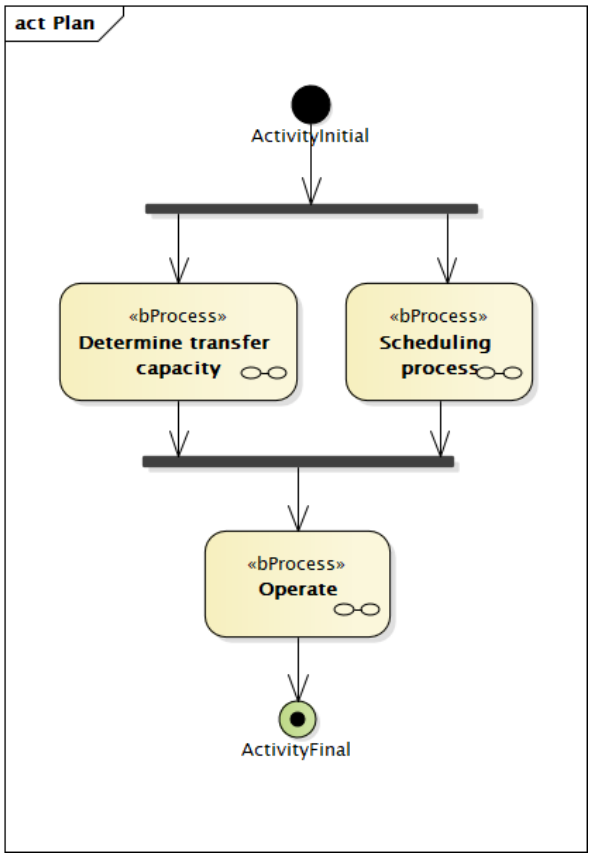

Figure 3: Activity diagram: The Nordic planning process

3 Overview of the Nordic scheduling process

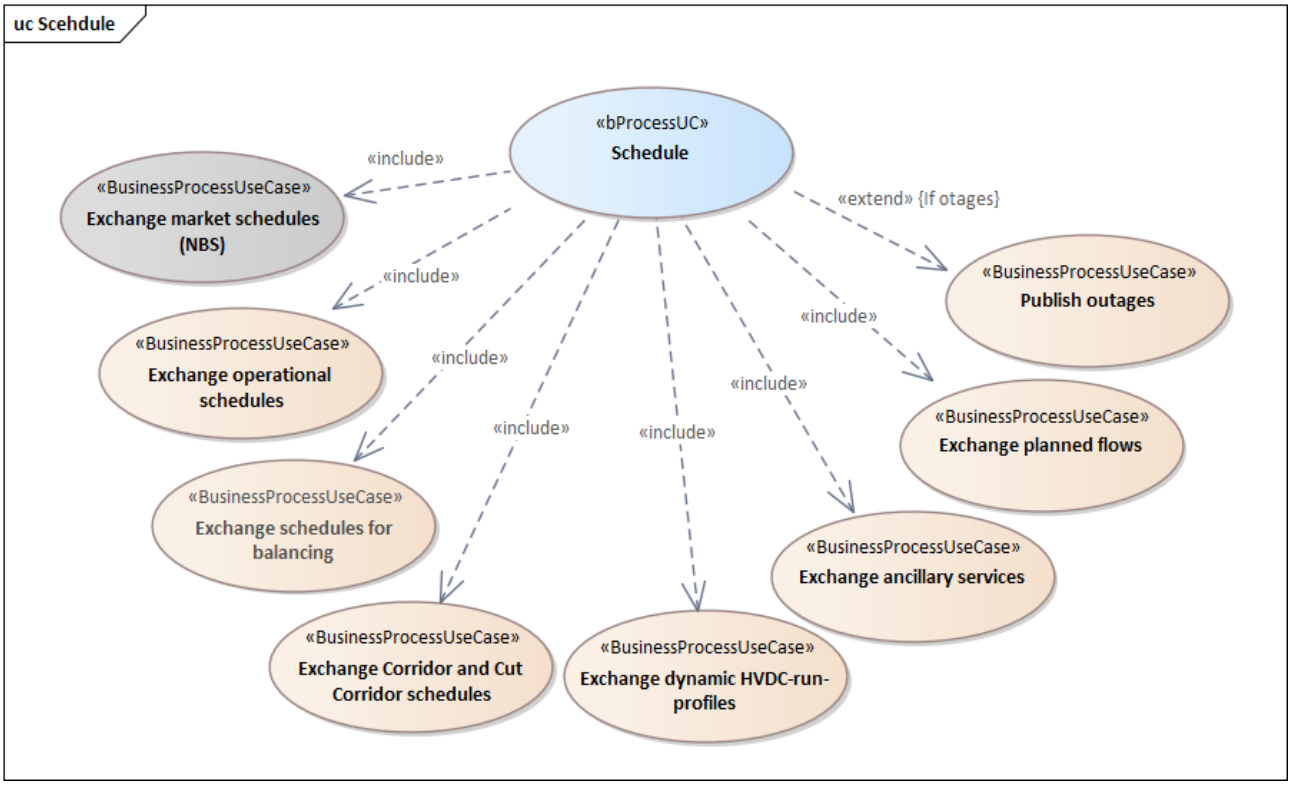

Figure 4: UseCase diagram: The Nordic Scheduling process

In **Figure 4** the Nordic scheduling process is further decomposed into Business Process UseCases. Except for the Business Process Exchange market schedules, which is described in BRS for Nordic Balancing System (NBS) [3], each of these Business Process UseCases will be further described below.

As an overall view, the Balancing Service Providers, operating within one or more Scheduling Areas sends schedules and prognosis to the System Operator, ensuring the correct operation of one or several Scheduling Areas. The System Operator sends the schedules to the Market Information Aggregator for validation and publication.

The basic principle upon which this phase has been based is that all the trades between two Balance Responsible Parties must be notified and coherent. In the case of imbalance, the System Operator must manage the imbalance prior to the operation phase.

In this phase also the publication of outages is handled.

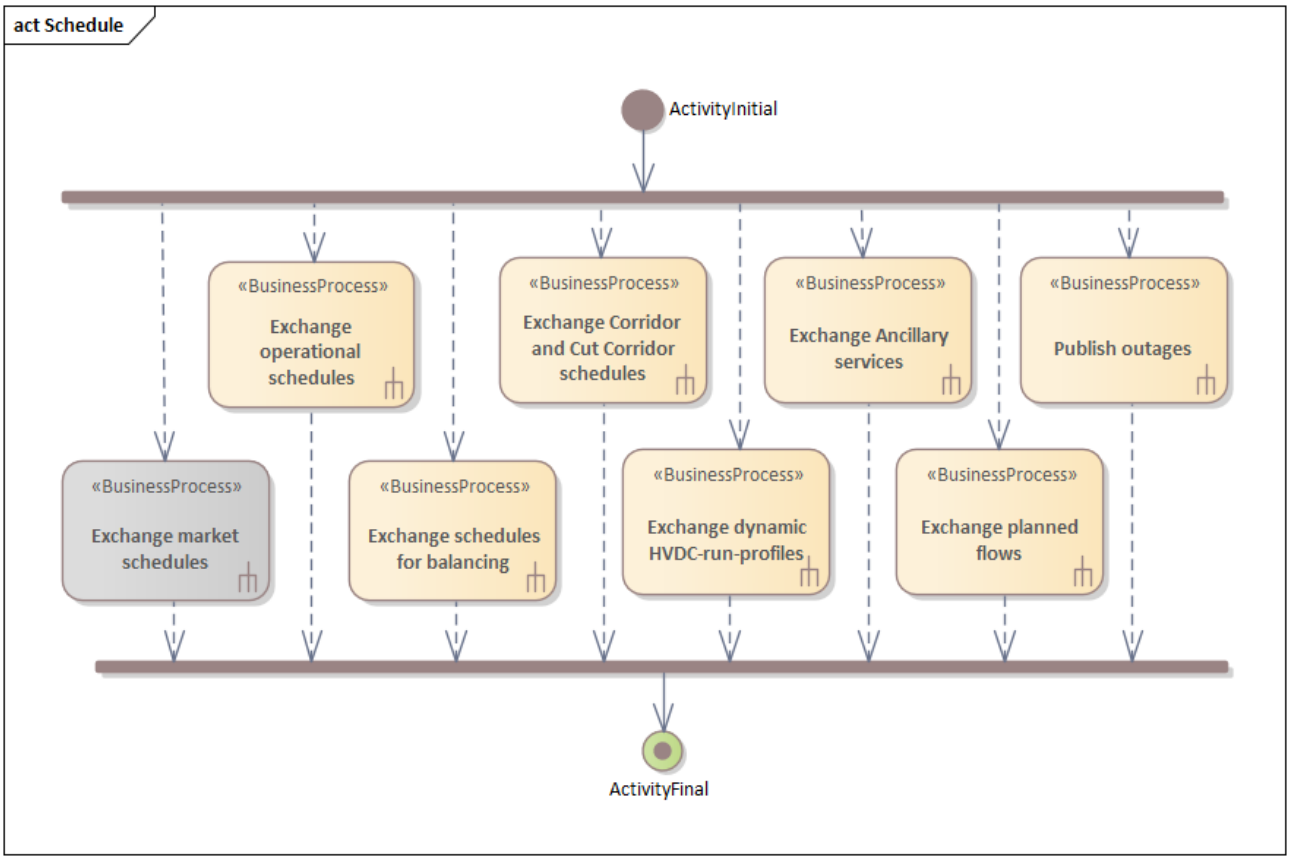

Figure 5: Activity diagram: The Nordic Scheduling process

3.1 Schedule system information flows

The schedule document transmission cycle is composed of the following phases:

1. The initial transmission of the schedule document to the TSO. During this phase the document is verified for coherence. The phase ends with the transmission to the sender of a positive or negative acknowledgement of the time series received and a transmission of the validated schedules to the Market Information Aggregator.
2. In the second phase, the TSO informs the Market Information Aggregator about relevant received schedules and prognosis. The Market Information Aggregator is responsible for publication of the information.
3. In the last phase, the Balancing Service Providers send the schedules to the Imbalance Settlement Responsible as input to the Settlement process.

In addition, the planning phase includes the publication of planned outages.

Related documents are defined according to the UMM Business Data View [7], see chapter 6.

3.2 Schedule system information requirements

This chapter outlines the operational schedules used for operational purposes, while the market schedules are handled by NBS (eSett), see [3].

The information flows concern essentially the day-ahead and intraday scheduling process as seen from a Scheduling Area administered by a System Operator and connected to another Scheduling Area administered by an external System Operator.

To correctly handle load/generation balance prognosis it has become essential to exchange an ever-growing amount of information between all involved parties. So much that the historical phone operations are no longer feasible. The open market requirements demand that the non-discrimination of information also plays its part with added complexity. Amongst the primary requirements is the necessity to provide for energy reserves in order to respond to unexpected events to keep the electricity system operational.

Three types of reserve are collected in order to guarantee an operational network:

Frequency Containment Reserves (FCR) (earlier primary reserves) is instantaneous and is activated automatically as a function of the frequency or to be more exact, the deviation from 50 Hz. The settings of the generators define how much they contribute when there is a frequency deviation. The FCR can be split into FCR-N (FCR Normal), which is automatically activated in both directions around a set point when the frequency varies between 50.10 Hz and 49.90 Hz, and FCR-D, which is automatically activated when the frequency falls below 49.90 Hz or above 50.10 Hz.

Automatic Frequency Restoration Reserves (aFRR) (earlier secondary reserves or fast reserves) is a reserve that within 15 minutes shall be able to eliminate the unbalance between generation and load and thus re-establish the Frequency Containment Reserves (FCR).

Manual Frequency Restoration Reserves (mFRR) (earlier tertiary reserves or slow reserves) shall have such qualities that it can replace the fast reserves. Economical judgement is considered when decision is taken regarding the speed of the slow reserves. The activation of mFRR may be handled manually.

In the future also Fast Frequency Reserves (FFR), which is even faster than FCR, and Replacement Reserve (RR) which is slower than the mFRR, will be introduced.

3.2.1 Overview of Nordic Scheduling Process

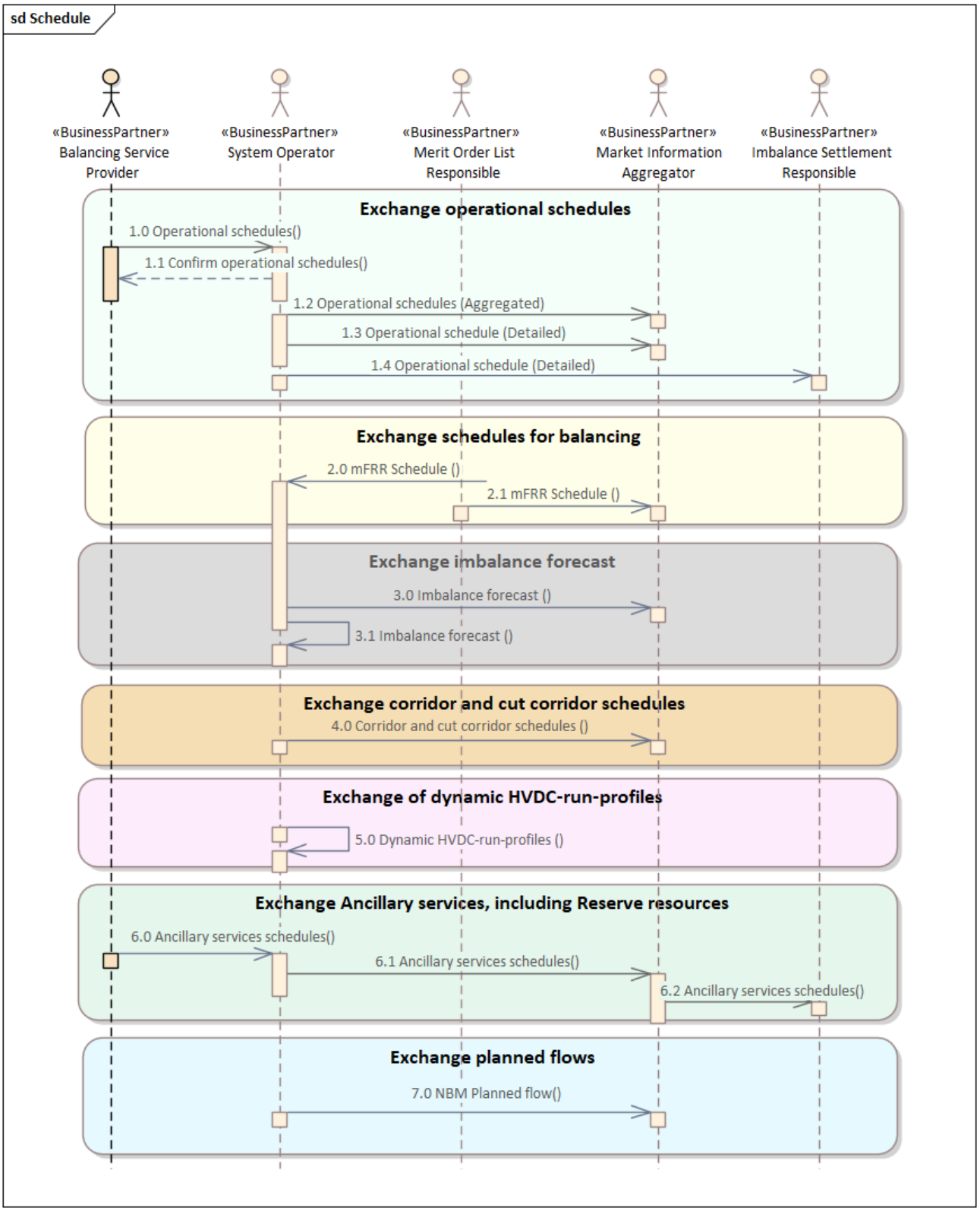

Figure 6: Sequence diagram of operational schedules[1]

[1] In some NBM documents the Market Information Aggregator role may be replaced by the more generic Information Receiver.

Arrow	Roles	Documentation
1.0 Operational schedules	BSP->SO	ERRP Planned Resource Schedule Document, see 6.2.3
1.1 Confirm Operational schedules	SO->BSP	ERRP Resource Schedule Confirmation Report based on IEC62325-351 Ed.3, se 6.3.3.
1.2 Operational schedules (aggregated)	SO->MIA	ESS Schedule Document from IEC62325-451-2 Ed.2 , see 6.1.3.
1.3 Operational schedules (Detailed)	SO->MIA	ESS Schedule Document from IEC62325-451-2 Ed.2, see 6.1.3.
1.4 Operational schedules (Detailed)	SO->ISR	Documented in NBS BRS (combined NBS BRS and NBS BRS for TSO-MO) [3]
2.0 mFRR Schedule	MOL->SO	ESS Schedule Document from IEC62325-451-2 Ed.2 , see 6.1.3.
2.1 mFRR Schedule	MOL->MIA	ESS Schedule Document from IEC62325-451-2 Ed.2 , see 6.1.3.
3.0 Imbalance forecast	SO->MIA	Attribute usage Energy prognosis document, see 6.5.3.
3.1 Imbalance forecast	SO->SO	Attribute usage Energy prognosis document, see 6.5.3.
4.0 Corridor and cut corridor schedules	SO->MIA	ESS Schedule Document from IEC62325-451-2 Ed.2, see 6.1.7.
5.0 Dynamic HVDC-run-profiles	SO->SO	Attribute usage Ediel HVDC Profile Market Document, see 6.4.3.
6.0 Ancillary services schedules	BSP->SO	ERRP Planned Resource Schedule Document, see 6.2: • 6.2.6, Attribute usage ERRP Planned Resource Schedule Document, Ancillary services schedule • 6.2.8, Attribute usage ERRP Planned Resource Schedule Document, Fast Frequency Reserves schedule
6.1 Ancillary services schedules	SO->MIA	ERRP Planned Resource Schedule Document, see 6.2: • 6.2.6, Attribute usage ERRP Planned Resource Schedule Document, Ancillary services schedule • 6.2.8, Attribute usage ERRP Planned Resource Schedule Document, Fast Frequency Reserves schedule
6.2 Ancillary services schedules	MIA->ISR	Documented in NBS BRS (combined NBS BRS and NBS BRS for TSO-MO) [3]
7.0 Planned flow	SO->MIA	ESS Schedule Document from IEC62325-451-2 Ed.2 , see 6.1.5.

Table 1: Documents used for operational schedules

3.2.2 Overview of Nordic Outages Process

The TSO has a complete overview of the tie line maintenance and operation¸ and is able to provide a coherent picture of the situation at a given instance in time. Tie line maintenance and operation is carried out at two levels, the first with the establishment of a tie line maintenance program plan, the second during operation with the discovery of a tie line outage. The System Operator informs the Market Information Aggregator of outages in the system.

The Market Information Aggregator, who in the Nordic countries is played by NOIS, is the one who makes the information available to the public.

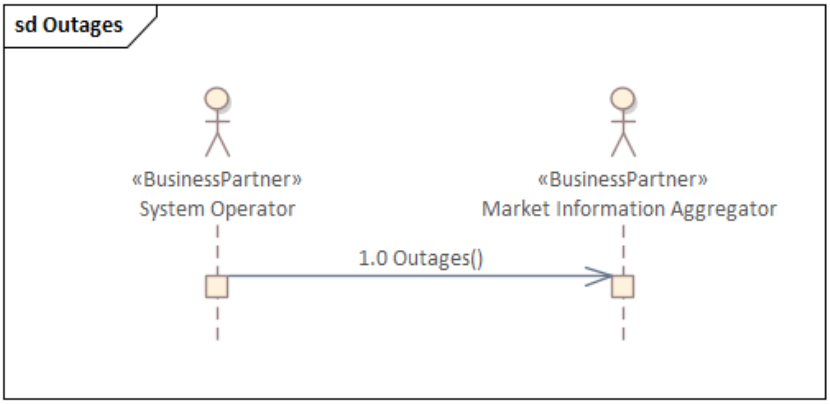

Figure 7: Sequence diagram of outages

Arrow	Documentation
1.0 Outages	Outage Document, see 6.6

Table 2: Document used for outages

The sequence diagram in **Figure 7** outlines the typical context where outage information is sent to the Market Information Aggregator following a particular activity such as the establishment of a planned maintenance program for tie lines or an unexpected outage of a tie line.

4 Harmonised roles used in "Exchange schedules"

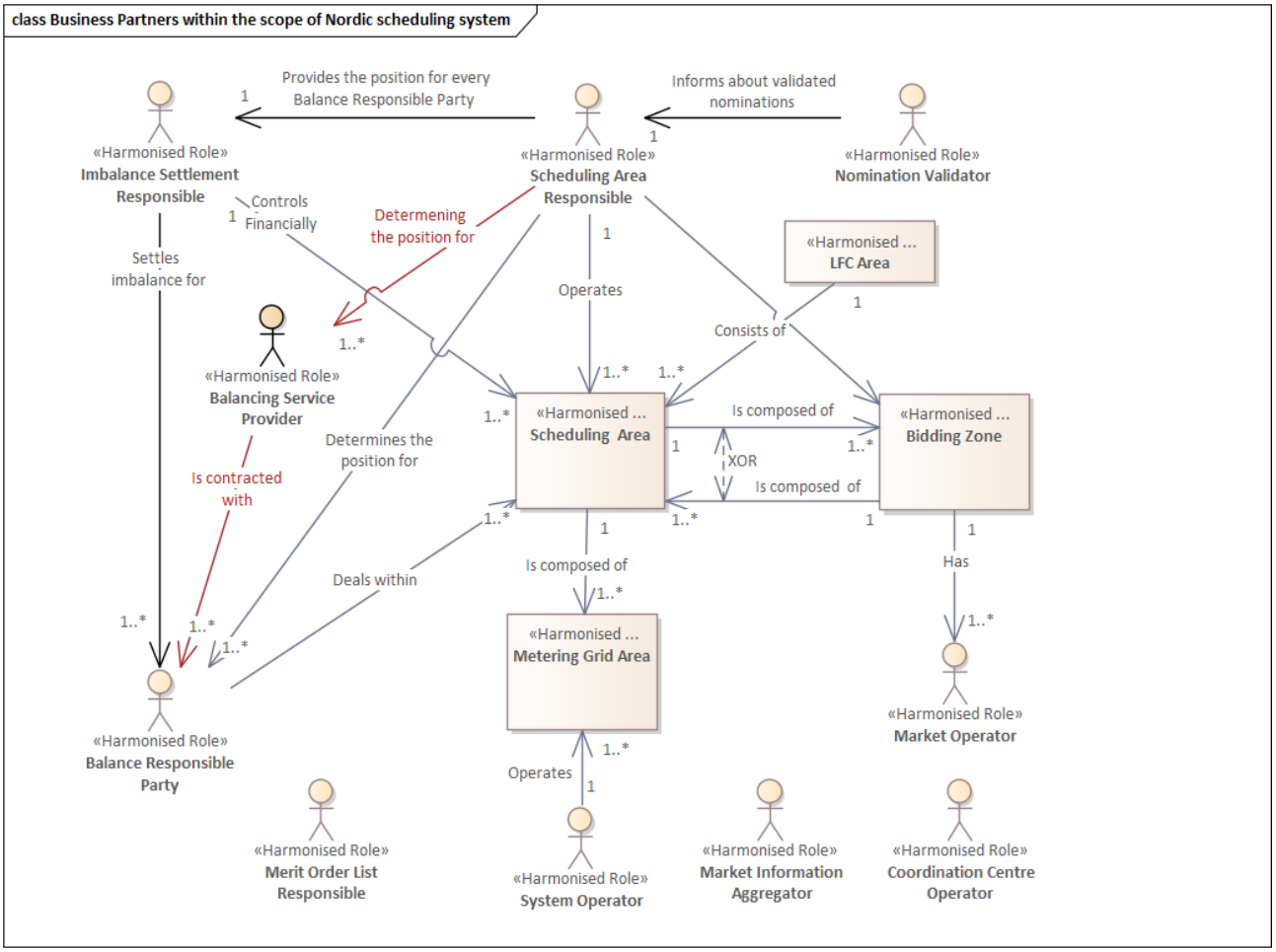

Figure 8: Outline of the Harmonised role model within the scope of Nordic scheduling process

Note: The red arrows are Nordic extensions, not part of the Harmonised Electricity Market Role Model [6].

4.1 Definitions (from the ebIX, EFET and ENTSO-E Harmonised role model [6])

Role/Domain	Definition
Balance Responsible Party	A party financially accountable for its imbalances. **Based on:** Consolidated text: Commission Regulation (EU) 2017/2195 - Art.2 Definitions. **Additional information:** A 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. Imbalance means an energy volume calculated for a Balance Responsible Party and representing the difference between the allocated volume attributed to that Balance Responsible Party and the final position of that Balance Responsible Party, including any imbalance adjustment applied to that Balance Responsible Party, within a given imbalance settlement period.
Balancing Service Provider	A party providing energy balancing services to the energy market. **Additional information:** Balancing services can be balancing energy and/or balancing capacity. This is a type of Flexibility Service Provider. **Based on:** Consolidated text: Commission Regulation (EU) 2017/2195 - Art.2 Definitions and Consolidated text: Regulation (EU) 2019/943.
Bidding Zone	The largest geographical area within which market participants are able to exchange energy without capacity allocation. **Source:** Consolidated text: Commission Regulation (EU) No 543/2013.
Coordination Centre Operator	A party responsible for the coordination of its Coordination Centre Zone in respect of scheduling, load frequency control, time deviation and compensation of unintentional deviation.
Imbalance Settlement Responsible	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. **Additional information:** The Imbalance Settlement Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.
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:** Consolidated text: Commission Regulation (EU) 2017/1485.

Role/Domain	Definition
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.
Market Operator	A party that provides a service whereby the offers to sell energy are matched with bids to buy energy. **Based on:** Consolidated text: Regulation (EU) 2019/943. **Additional information:** 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.
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.
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.
Nomination Validator	Has the responsibility of ensuring that all capacity nominated is within the allowed limits and confirming all valid nominations to all involved parties. He informs the Interconnection Trade Responsible of the maximum nominated capacity allowed. Depending on market rules for a given interconnection the corresponding System Operators may appoint one Nomination Validator.
Scheduling Area	An area within which the TSOs' obligations regarding scheduling apply due to operational or organisational needs. This area consists of one or more Metering Grid Areas with common market rules for which the settlement responsible party carries out an imbalance settlement and which has the same price for imbalance. **Source:** Consolidated text: Commission Regulation (EU) 2017/1485. **Additional information:** This covers both Imbalance Area and Imbalance Price Area from the Consolidated text: Commission Regulation (EU) 2017/2195
Scheduling Area Responsible	A party responsible for the coordination of nominated volumes within a Scheduling Area. **Additional information:** This role is typically performed by a TSO.

Role/Domain	Definition
System Operator	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of energy. **Based on:** Consolidated text: Directive (EU) 2019/944

5 Process areas within the Nordic scheduling process

5.1 Process area: Exchange market schedules

Handled by NBS and the Market Operator, see [3].

5.2 Process area: Exchange operational schedules

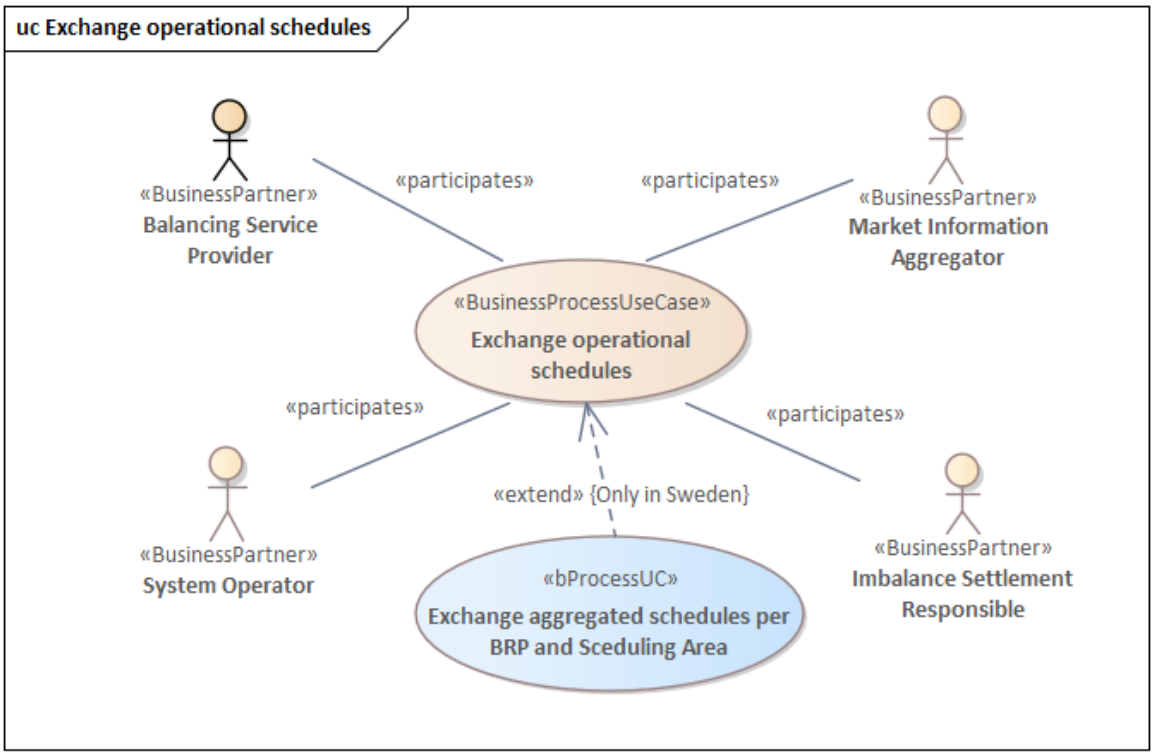

Figure 9: UseCase: Exchange operational schedules

Operational schedules can be sent “day-ahead” or intraday. Day-ahead schedules can be sent up to two weeks before the operational day and be changed up to the cut-off time the day before. Binding Intra-day schedules can be sent up to 45 minutes ahead of operation.

In Denmark, the schedules may be sent any time, but values are only accepted forward.

If updated later than 45 minutes before operation in Sweden, the schedules will not be forwarded to the Imbalance Settlement Responsible.

The Operational schedules contain power values and are sent from the Balancing Service Provider to the System Operator for operational purposes. The resolution varies between the Nordic countries, from 5 to 60 minutes.

Further the Operational schedules are used for exchange of the imbalance or equivalent to the forecast (prognosis) of the ACE Open Loop (ACE OL). The ACE OL is the real-time imbalance of an area 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. The imbalance prognosis is the prognosis of ACE OL.

Each TSO is responsible for calculating Imbalance forecast, e.g. for the next 2 hours every 5 minutes for all Bidding Zones that the TSO is responsible for. The Imbalance Forecast message (Energy prognosis document) should include a time series for each prognosis type with an associated quality indicator for each time slot. It is assumed that each TSO that receives an Imbalance Forecast message stores the data so

that analysis of completed prognosis can be performed. It is used to calculate the message volume per hour for each Bidding Zone.

The Process area Exchange operational schedules include:

- ACE OL Limits (NBM)
- Flows AOF (NBM)
- Imbalance forecast

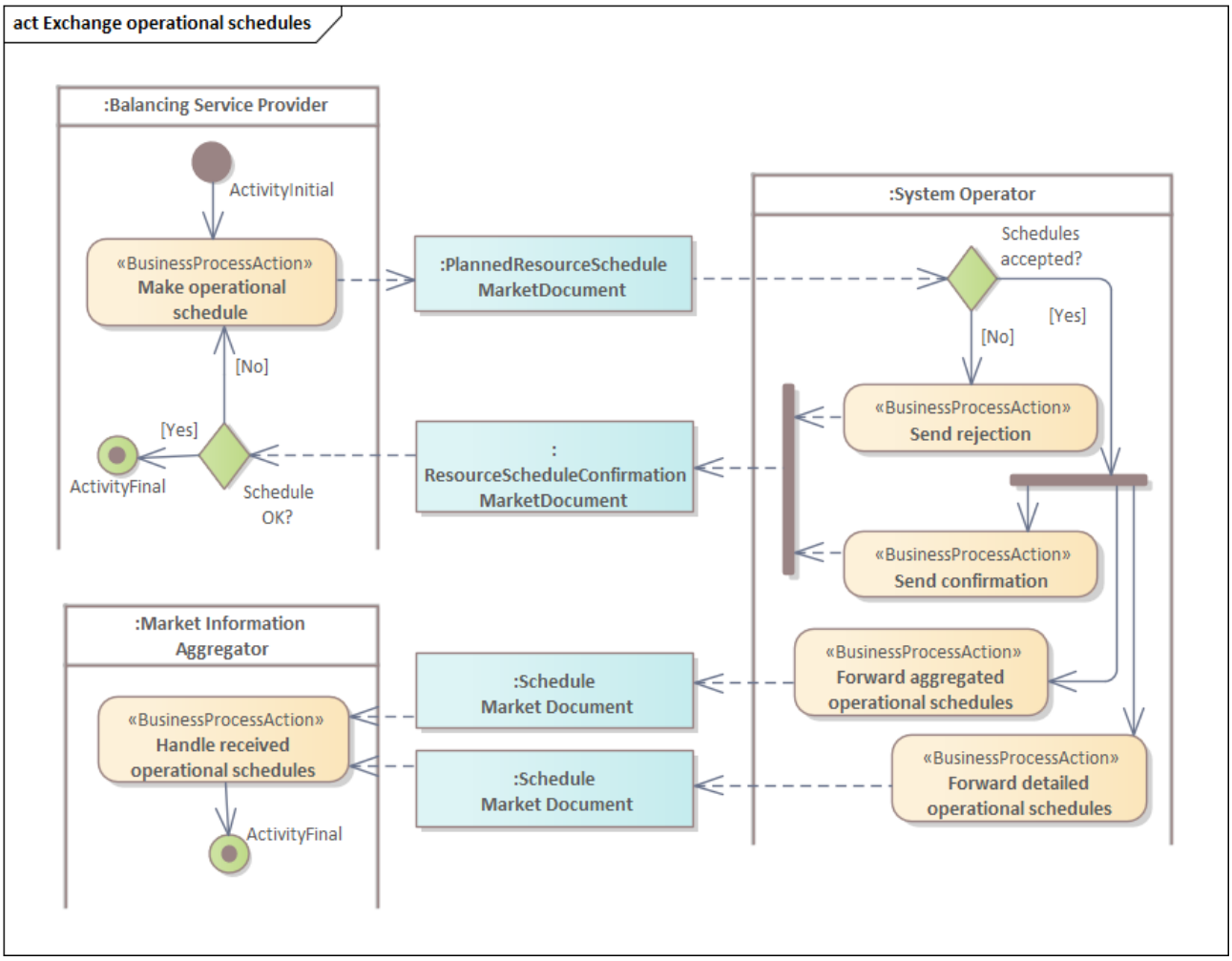

Figure 10: Activity diagram: Exchange operational schedules

5.3 Process area: Exchange schedules for balancing

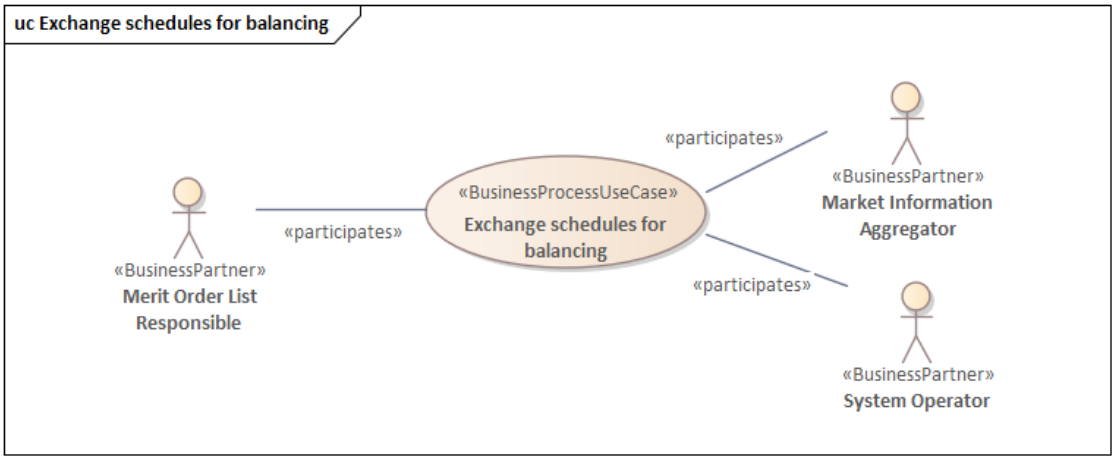

Figure 11: UseCase: Exchange schedules for balancing

The UseCase Exchange schedules for Nordic Balancing Model (NBM) consist of a set of schedules for detailed flows and the total sum of all intended exchange between Bidding Zones.

The Total planned flow includes planned exchange from energy markets as well as agreed exchanges resulting from balancing and system operations. Total planned flow includes ramping.

The detailed schedules include:

1. Activation - mFRR Balancing
2. Activation - aFRR
3. Activation - mFRR System
4. Activation - Period Shift
5. Plan- FCR-D down
6. Plan- FCR-D up
7. Plan- FCR-N
8. Plan - Production

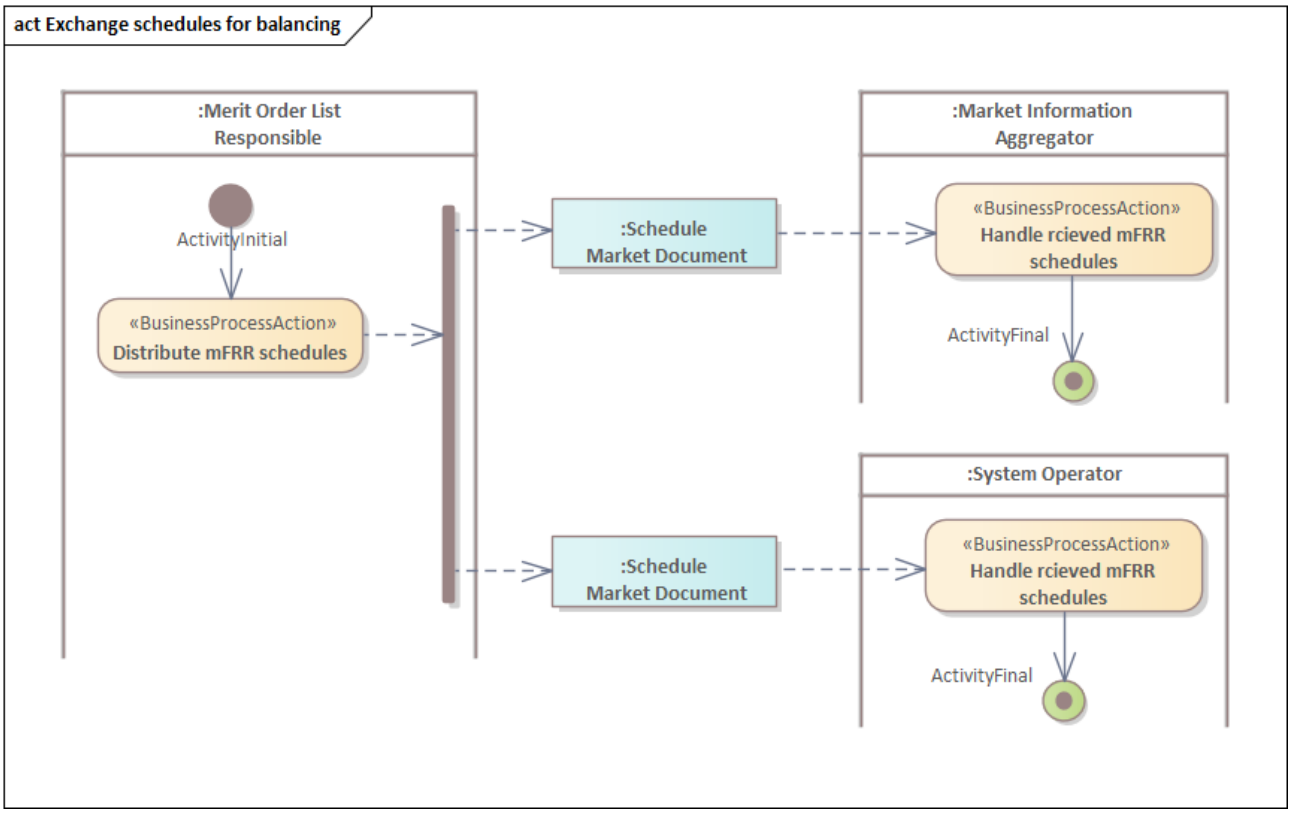

Figure 12: Activity diagram: Exchange schedules for balancing

5.4 Process area: Exchange imbalance forecast

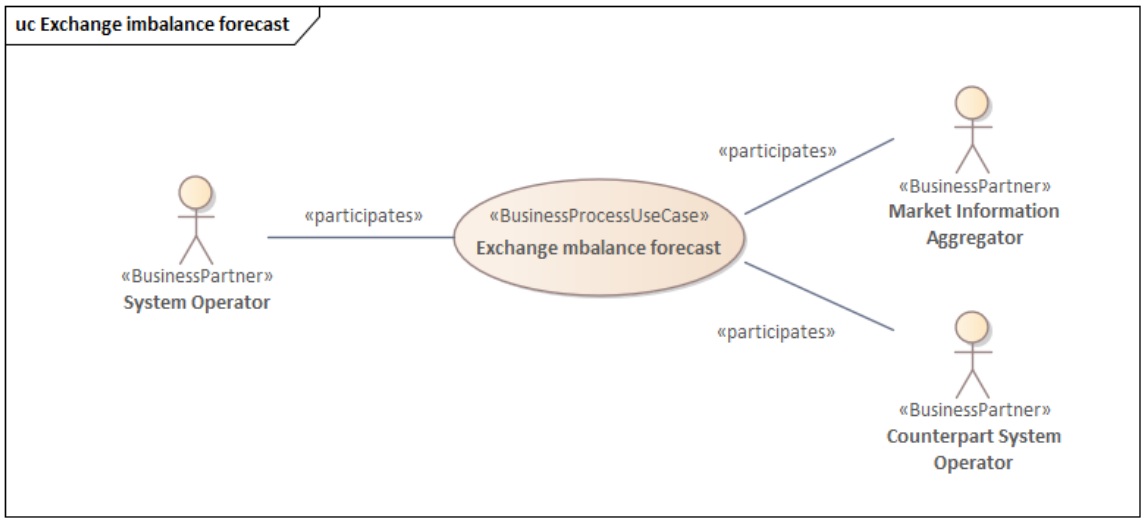

Figure 13: UseCase: Exchange imbalance forecast

The imbalance forecast schedules are sent from the System Operator to the Market Information Aggregator and neighbouring System Operators.

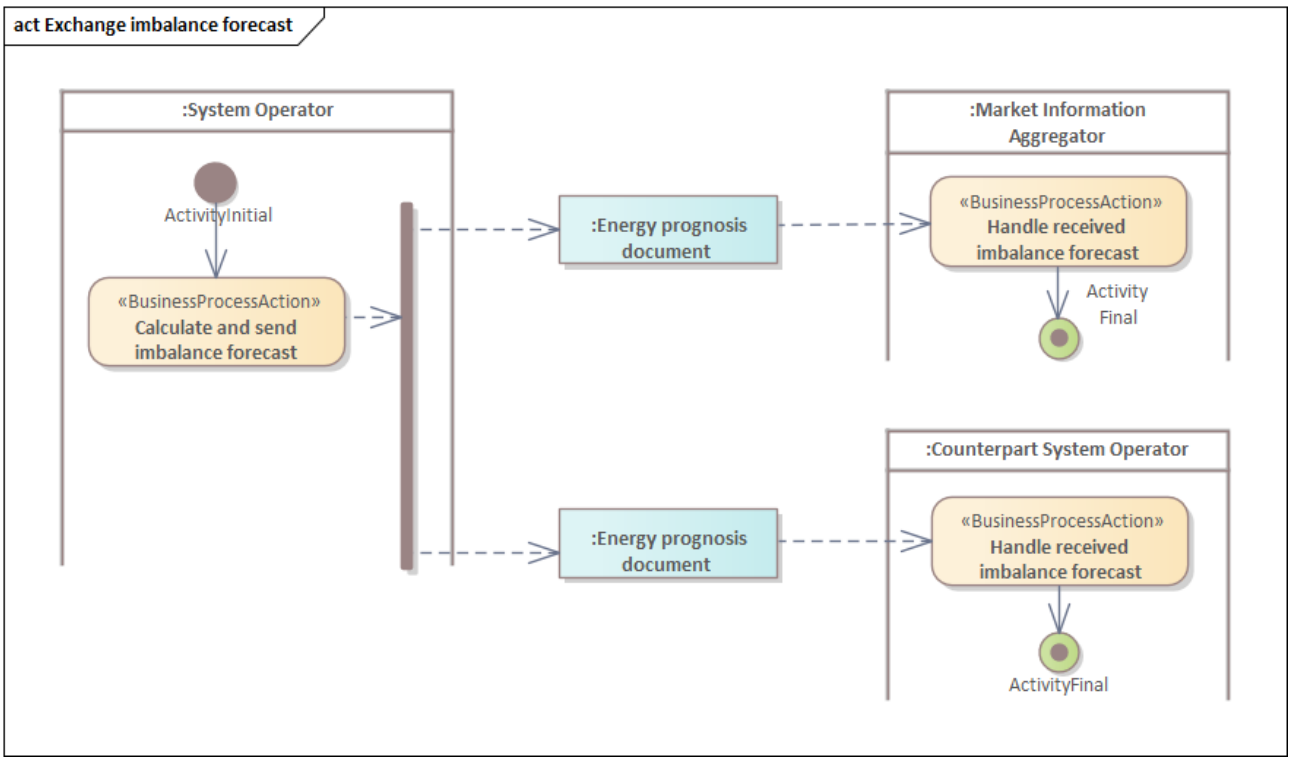

Figure 14: Activity diagram: Exchange imbalance forecast

5.5 Process area: Exchange Corridor and cut corridor schedules

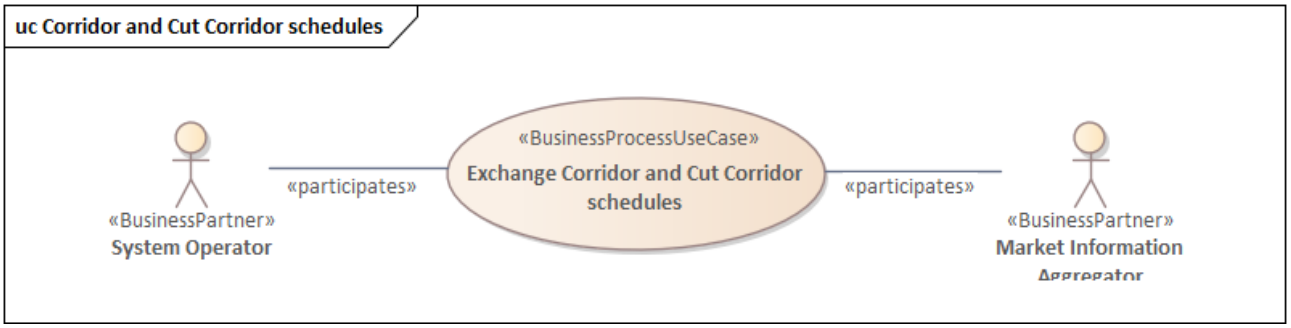

Figure 15: UseCase: Exchange Corridor and cut corridor schedules

The Corridor and cut corridor schedules are sent from the System Operator to the Market Information Aggregator and contain the scheduled exchange from the Transmission Capacity Allocator split on relevant corridors.

A corridor is a group of power cables/lines. Corridors are used in order to give details about individual or groups of cables. The information is used by the Market Information Aggregator in balance management to present details of import/export plans (individual plans display) and to compute surplus/deficit of each LFC Area. For example, Skagerrak corridor has 3 cables and can be defined as two HVDC corridors (Skagerrak1-2 and Skagerrak3). The Corridors can be split into three types:

- Day-ahead corridor Corridors between Scheduling Area within the Nordic market area.
- Cut corridor Internal corridor within a Scheduling Area
- External corridor Corridors external to the Nordic market area (in/out of the Nordic market area).

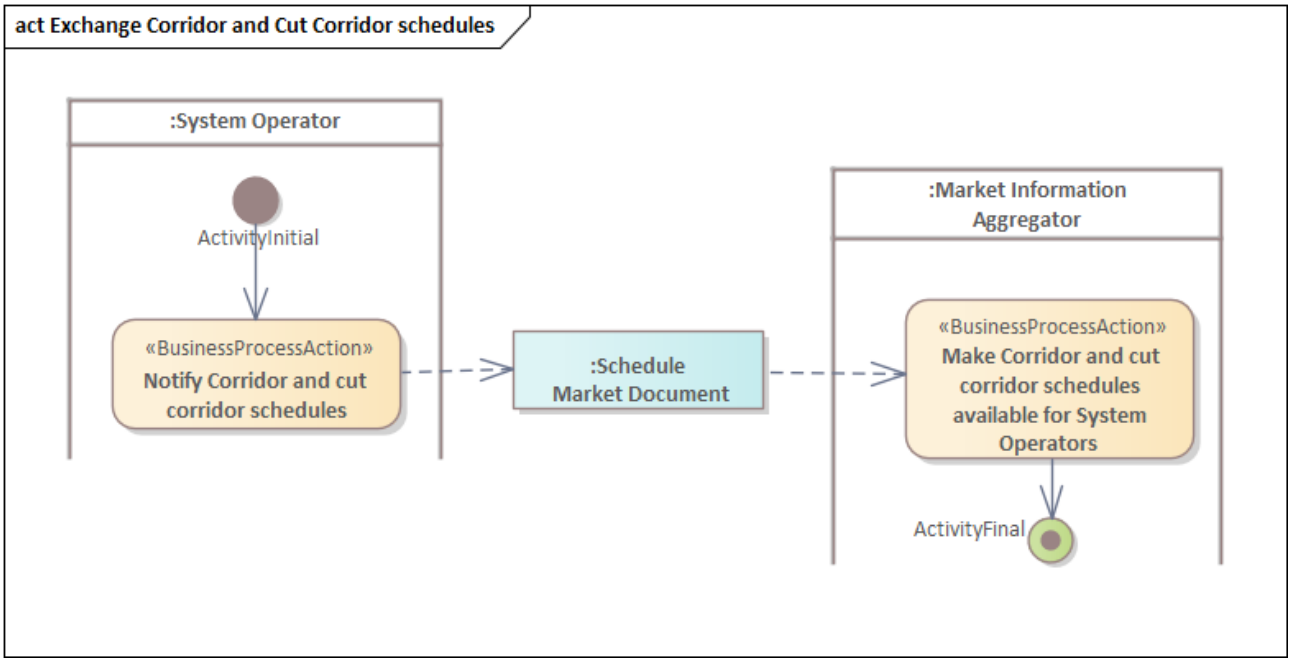

Figure 16: Activity diagram: Exchange Corridor and cut corridor schedules

5.6 Process area: Exchange of dynamic HVDC-run-profiles

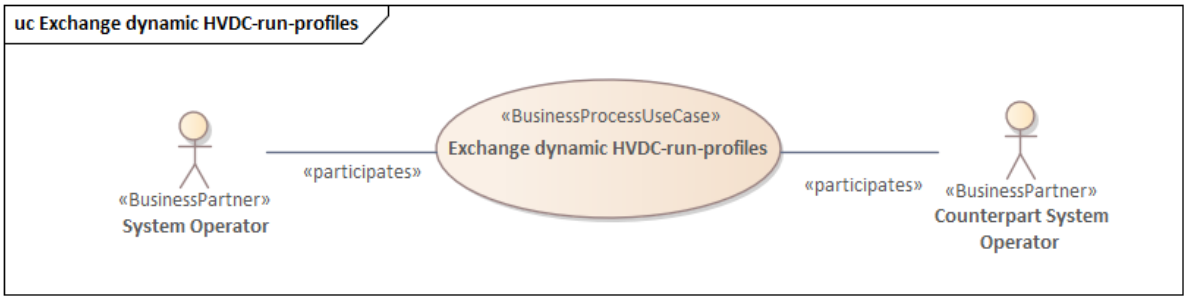

Figure 17: UseCase: Exchange of dynamic HVDC-run-profiles

The dynamic HVDC-run-profiles are exchanged between two System Operators that have two or more HVDC cables between two Areas (e.g. Scheduling Areas). The involved System Operators exchange the profile for planned load distribution for two or more HVDC cables. I.e. how the energy flow between the two or more Areas would be split between the HVDC cables, depending on the total flow.

The process is typically run daily between the closure of the Day Ahead market and the opening of the Intraday market and used for reduction of cable stress.

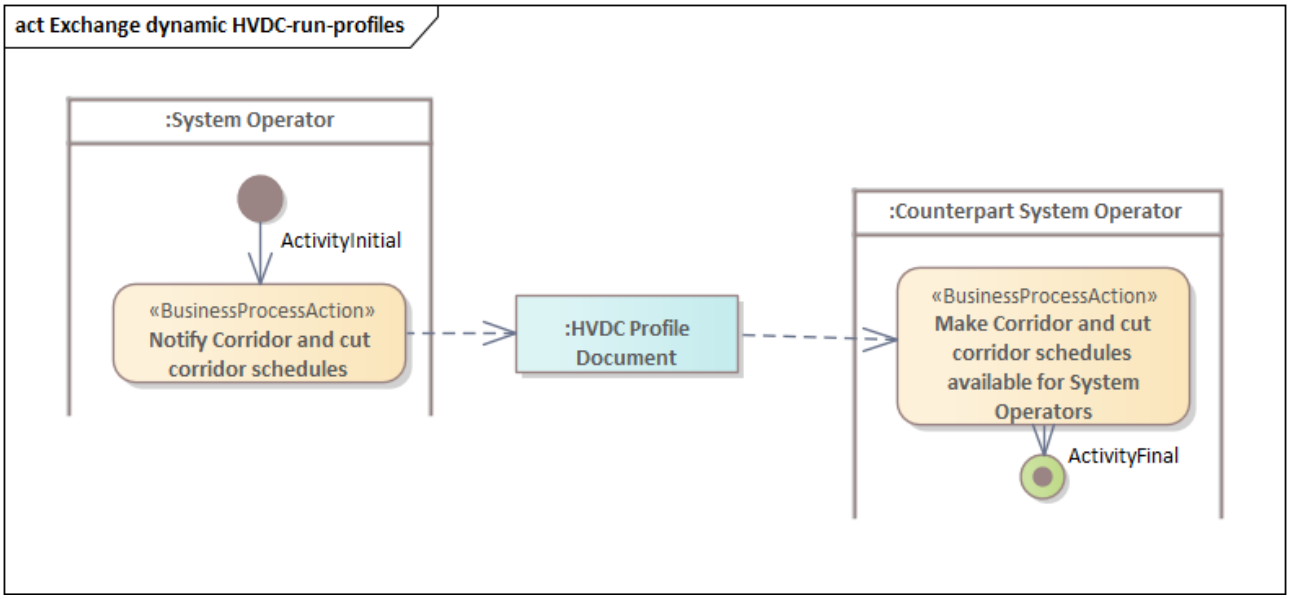

Figure 18: Activity diagram: Exchange of dynamic HVDC-run-profiles

5.7 Process area: Exchange Ancillary services, including Reserve resources

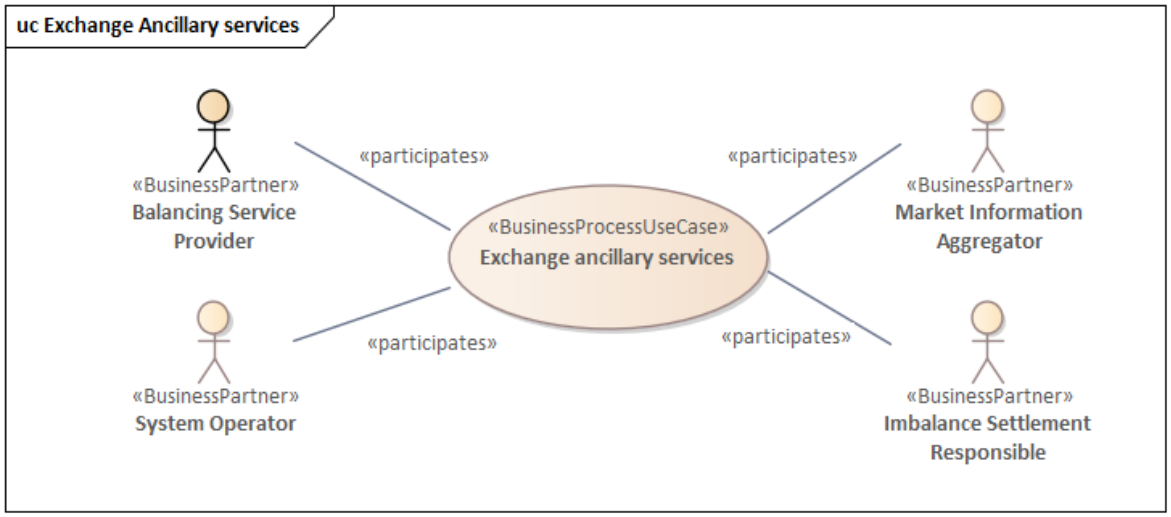

Figure 19: UseCase: Exchange Ancillary services

The Ancillary services process in the Nordic countries may contain:

- Frequency bias
- Frequency Containment Reserves, Disturbance (**FCR-D**)
- Frequency Containment Reserves, Normal (**FCR-N**)
- Unavailable production capacity (only Norway and Sweden)
- Available production capacity (only Denmark)
- Spinning reserve (only Norway)

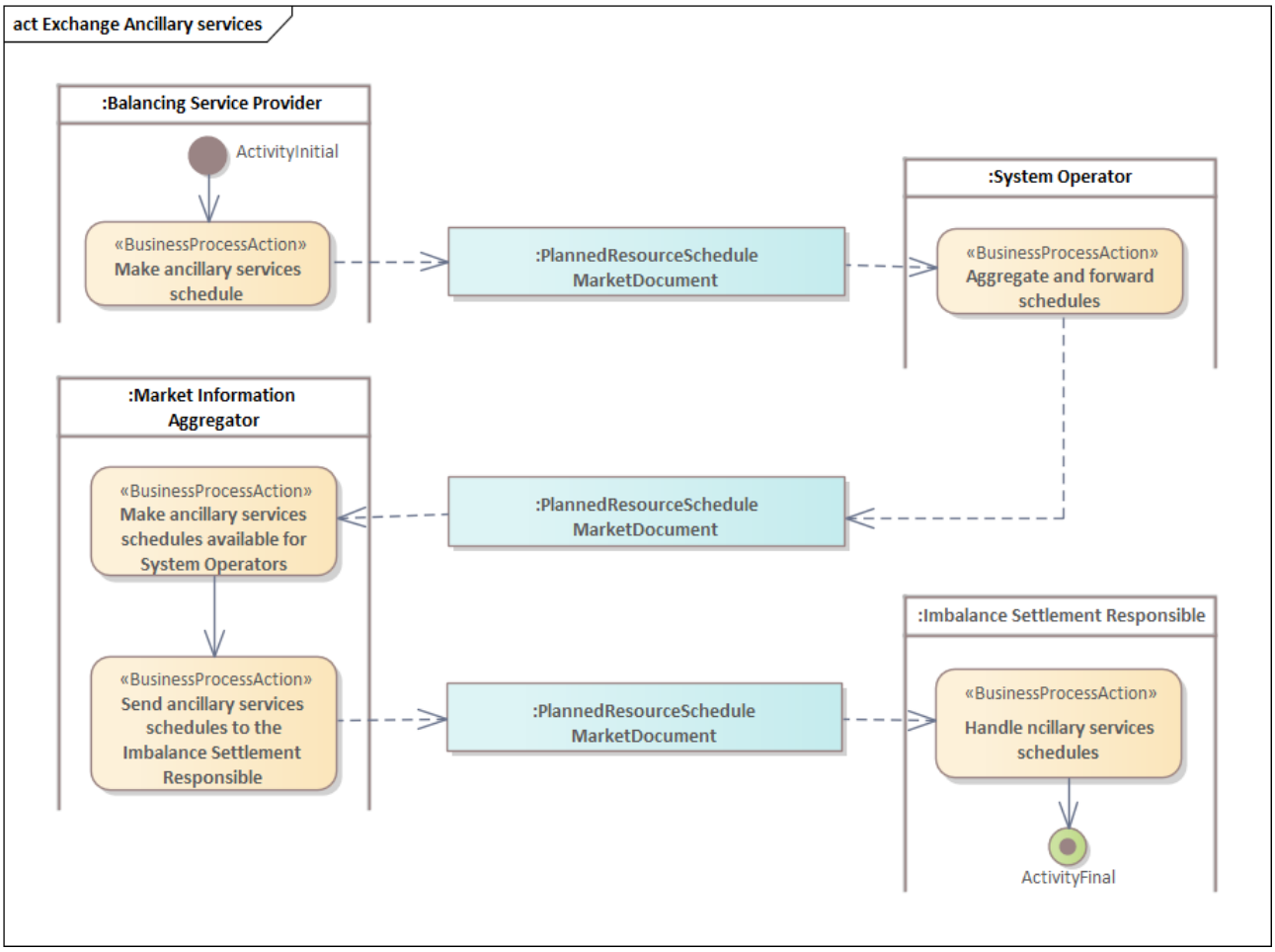

Figure 20: Activity diagram: Exchange Ancillary services

Amongst the primary requirements for the System Operators is the necessity to provide for energy reserves in order to respond to unexpected events to keep the electricity system operational.

5.8 Process area: Exchange planned flows

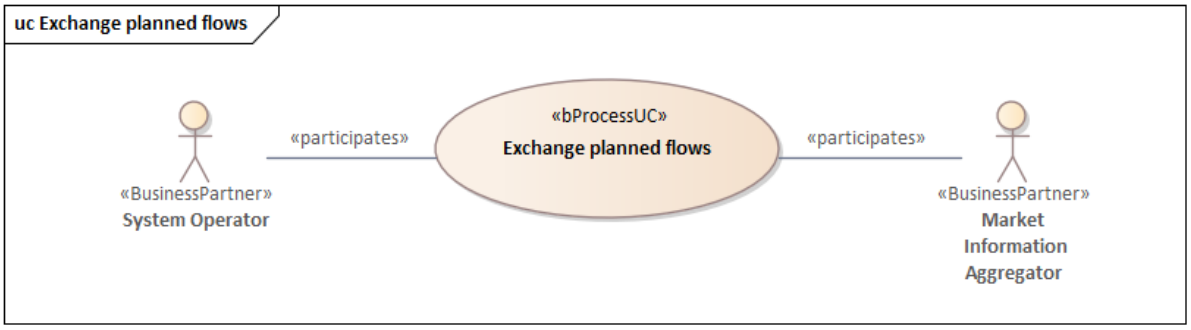

Figure 21: UseCase: Exchange planned flows

The planned flows consist of a set of scheduled flow messages. They are divided into several sub-flows that add together to the a "Total Planned Flow".

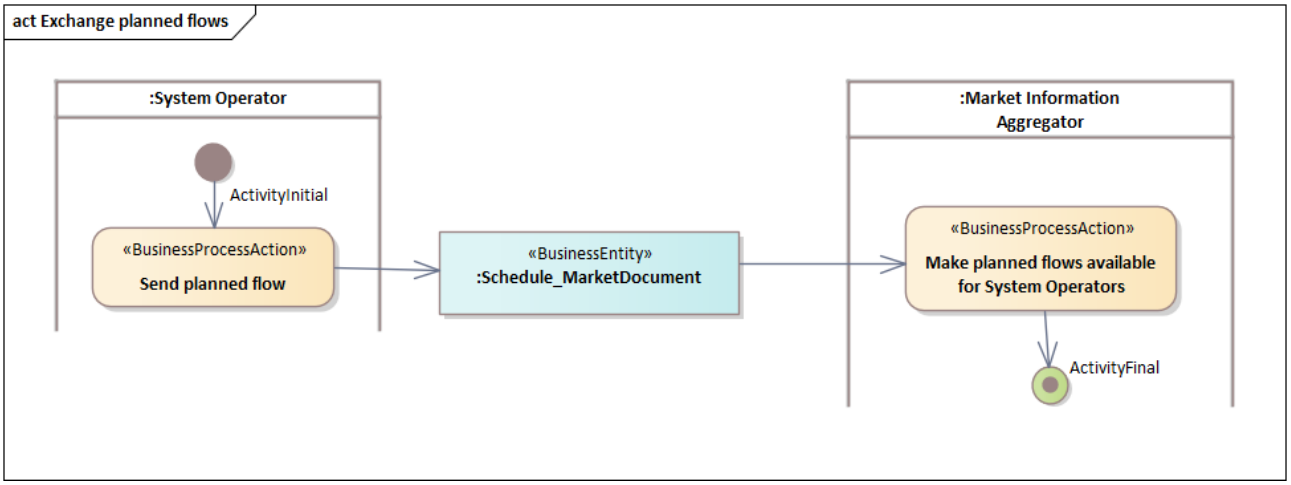

Figure 22: Activity diagram: Exchange planned flows

5.9 Process area: Publish outages

Whenever an outage situation occurs (either forced or planned) the System Operator sends the information to the Market Information Aggregator.

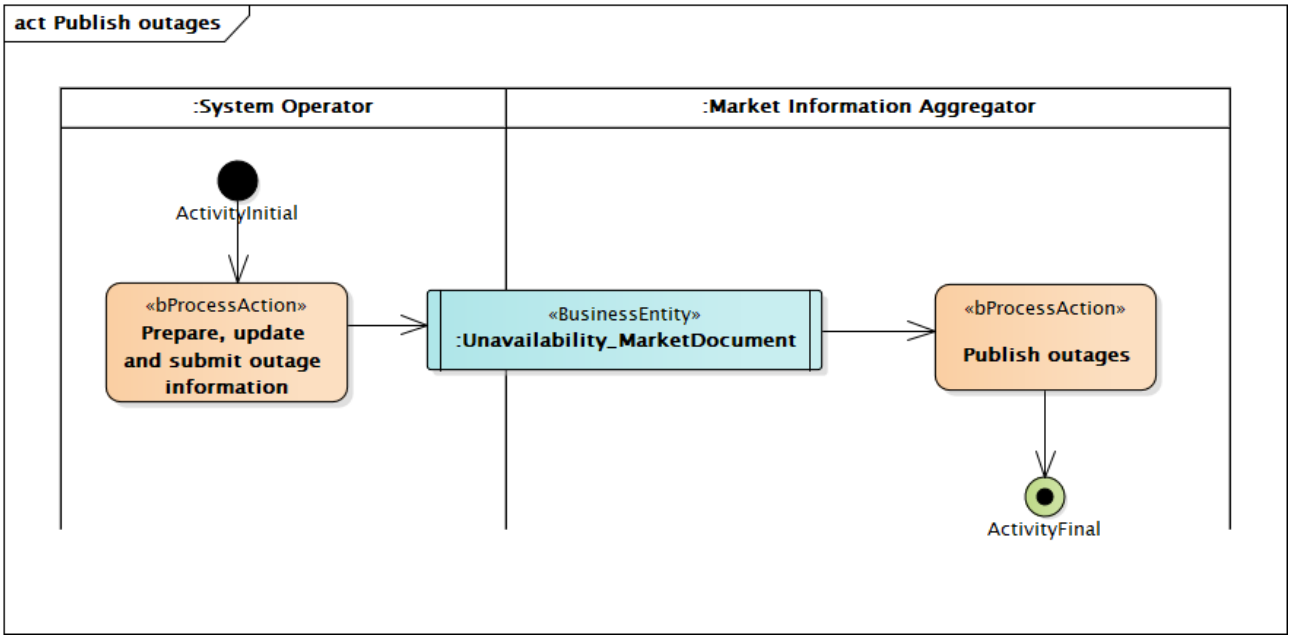

Figure 23: Activity diagram: Publish outages

5.9.1 Outage information modification

An outage situation may be modified to indicate its progress or to correct any data that is found to be invalid.

5.9.2 Outage information deletion

A given outage may be deleted with an update that makes use of the “Delete” attribute. This has the effect of deleting the outage from the published list.

6 Business Data View

6.1 ESS Schedule Document from IEC62325-451-2 Ed.2

The ESS (ENTSO-E Scheduling System) Schedule Document is used for planned corridors and cut corridors exchanges.

This chapter describes a Nordic subset of the document described in IEC 62325 framework for energy market communications, Part 451, see [2].

6.1.1 Class diagram: ESS Schedule Document contextual model, version 5.2

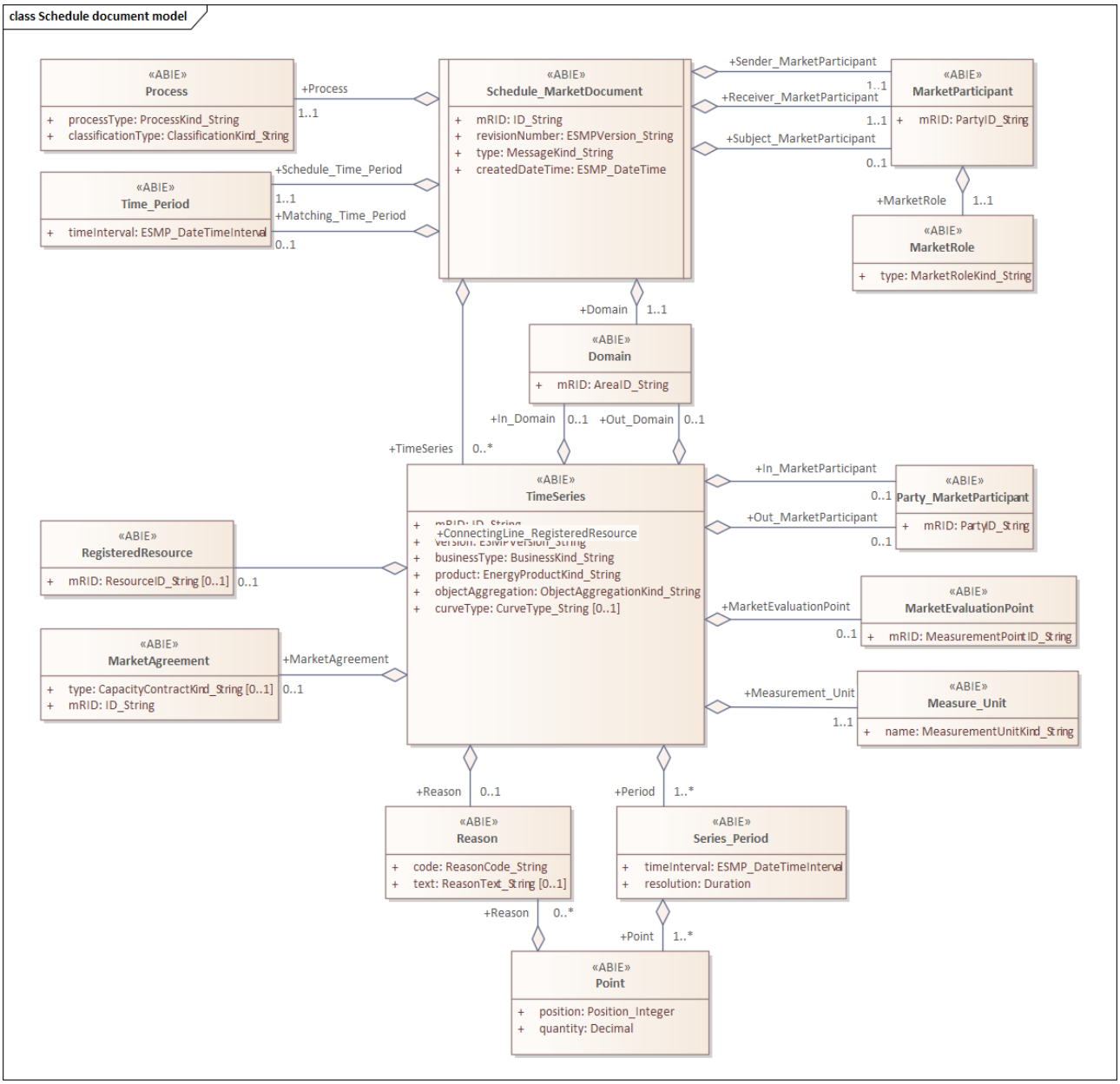

Figure 24: Class diagram: ESS Schedule Document contextual model

6.1.2 Class diagram: ESS Schedule Document assembly model

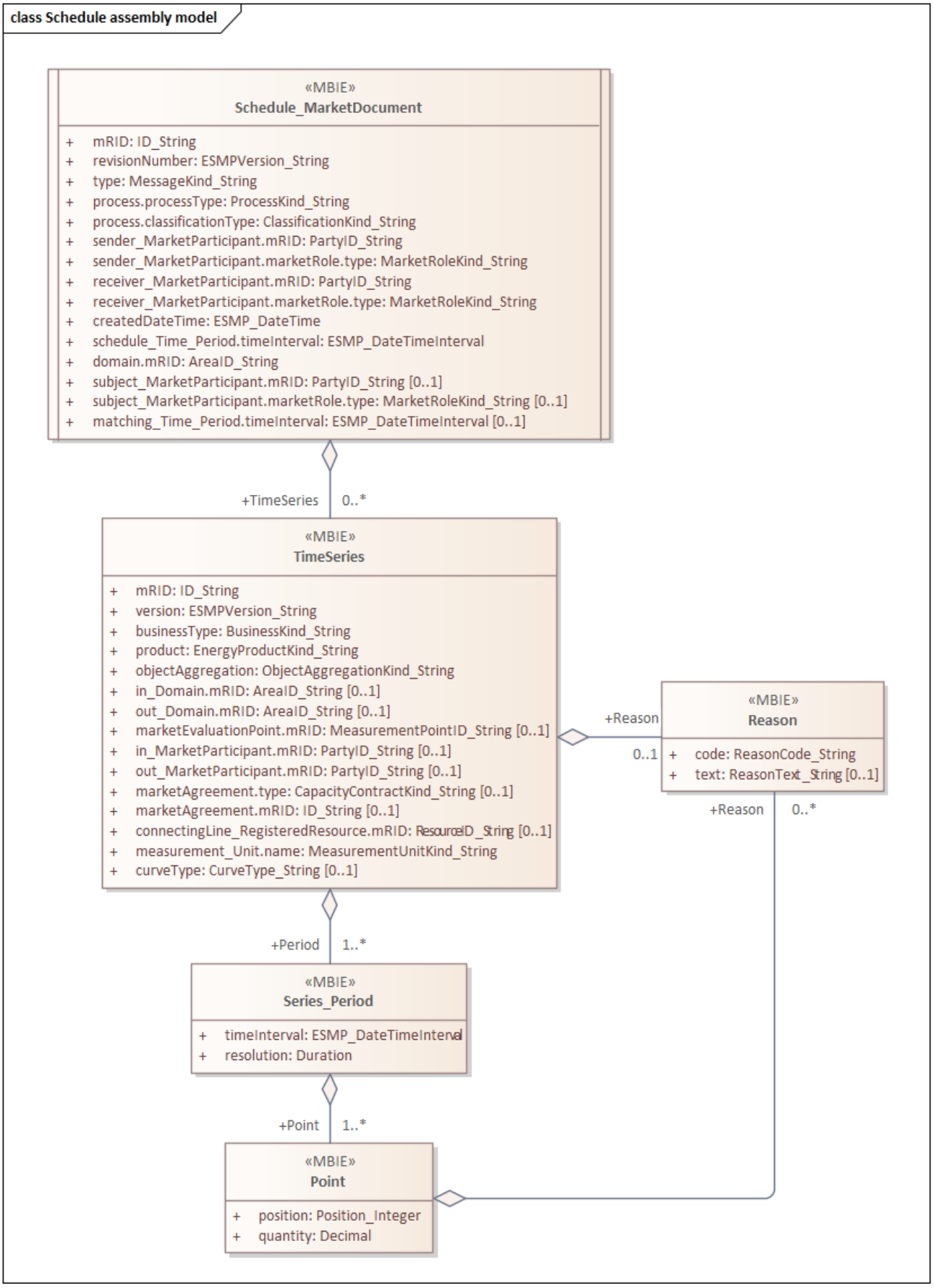

Figure 25: Class diagram: ESS Schedule Document assembly model

6.1.3 Attribute usage ESS Schedule Document, schedules for balancing

The document is used in the following exchanges:

- ***Table 1:*** *Documents used for operational schedules:*
  - 1.2, Operational schedules (aggregated)
  - 1.3, Operational schedules (Detailed)
  - 2.0, mFRR Schedule
  - 2.1, mFRR Schedule

IEC CIM Attribute	Cl.	Code and description
Schedule_MarketDocument	[1]	
mRID	[1]	Unique identification of the document **Note:** The maximum length of the ID is 60 characters.
revisionNumber	[1]	**Fixed 1**
type	[1]	**A03** Balance area schedule **A30** Cross border schedule **Z36** Power Prognoses
process.processType	[1]	**A14** Forecast **A39** Synchronisation process **A47** Manual frequency restoration reserve **Z12** ACE OL real-time
process.classificationType	[1]	**A01** Detail type **A02** Summary type
sender_MarketParticipant. mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant. marketRole.type	[1]	**A04** System Operator **A35** MOL Responsible
receiver_MarketParticipant. mRID	[1]	Identification of the party who is receiving the schedules
receiver_MarketParticipant.marketRole. type	[1]	**A04** System Operator **A32** Market Information Aggregator **A33** Information receiver
createdDateTime	[1]	Date and time of creation of the document.
schedule_Time_Period. timeInterval	[1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	Domain covered within document
subject_MarketParticipant.mRID	[0..1]	The unique identification of the party that is the subject of the documents time series.
subject_MarketParticipant.marketRole. type	[0..1]	**A04** System Operator
TimeSeries	[1..*]	
mRID	[1]	Unique identification of the Time Series (unique over time for the sender in question) **Note:** The maximum length of the ID is 60 characters
version	[1]	**Fixed 1**

IEC CIM Attribute	Cl.	Code and description
businessType	[1]	**A04** Consumption **A45** Schedule activated reserves **Z78** Upper Alert **Z79** Upper Emergency **Z80** Lower Alert **Z81** Lower Emergency **Z82** Upper Warning **Z83** Lower Warning **Z88** Total planned flow **Z95** Non-conform load schedule **Z96** Conform load schedule
product	[1]	**8716867000016** Active power
objectAggregation	[1]	**A01** Area
in_Domain.mRID	[0..1]	EIC code of area where the energy is going to
out_Domain.mRID	[0..1]	EIC code of area where the energy is coming from **Note:** For Ace OL Limits only in_Domain is used.
measurement_Unit.name	[1]	**MAW** MW
curveType	[1]	**A01** Sequential fixed size block **A03** Variable sized Block **A05** Non-overlapping break points
Series_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. 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]	Bilateral exchange between domains.

Table 3: Usage of ESS Schedule Document, NBM schedules: ESS Schedule

6.1.4 Dependency matrix: ESS Schedule Document, schedules for balancing

	Schedule Market Document				Time Series			Series Period
	Document type	**Process type**	**Classification type**	**Subject party role**	**Business type**	**Object aggre-gation**	**Curve type**	**Reso-lution**
Conform Load Forecast	A03	A14	A02	Not used	Z96	A01	A01	PT5M
Non-conform Load Forecast	A03	A14	A02	Not used	Z95	A01	A01	PT5M
Total Consumption Forecast	A03	A14	A02	Not used	A04	A01	A01	PT5M
ACE OL Limits (NBM)	Z36	Z12	A02	Not used	Z78 Z79 Z80 Z81 Z82 Z83	A01	A03	PT15M or PT60M
Flows AOF (NBM)	A30	A47	A01	A04	A45	A01	A01	PT15M
Forecast Total Consumption	A03	A14	A02	Not used	A04	A01	A01	PT5M
Total Planned Flow-TSO	A30	A39	A02	Not used	Z88	A01	A05	PTM

Table 4: Usage of ERRP Planned Resource Schedule Document, schedules for balancing

6.1.5 Attribute usage ESS Schedule Document, Planned flow

The document is used in the following exchanges:

- ***Table 1:*** *Documents used for operational schedules:*
  - 7.0, Planned flow

IEC CIM Attribute	Cl.	Code and description
Schedule_MarketDocument	[1]	
mRID	[1]	Unique identification of the document **Note:** The maximum length of the ID is 60 characters.
revisionNumber	[1]	**Fixed 1**
type	[1]	**A30** Cross border schedule
process.processType	[1]	**A39** Synchronisation process
process.classificationType	[1]	**A02** Summary type
sender_MarketParticipant. mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant. marketRole.type	[1]	**A04** System Operator
receiver_MarketParticipant. mRID	[1]	Identification of the party who is receiving the schedules
receiver_MarketParticipant.marketRole.type	[1]	**A33** Information receiver
createdDateTime	[1]	Date and time of creation of the document.
schedule_Time_Period. timeInterval	[1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	Domain covered within document
TimeSeries	[1..*]	
mRID	[1]	Unique identification of the Time Series (unique over time for the sender in question) **Note:** The maximum length of the ID is 60 characters
version	[1]	**Fixed 1**
businessType	[1]	**A46** System Operator redispatching (Replacement reserve) **A97** Manual frequency restoration reserve **B09** Net position **B67** DC flow with losses **B68** DC flow without losses **Z88** Total planned flow **Z89** Expected countertrade **Z90** Power Plan Trade **Z91** Loop transit **Z92** Agreed supportive power (ASP) **Z93** Production adjustments
product	[1]	**8716867000016** Active power
objectAggregation	[1]	**A01** Area
in_Domain.mRID	[0..1]	EIC code of area where the energy is going to

IEC CIM Attribute	Cl.	Code and description
out_Domain.mRID	[1]	EIC code of area where the energy is coming from Within a Bidding Zone, use same in_Domain as out_Domain
marketAgreement.type	[1]	**A01** Daily contract **A07** Intraday contract
measurement_Unit.name	[1]	**MAW** MW
curveType	[1]	**A01** Sequential fixed size block **A03** Variable sized Block **A05** Non-overlapping break points
Series_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. **PT1M** or **PT15M**
Point	[1..*]	
position	[1]	The position of the observation within the time series. Sequential value beginning with 1.
quantity	[1]	Bilateral exchange between domains.
Reason (TimeSeries level)	[0..1]	**Dependency:** • For businessType **A46** and **A97:** **B49** Balancing **B22** System • For businessType = **Z92:** **Z22** Supportive power • For businessType = **Z91/Z92:** See use of reason codes in conjunction with Harmonized products definitions: https://nordic-balancing.pages.fifty.eu/information/common-guidelines.html#_harmonized_products_definitions
code	[1]	The position of the observation within the time series. Sequential value beginning with 1.

Table 5: Usage of ESS Schedule Document, NBM schedules: Planned flow

6.1.6 Dependency matrix: ESS Schedule Document, Planned flow

	Schedule Market Document				Time Series				Series Period
	Doc. type	**Process type**	**Classifi. type**	**Subject party role**	**Busi-ness type**	**Object aggregation**	**Market agreement type**	**Curve type**	**Reso-lution**
Total Planned Flow-TSO	A30	A39	A02	Not used	Z88	A01		A05	PT15M
Planned Flow Power Plan Trade TSO	A30	A39	A02	Not used	Z90	A01	A01	A01, A05	PT1M, PT15M
Planned flow Day aheadTSO	A30	A39	A02	Not used	B67, B68	A01	A01	A01	PT15M
Planned Flow Intraday TSO	A30	A39	A02	Not used	B09	A01	A07	A01	PT15M
Planned Flow mFRR TSO	A30	A39	A02	Not used	A97	A01		A03	PT1M
Loop Transit in Planned Flow ASP TSO	A30	A39	A02	Not used	Z91	A01		A03, A05	PT1M
Planned Flow Agreed Supportive Power(ASP) TSO	A30	A39	A02	Not used	Z92	A01		A03, A05	PT1M
Planned Flow Replacement Activation Reserve TSO	A30	A39	A02	Not used	Z46	A01		A03, A05	PT1M
Planned Flow Period Shift-Adjustment TSO	A30	A39	A02	Not used	Z93	A01		A03, A05	PT1M
Expected-countertrade-TSO	A30	A39	A02	Not used	Z89	A01		A03, A05	PT1M

Table 6: Usage of ERRP Planned Resource Schedule Document, planned flow

6.1.7 Attribute usage ESS Schedule Document, Corridor and Cut corridor schedules

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules:
  - 4.0, Corridor and cut corridor schedules

IEC CIM Attribute	Cl.	Code and description
Schedule_MarketDocument	[1]	
mRID	[1]	Unique identification of the document **Note:** The maximum length of the ID is 35 characters.
revisionNumber	[1]	Fixed 1
type	[1]	**A04** System Operator area schedule
process.processType	[1]	**A17** Schedule day
process.classificationType	[1]	**A01** Detail type
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant. marketRole.type	[1]	**A04** System Operator
receiver_MarketParticipant. mRID	[1]	Identification of the party who is receiving the schedules
receiver_MarketParticipant.market Role.type	[1]	**A32** Market information aggregator
createdDateTime	[1]	Date and time of creation of the document.
schedule_Time_Period. timeInterval	[1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	Any known area from the Harmonised role model covering the areas within the time series level of the document, e.g. Scheduling Area, National Area, Nordic Market Area (10Y1001A1001A91G) etc.
TimeSeries	[1..*]	
mRID	[1]	Unique identification of the Time Series (unique over time for the sender in question) **Note:** The maximum length of the ID is 35 characters
version	[1]	Fixed 1
businessType	[1]	**A66** Energy flow
product	[1]	**8716867000016** Active power
objectAggregation	[1]	**A06** Resource Object
in_Domain.mRID	[1]	Scheduling Area or National Area.
out_Domain.mRID	[1]	Scheduling Area or National Area.
connectingLine_ RegisteredResource.mRID	[0..1]	Corridor
measurement_Unit.name	[1]	**MAW** MW or **KWT** kW

IEC CIM Attribute	Cl.	Code and description
curveType	[1]	**A01** Sequential fixed size blocks **A04** Overlapping break points **A05** Non-overlapping break points
Series_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]	The position of the observation within the time series
quantity	[1]	The quantity of the product for the position within the time interval in question

Table 7: Usage of ESS Schedule Document for Corridor and Cut corridor schedules

6.2 ERRP Planned Resource Schedule Document

The ERRP Planned Resource Schedule Document (Operational Schedule Document) is used for operational schedules.

This chapter describes a Nordic subset of the ENTSO-E version of the document. The document is based on the European Style Market Profile (ESMP) as described in IEC 62325 framework for energy market communications, Part 351, see [2].

6.2.1 Class diagram: ERRP Planned Resource Schedule Document contextual model

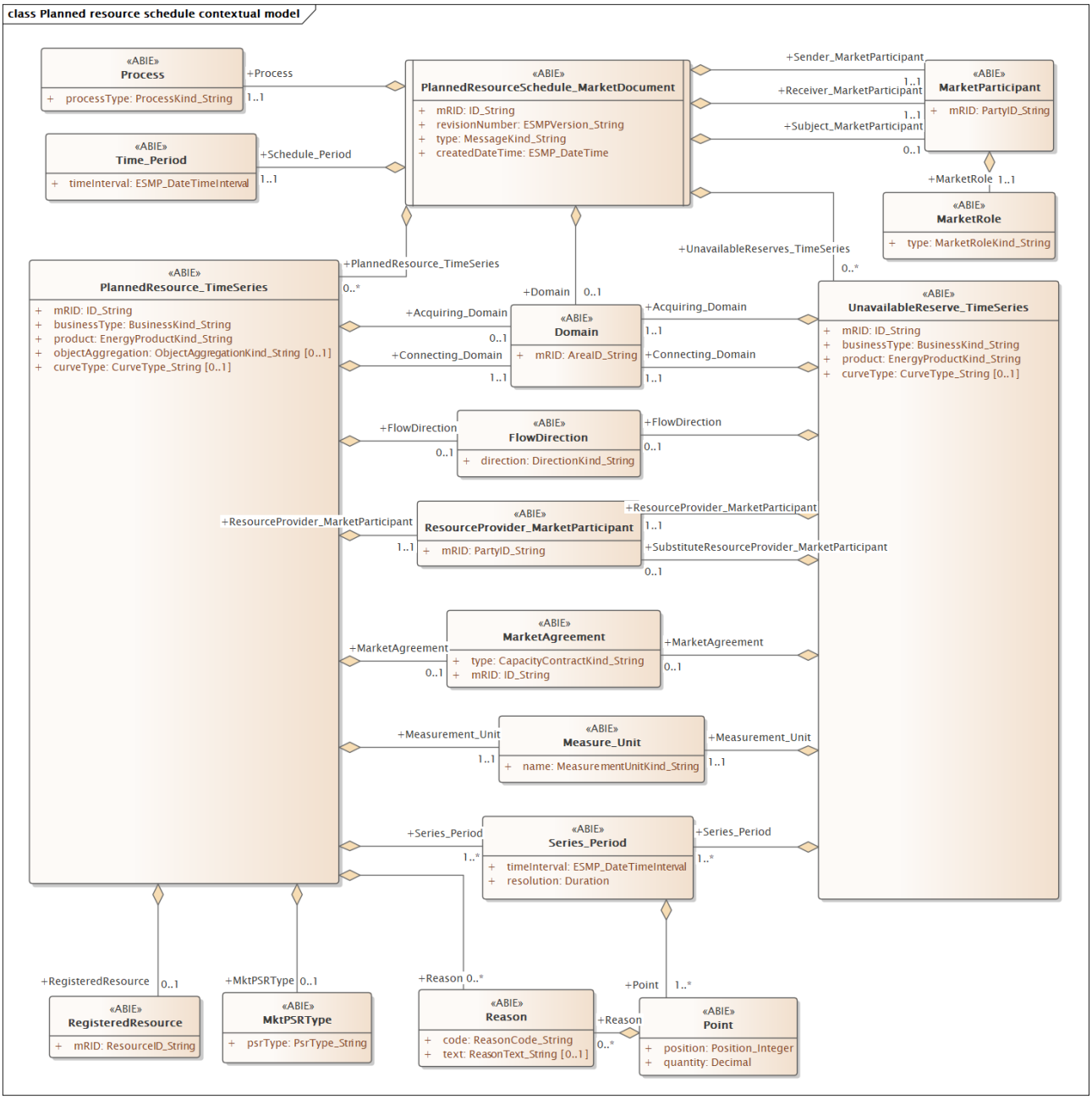

Figure 26: Class diagram: ERRP Planned Resource Schedule Document contextual model

6.2.2 Class diagram: ERRP Planned Resource Schedule Document assembly model

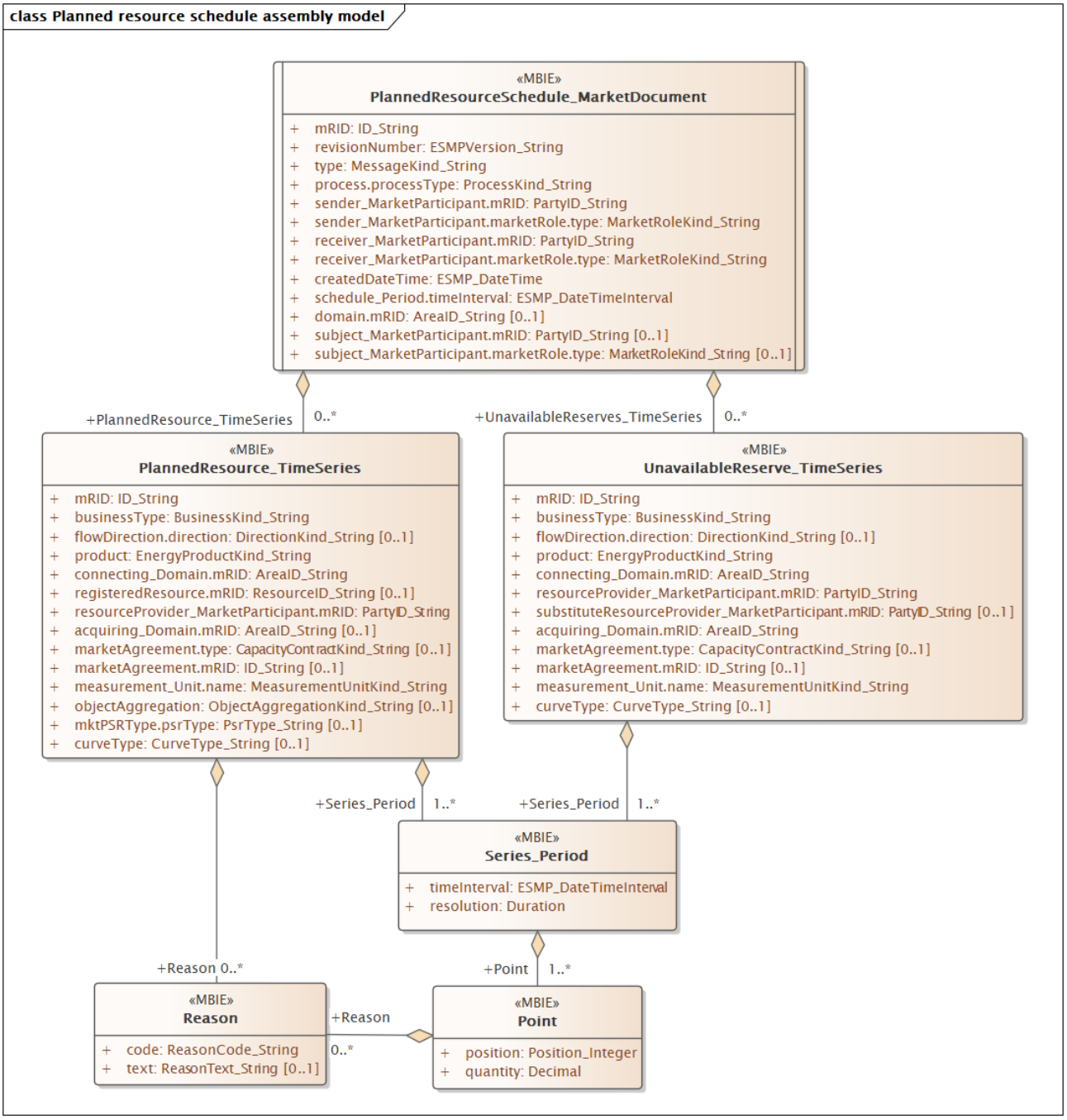

Figure 27: Class diagram: ERRP Planned Schedule Resource Document assembly model

6.2.3 Attribute usage ERRP Planned Resource Schedule Document, Production and consumption schedule

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules:
  - 1.0, Operational schedules
  -

IEC CIM Attribute	Cl.	Code and description
PlannedResourceSchedule_MarketDocument	[1]	
mRID	[1]	Unique identification of the document
revisionNumber	[1]	**Fixed 1**
type	[1]	**A14** Resource Provider Resource Schedule (Operational schedule)
process.processType	[1]	**A01** Day-ahead (Used in Denmark for day-ahead prognoses) **A14** Forecast (Used in Denmark for 4 weeks ahead prognoses) **A17** Schedule day (Used for production and consumption schedules in all Nordic countries)
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant.market Role.type	[1]	**A46** Balancing Service Provider (BSP)
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 of creation of the document.
schedule_Period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	Any known area from the Harmonised role model covering the areas within the time series level of the document, e.g. Scheduling Area, National Area, Nordic Market Area (10Y1001A1001A91G) etc.
PlannedResource_TimeSeries	[1..*]	
mRID	[1]	Sender's identification of the time series instance

IEC CIM Attribute	Cl.	Code and description
businessType	[1]	**A01** Production **A04** Consumption **A60** Minimum possible **A61** Maximum available **A80** Consumption, non-dispatchable (Used in DK) **A90** Solar **Z17** Technical minimum **Z18** Technical maximum **Z38** Hydro production **Z39** Nuclear production **Z40** Thermal production **Z41** Wind production **Z42** Decentralised production **Z43** Gas turbine and diesel production **Z44** Other thermal production **ZA5** Expected imbalance *National rules:* **DK**: **Z42** is only used in Denmark (aggregated production for small production units)
product	[1]	**8716867000016** Active power
connecting_Domain.mRID	[1]	Scheduling Area. This is the In-area for production and Out-area for consumption.
registeredResource.mRID	[0..1]	Station group (NO), Regulation object (SE), GSRN (power units in DK)
resourceProvider_Market Participant.mRID	[1]	**TSO** or **BRP**
measurement_Unit.name	[1]	**MAW** MW or **KWT** kW
mktPSRType.psrType	[0..1]	**B01** Biomass **B02** Fossil Brown coal/Lignite **B03** Fossil Coal-derived gas **B04** Fossil Gas **B05** Fossil Hard coal **B06** Fossil Oil **B07** Fossil Oil shale **B08** Fossil Peat **B09** Geothermal **B10** Hydro Pumped Storage **B11** Hydro Run-of-river and pondage **B12** Hydro Water Reservoir **B13** Marin **B14** Nuclear **B15** Other renewable **B16** Solar **B17** Waste **B18** Wind Offshore **B19** Wind Onshore **B20** Other (production) **Z04** Thermal **Z05** Wind **Z06** Hydro **Z07** Consumption

IEC CIM Attribute	Cl.	Code and description
curveType	[1]	**A01** Sequential fixed size blocks **A04** Overlapping break points **A05** Non-overlapping break points
Series_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]	The position of the observation within the time series
quantity	[1]	The quantity of the product for the position within the time interval in question

Table 8: Usage of ERRP Planned Resource Schedule Document, Production and consumption schedule

6.2.4 Dependency matrix: ERRP Planned Resource Schedule Document, Production and consumption schedule

Document type	Process Type	Curve Type	Business type	Used in
A09 Finalised schedule	**A17** Schedule day (Used for production and consumption schedules in all Nordic countries)	**A01** Sequential fixed size blocks **A04** Overlapping break points **A05** Non-overlapping break points	**A01** Production	
			A04 Consumption	
			A60 Minimum possible	DK?
			A61 Maximum available	DK?
			A80 Consumption, non-dispatchable	DK
			A90 Solar	
			Z17 Technical minimum	DK?
			Z18 Technical maximum	DK?
			Z38 Hydro production	
			Z39 Nuclear production	
			Z40 Thermal production	
			Z41 Wind production	
			Z42 Decentralised production	
			Z43 Gas turbine and diesel production	
			Z44 Other thermal production	
A14 Resource Provider Resource Schedule (Operational schedule)	**A01** Day-ahead (Used in Denmark for day-ahead prognoses) **A14** Forecast (Used in Denmark for 4 weeks ahead prognoses) **A17** Schedule day (used for production and consumption schedules in all Nordic countries)	**A01** Sequential fixed size blocks **A04** Overlapping break points **A05** Non-overlapping break points	**A01** Production	NO
			A04 Consumption	
			A60 Minimum possible	DK?
			A61 Maximum available	DK?
			A80 Consumption, non-dispatchable (Used in DK)	
			A90 Solar	
			Z17 Technical minimum	DK?
			Z18 Technical maximum	DK?
			Z38 Hydro production	
			Z39 Nuclear production	
			Z40 Thermal production	
			Z41 Wind production	
			Z42 Decentralised production	
			Z43 Gas turbine and diesel production	
			Z44 Other thermal production	

Table 9: Dependency matrix: for ERRP Planned Resource Schedule Document, Production and consumption schedule

6.2.6 Attribute usage ERRP Planned Resource Schedule Document, Ancillary services schedule

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules:
  - 6.0, Ancillary services schedules
  - 6.1, Ancillary services schedules

Attribute	Cl.	Code and description
PlannedResourceSchedule_MarketDocument	[1]	
mRID	[1]	Unique identification of the document
revisionNumber	[1]	Fixed 1
type	[1]	**A14** Resource Provider Resource Schedule (Operational schedule)
process.processType	[1]	**A17** Schedule day
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant.market Role.type	[1]	**A04** System Operator **A08** Balance Responsible party **A46** Balancing Service Provider (BSP)
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules
receiver_MarketParticipant.market Role.type	[1]	**A04** System Operator **A05** Imbalance Settlement Responsible **A32** Market information aggregator
createdDateTime	[1]	Date and time of creation of the document.
schedule_Period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	Any known area from the Harmonised role model covering the areas within the time series level of the document, e.g. Scheduling Area, National Area, Nordic Market Area (10Y1001A1001A91G) etc.
PlannedResource_TimeSeries	[1..*]	
mRID	[1]	Sender's identification of the time series instance
businessType	[1]	**A70** Production, unavailable **A71** Supplementary available generation **A72** Interruptible consumption **A89** Spinning reserve **A96** Automatic frequency restoration reserve (replaces **A12**) **C25** Frequency bias **C26** Frequency Containment Reserves, Normal (**FCR-N**) **C27** Frequency Containment Reserves, Disturbance (**FCR-D**)

Attribute	Cl.	Code and description
		National rules: DK: **A10**[2], **A12**, **A70**, **C25**, **C26**, **C27** (15 minutes reserve), and **A89** are used in Denmark FI: **C26** and **C27** NO: **A70**, **A95**, **A96**, **C25**, **C26**, **C27** and **A89** are used in Norway SE: **A70**, **A71**, **A72**, **A95**, **A96**, **C26** and **C27** are used in Sweden
product	[1]	**8716867000016** Active power
connecting_Domain.mRID	[1]	Scheduling Area
product	[0..1]	Only used for *Object Aggregation* = A06, i.e. Station group, regulation object
registeredResource.mRID	[1]	Station group (NO), Regulation object (SE), GSRN (power units in DK)
measurement_Unit.name	[1]	**MAW** MW or **KWT** kW **E08** MW/Hz
objectAggregation	[1]	**A01** Area **A06** Resource Object
Series_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]	The position of the observation within the time series
quantity	[1]	The quantity of the product for the position within the time interval in question

Table 10: Usage of: ERRP Planned Resource Schedule Document, Ancillary services schedule

[2] The code **A10** should not have been used for the Ancillary services schedule, hence removed from the list of available Business Types

6.2.7 Dependency matrix: ERRP Planned Resource Schedule Document, Ancillary services schedule

Business type	Measurement Unit	Object Aggregation	Recipient
A70 Production, unavailable **A71** Supplementary available generation **A72** Interruptible consumption **A89** Spinning reserve **A96** Automatic frequency restoration reserve (replaces **A12**) **C26** Frequency Containment Reserves, Normal (**FCR-N**) **C27** Frequency Containment Reserves, Disturbance (**FCR-D**)	**MAW** MW **KWT** kW **E08** MW/Hz	**A01** Area	**A32** *Market information aggregator*
		A06 Resource Object	**A04** System Operator
C25 Frequency bias (Nordic code)	**E08** MW/Hz	**A06** Resource Object	**A04** System Operator

Table 11: Dependency matrix: for ERRP Planned Resource Schedule Document, Ancillary services schedule

6.2.8 Attribute usage ERRP Planned Resource Schedule Document, Fast Frequency Reserves schedule

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules:
  - 6.0, Ancillary services schedules
  - 6.1, Ancillary services schedules

Attribute	Cl.	Code and description
	[1]	**PlannedResourceSchedule_MarketDocument**
mRID	[1]	Unique identification of the document
revisionNumber	[1]	Fixed 1
type	[1]	**Z36** Power Prognoses
process.processType	[1]	**Z14** Fast Frequency Reserve Process
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant.marketRole.type	[1]	**A04** System Operator **A08** Balance Responsible party **A46** Balancing Service Provider (BSP)
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules
receiver_MarketParticipant.marketRole.type	[1]	**A04** System Operator **A05** Imbalance Settlement Responsible **A32** Market information aggregator
createdDateTime	[1]	Date and time of creation of the document.
schedule_Period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	Any known area from the Harmonised role model covering the areas within the time series level of the document, e.g. Scheduling Area, National Area, Nordic Market Area (10Y1001A1001A91G) etc.
	[1..*]	**PlannedResource_TimeSeries**
mRID	[1]	Sender's identification of the time series instance
businessType	[1]	**Z84** Inertia **Z85** FFR **Z86** Frequency nadir **Z87** Reference incident
product	[1]	**8716867000016** Active power
connecting_Domain.mRID	[1]	Scheduling Area
registeredResource.mRID	[0..1]	Only used for *Object Aggregation* = A06, i.e. Station group, regulation object
resourceProvider_MarketParticipant.mRID	[1]	System Operator or Balance Responsible party or Balancing Service Provider
measurement_Unit.name	[1]	**MAW** MW or **KWT** kW **E08** MW/Hz
objectAggregation	[1]	**A01** Area **A06** Resource Object

Attribute	Cl.	Code and description
	[1..*]	**Series_Period**
timeInterval	[1]	The start and end date and time of the time interval of the period in question
resolution	[1]	The resolution defining the number of periods that the time interval is divided. The resolution is expressed in compliance with ISO 8601 in the following format: PnYnMnDTnHnMnS. Where nY expresses a number of years, nM a number of months, nD a number of days. The letter "T" separates the date expression from the time expression and after it nH identifies a number of hours, nM a number of minutes and nS a number of seconds. E.g. **PT1H** or **PT60M**
	[1..*]	**Point**
position	[1]	The position of the observation within the time series
quantity	[1]	The quantity of the product for the position within the time interval in question

Table 12: Usage of: ERRP Planned Resource Schedule Document, Ancillary services schedule

6.3 ERRP Resource Schedule Confirmation Report based on IEC62325-351 Ed.3

The ERRP Resource Schedule Confirmation Report described below is based on the IEC 62325 framework for energy market communications, Part 351, see [2].

6.3.1 Class diagram: ERRP Resource Schedule Confirmation Report contextual mode

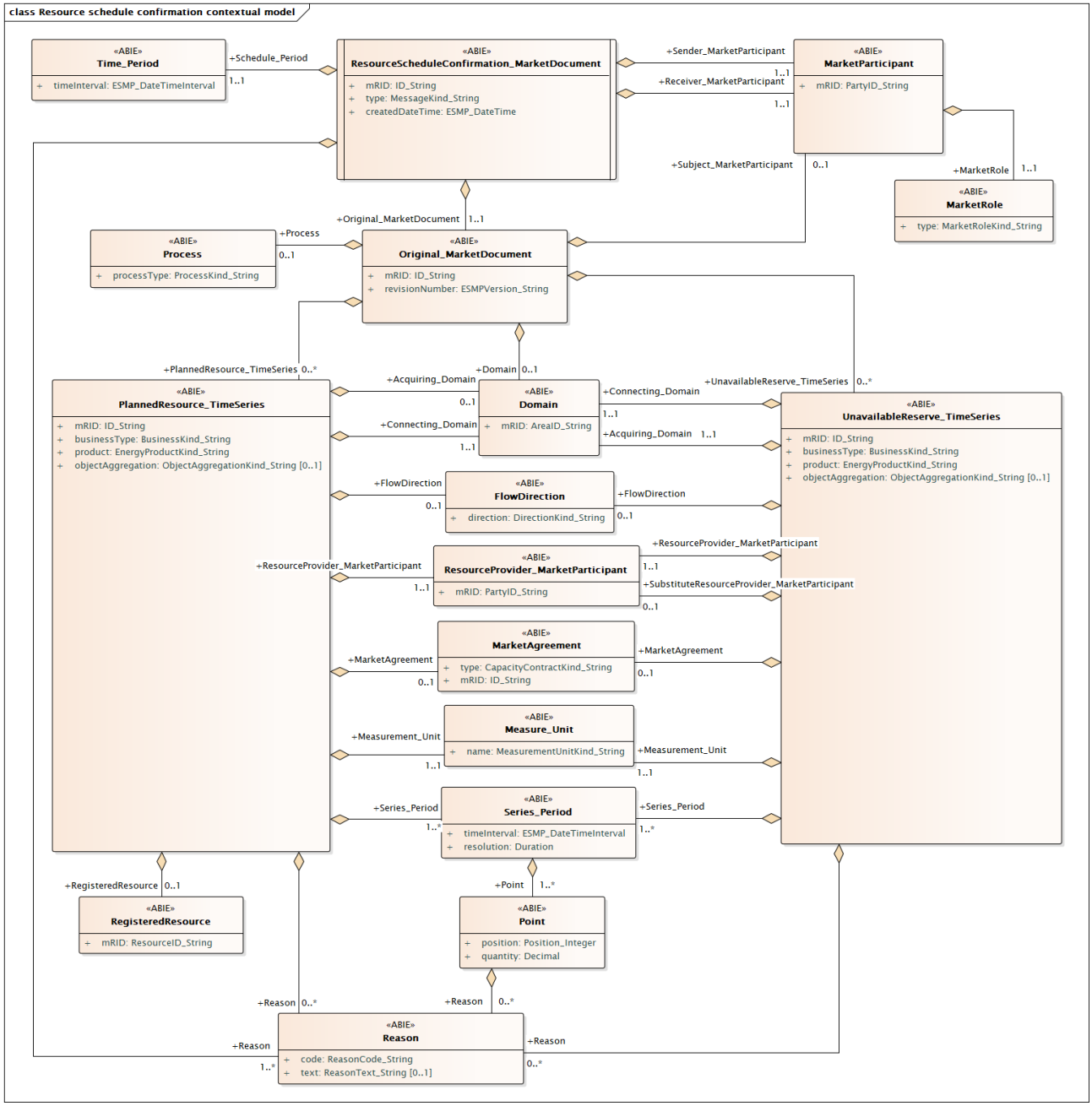

Figure 28: Class diagram: ERRP Resource Schedule Confirmation Report contextual model

6.3.2 Class diagram: ERRP Resource Schedule Confirmation Report Document assembly model

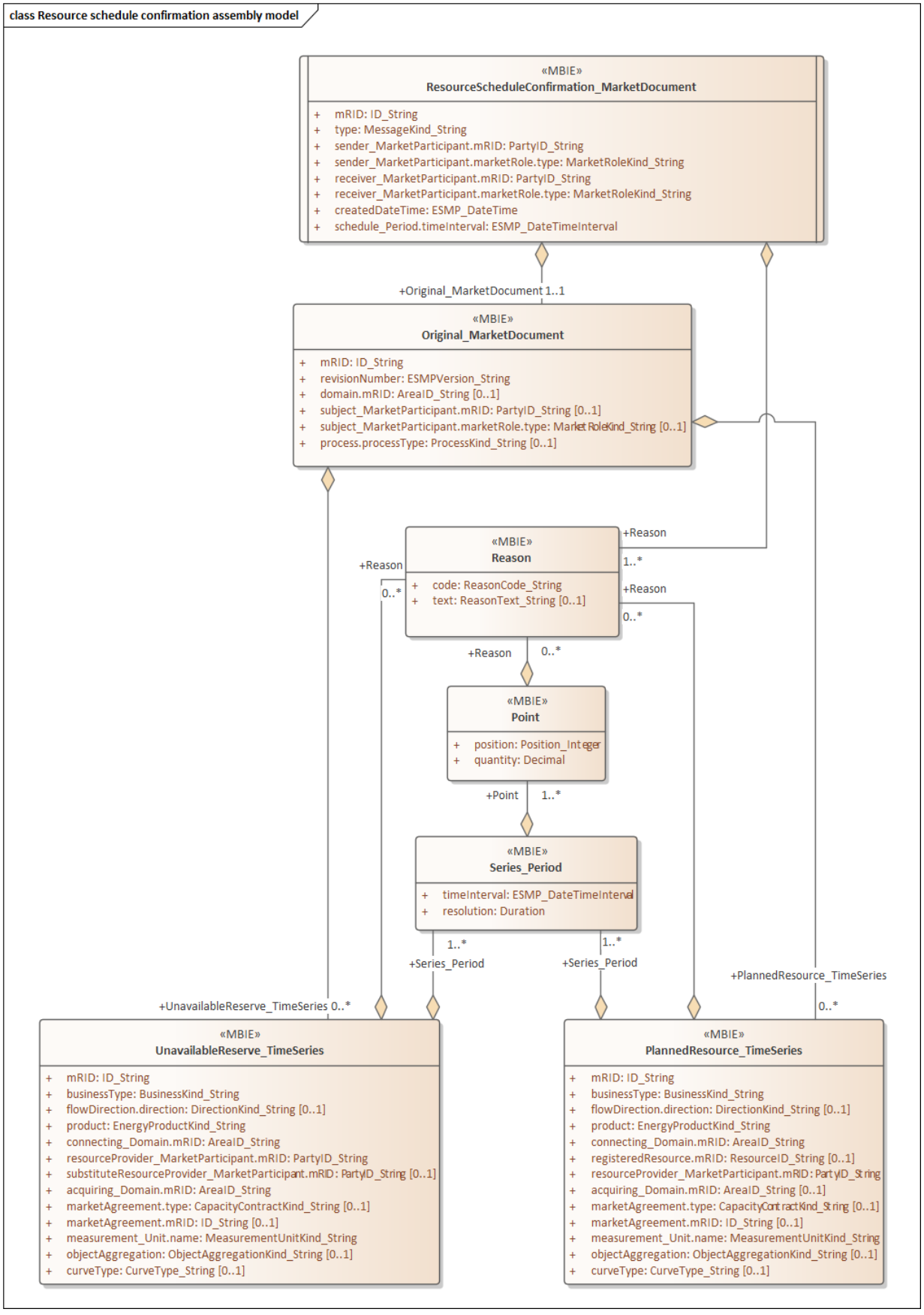

Figure 29: Class diagram: ERRP Resource Schedule Confirmation Report assembly model

6.3.3 Attribute usage ERRP Resource Schedule Confirmation Report

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules
  - 1.1, Confirm Operational schedules

IEC CIM Attribute	Cl.	Code and description
	[1]	**ResourceScheduleConfirmation_MarketDocument**
mRID	[1]	Unique identification of the document
type	[1]	**A18** Confirmation report
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant.marketRole.type	[1]	**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[3] **A46** Balancing Service Provider (BSP)
createdDateTime	[1]	Date and time of creation of the document.
schedule_Period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document
	[1]	**Original_MarketDocument**
mRID	[1]	The identification of the original document containing the confirmed time series.
revisionNumber	[1]	The version of the original document containing the confirmed time series.
process.processType		Use the same process type as in the original document, e.g.: **A01** Day-ahead **A14** Forecast **A17** Schedule day
	[1..*]	**Reason (Market Document level)**
code	[1]	Reason Code **A01** Message fully accepted **A02** Message fully rejected
text	[0..1]	Reason Text
	[0..*]	**PlannedResource_TimeSeries**
mRID	[1]	Sender's identification of the time series instance
businessType	[1]	Use the same businessType as in the original document, e.g.: **A01** Production **A04** Consumption

[3] To be replaced by BSP

		A90 Solar **Z38** Hydro production **Z39** Nuclear production **Z40** Thermal production **Z41** Wind production **Z42** Decentralised production **Z43** Gas turbine and diesel production **Z44** Other thermal production
product	[1]	**8716867000016** Active power
connecting_Domain.mRID	[1]	Relevant area, such as *National Area* or Scheduling Area
registeredResource.mRID	[0..1]	Only used for Classification type = **A01**, i.e. Station group, regulation object
resourceProvider_MarketParticipant.mRID	[1]	The ID of the relevant Balance Responsible party
measurement_Unit.name	[1]	**MAW** MW or **KWT** kW
objectAggregation	[1]	**A01** Area **A03** Party **A06** Resource object
curveType	[1]	**A01** Sequential fixed size blocks **A04** Overlapping breakpoint **A05** Non-overlapping break points
	[1..*]	**Series_Period**
Time Interval	[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**
	[1..*]	**Point**
position	[1]	The position of the observation within the time series
quantity	[1]	The quantity of the product for the position within the time interval in question
	[0..*]	**Reason (Point level)**
code	[1]	Reason Code
text	[0..1]	Reason Text

Table 13: Usage of ERRP Resource Schedule Confirmation Report

6.4 Ediel HVDC Profile Market Document based on IEC62325-351 Ed.3

The Ediel HVDC Profile Market Document described below is based on the IEC 62325 framework for energy market communications, Part 351, see [2].

6.4.1 Class diagram: Ediel HVDC Profile Market Document contextual mode

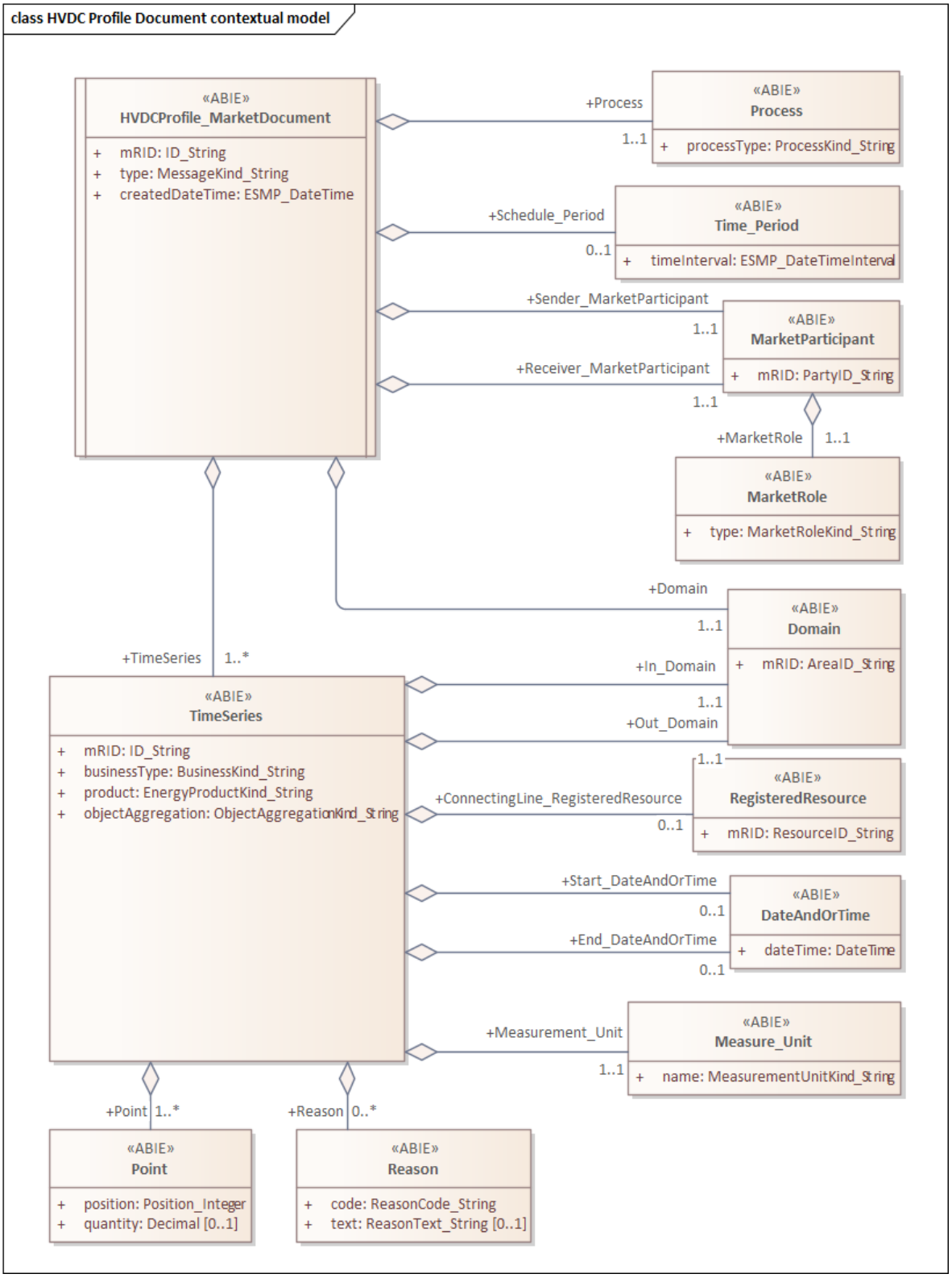

Figure 30: Class diagram: Ediel HVDC Profile Market Document contextual model

6.4.2 Class diagram: Ediel HVDC Profile Market Document assembly model

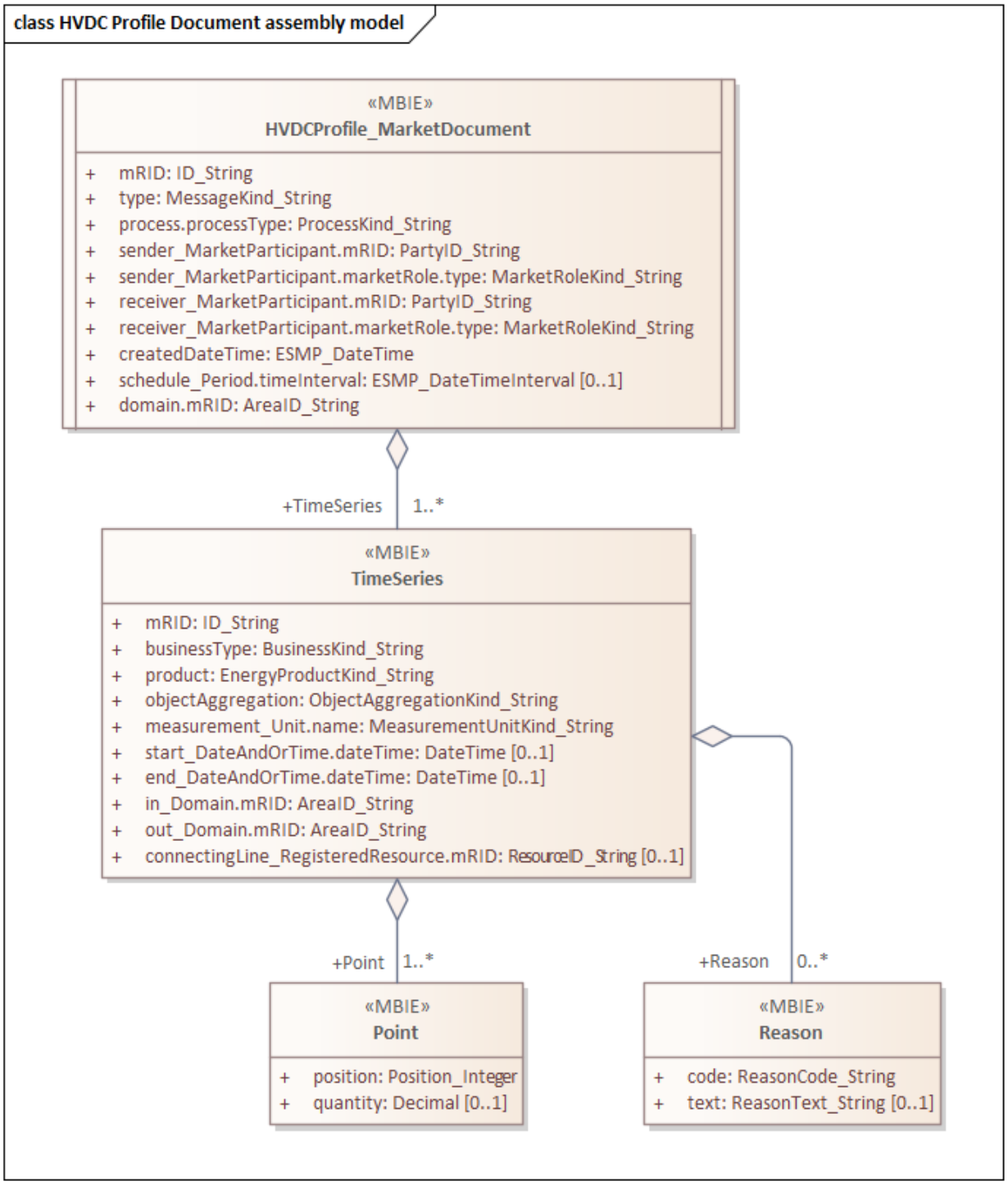

Figure 31: Class diagram: Ediel HVDC Profile Market Document assembly model

6.4.3 Attribute usage Ediel HVDC Profile Market Document

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules
  - 5.0, Dynamic HVDC-run-profiles

IEC CIM Attribute	Cl.	Code and description
HVDCProfile_MarketDocument	**[1]**	
mRID	[1]	Unique identification of the document
type	[1]	**Z45** HVDC Load profile
process.processType		**A01** Day-ahead
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant.market Role.type	[1]	**A04** System Operator
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 of creation of the document.
schedule_Period.timeInterval	[0..1]	The beginning and ending date and time of the period covered by the document
domain.mRID	[1]	E.g. Nordic market area
TimeSeries	**[0..*]**	
mRID	[1]	Sender's identification of the time series instance
businessType	[1]	**ZA1** HVDC Power distribution
product	[1]	**8716867000016** Active power
objectAggregation	[1]	**A07** Tieline
measurement_Unit.name	[1]	**MAW** MW
start_DateAndOrTime.dateTime	[0..1]	The start and date and time for the timeseries
end_DateAndOrTime.dateTime	[0..1]	The end and date and time for the timeseries
in_Domain.mRID	[1]	EIC code of area where the energy is going to
out_Domain.mRID	[1]	EIC code of area where the energy is coming from
connectingLine_RegisteredResource.mRID	[1]	EIC code of the corridor in question
Point	**[1..*]**	
position	[1]	The position of the observation within the time series
quantity	[0..1]	The quantity of the product for the position within the time interval in question
Reason (TimeSeries level)	**[0..*]**	
code	[1]	Reason Code
text	[0..1]	Reason Text

Table 14: Usage of Ediel HVDC Profile Market Document

6.5 Energy prognosis document

The Energy prognosis document described below is based on the IEC 62325 framework for energy market communications, Part 351 Ed. 3, see [2]. The Energy prognosis document is used to distribute Imbalance Forecast for the various Bidding Zones from one TSO other TSOs.

This chapter describes a Nordic subset of the ENTSO-E version of the Energy prognosis document. The document is based on the European Style Market Profile (ESMP) as described in IEC 62325 framework for energy market communications, Part 351, see [2].

6.5.1 Class diagram: Energy prognosis document contextual mode

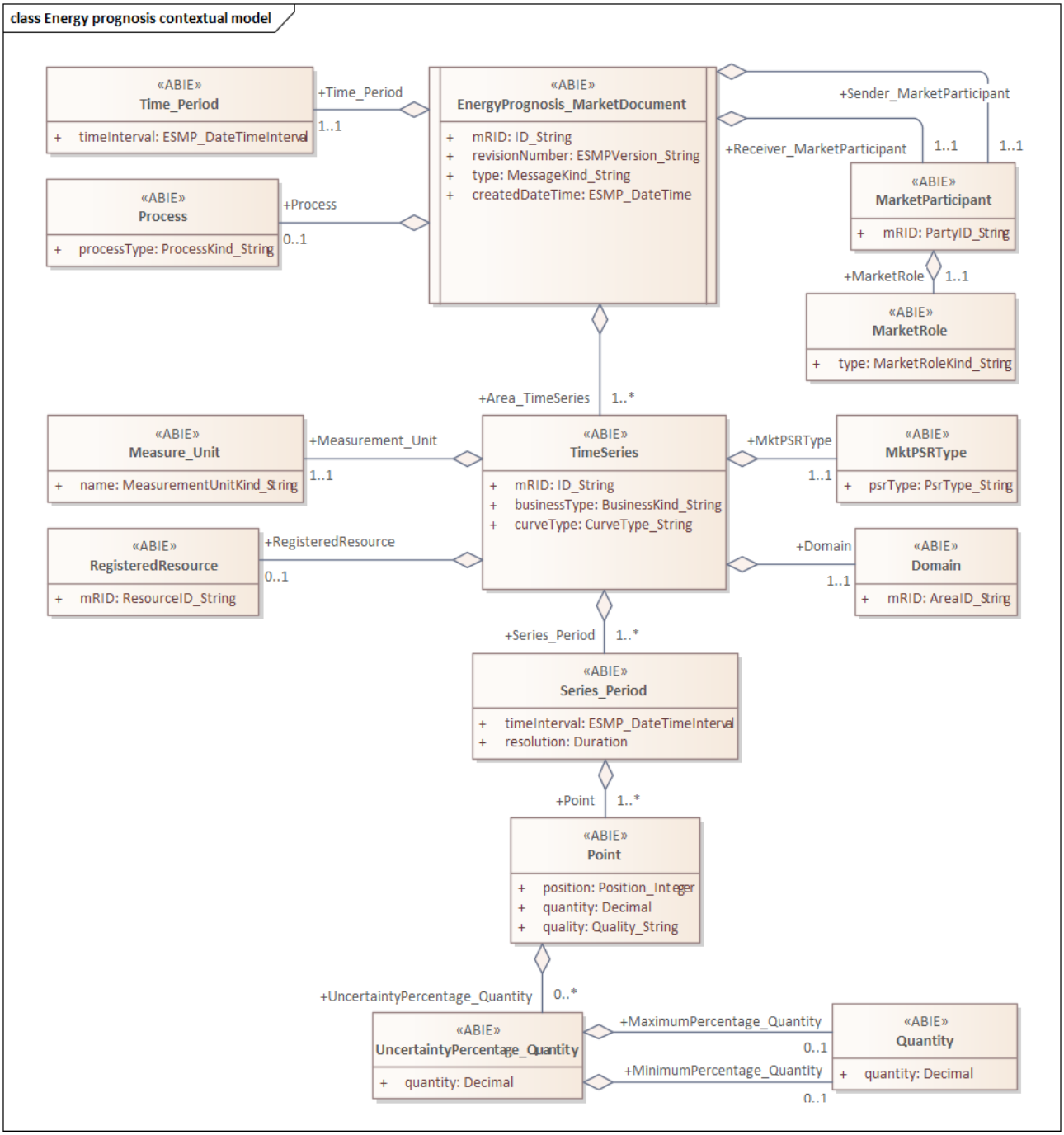

Figure 32: Class diagram: Energy prognosis document contextual model

6.5.2 Class diagram: Energy prognosis document assembly model

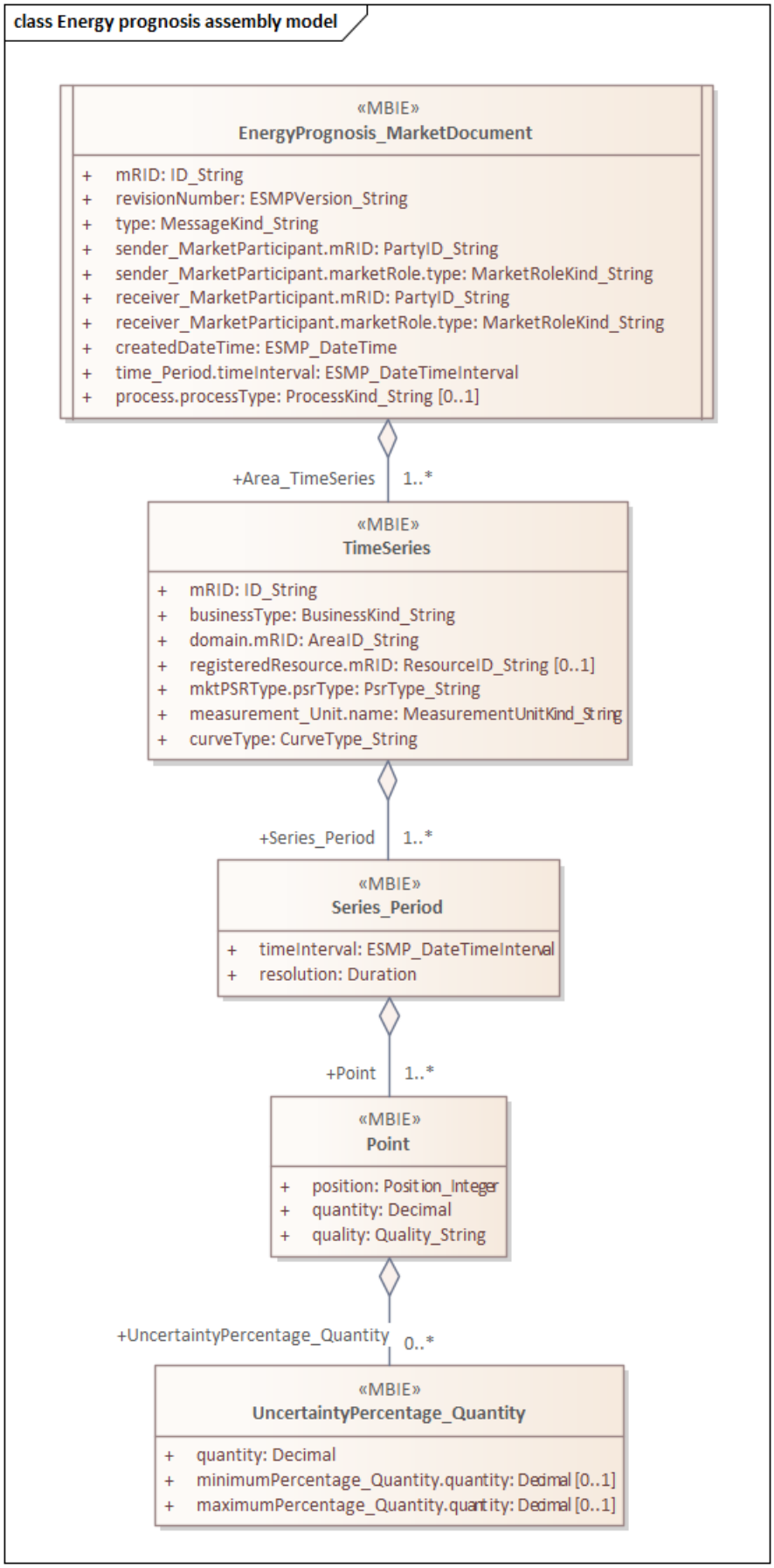

Figure 33: Class diagram: Energy prognosis document assembly model

6.5.3 Attribute usage Energy prognosis document

The document is used in the following exchanges:

- Table 1: Documents used for operational schedules
  - 3.0, Imbalance forecast
  - 3.1, Imbalance forecast

IEC CIM Attribute	Cl.	Code and description
EnergyPrognosis_MarketDocument	**[1]**	
mRID	[1]	Unique identification of the document
revisionNumber	[1]	**Fixed 1**
type	[1]	**B39** Imbalance prognosis document
sender_MarketParticipant.mRID	[1]	Identification of the party who is sending the document
sender_MarketParticipant.market Role.type	[1]	**A04** System Operator
receiver_MarketParticipant.mRID	[1]	Identification of the party who is receiving the schedules
receiver_MarketParticipant.market Role.type	[1]	**A33** Information receiver
createdDateTime	[1]	Timestamp when Imbalance is produced (original description: "Date and time of creation of the document").
time_Period.timeInterval	[1]	The beginning and ending date and time of the period covered by the document **NBM:** Two hours period.
TimeSeries	**[1..*]**	
mRID	[1]	The unique identification of this time series instance given by the sender.
businessType	[1]	**C32** Area imbalance
domain.mRID	[1]	EIC code of the relevant Bidding Zone
mktPSRType.psrType	[1]	**B20** Other
measurement_Unit.name	[1]	**MAW** MW
curveType	[1]	**A01** Sequential fixed size block
Series_Period	**[1..*]**	
Time Interval	[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.

IEC CIM Attribute	Cl.	Code and description
		Always: **PT15M**
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
quality	[1]	The quality of the information being provided, **e.g.:** **A01** Adjusted **A02** Not available **A03** Estimated **A04** As provided **A05** Incomplete **A06** Calculated
UncertaintyPercentage_Quantity	**[0..*]**	
quantity	[1]	The uncertainty range around the Imbalance Value, expressed as a percentage (0 - 100). Example: it is estimated to be 50% likely that the actual value will be between 800 MW and 1100 MW". Then the value = 50.
minimumPercentage_Quantity.quantity	[0..1]	The lower bound of the uncertainty range, expressed as a quantity (unit type: MW). Example: it is estimated to be 50% likely that the actual value will be between 800 MW and 1100 MW". Then the value = 800
maximumPercentage_Quantity.quantity	[0..1]	The upper bound of the uncertainty range, expressed as a quantity (unit type: MW). Example: it is estimated to be 50% likely that the actual value will be between 800 MW and 1100 MW". Then the value = 1100

Table 15: Usage of Energy prognosis document

6.6 Outage Document

The outage document is used for:

- As an extended version by NOIS.

The document is used in the following exchanges:

- Table 2: Document used for outages
  - 1.0, Outages

An Outage Document is issued by a System Operator to provide information to the Market Information Aggregator whenever outages concerning a specific object are planned or as soon as an unplanned outage of a specific object occurs. Upon reception the Market Information Aggregator makes this information promptly available to the market.

6.6.1 Outage Document from IEC62325-451-6 Ed.2

The CIM based document will be added as soon as NMEG have specified it.

6.6.2 Ediel Outage Document version 1.0 (ENTSO-E version 1.2)

The outage document described below is based on the ENTSO-E Outage Document Implementation Guide, version 1.2, see [1], and on the extended NOIS specification.

The Outage document has been extended with additional tags that contain the group, the version, the reconnect / disconnect information, the impact types and values over corridors.

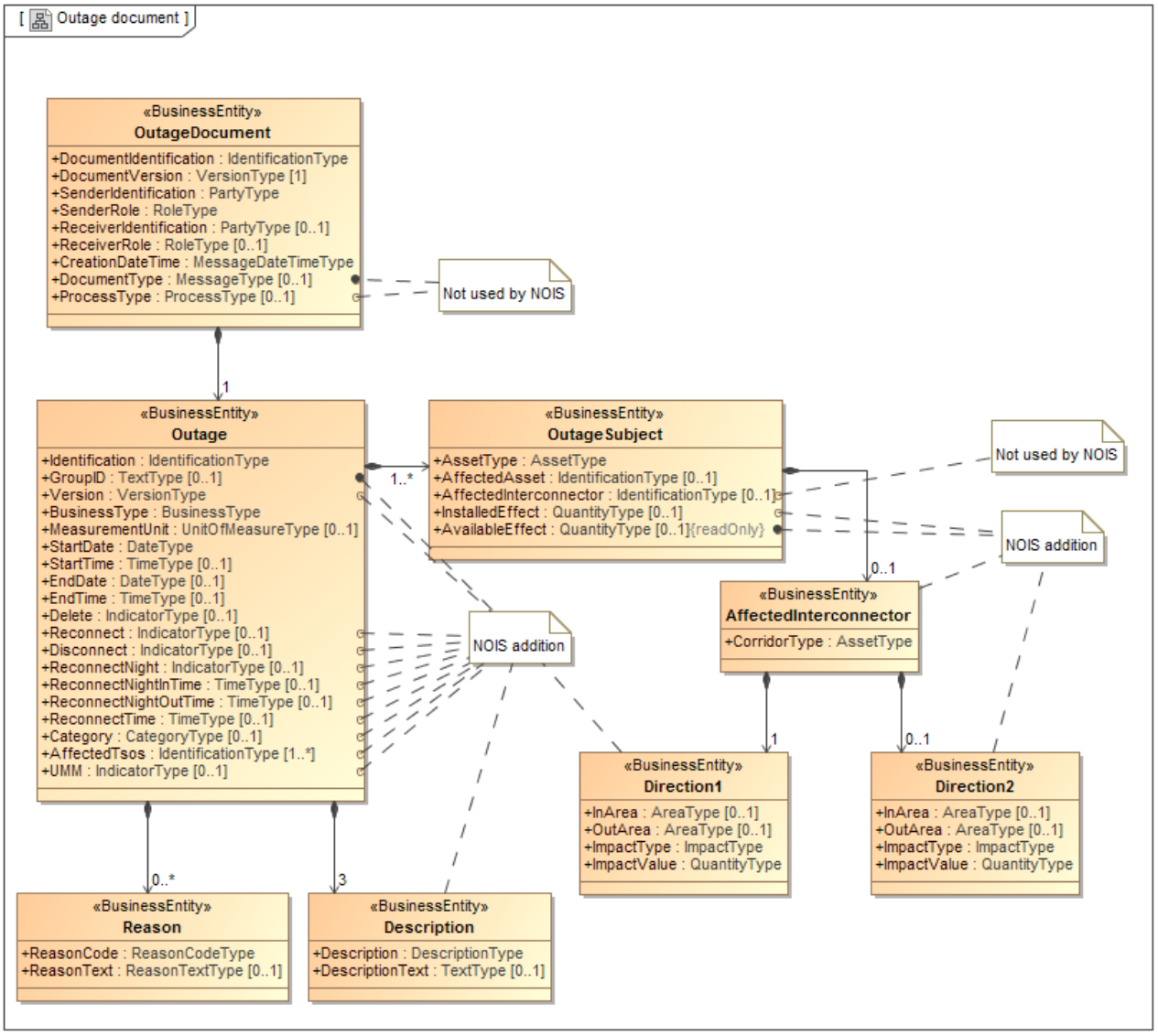

Figure 34: Class diagram: Outage document

The document is used in the following exchanges:

- Table 2: Document used for outages
  - 1.0, Outages

An Outage Document is issued by a System Operator to provide information to the Market Information Aggregator whenever outages concerning a specific object are planned or as soon as an unplanned outage of a specific object occurs. Upon reception the Market Information Aggregator makes this information promptly available to the market.

6.6.2.1 Attribute usage, Outage to NOIS

Attribute	Cl.	Code and description
	[1]	**Outage Document**
Document Identification	[1]	Unique identification of the document
Document Version	[1]	**Fixed 1**
Sender Identification	[1]	Identification of the party who is sending the document
Sender Role	[1]	**A04** System Operator
Receiver Identification	[0..1]	Identification of the party who is receiving the outage document
Receiver Role	[0..1]	**A32** Market information aggregator
Creation ate Time	[1]	Creation date and time
	[1]	**Outage**
Identification	[1]	Unique identification of the outage
Group ID	[0..1]	A string identifying a group of outages that are linked
Version	[1]	Version of the Outage being sent. Each outage change must be identified by a different version number that starts at 1 and increases sequentially. A new outage must be identified with version 1.
Business Type	[1]	**A53** Planned maintenance **A54** Forced outage
Measurement Unit	[0..1]	**MAW** MW
Start Date	[1]	The date that the outage will or has begun, expressed as YYYY-MM-DD
Start Time	[0..1]	Time that the outage has begun or will begin, expressed in UTC as HH:MM:SSZ
End Date	[0..1]	The date that the outage is expected to end, expressed as YYYY-MM-DD
End Time	[0..1]	Time that the outage is expected to end, expressed in UTC as HH:MM:SSZ
Delete	[0..1]	**A01** YES – delete the outage **A02** NO – no deletion
Reconnect	[0..1]	**A01** YES (A positive indication) **A02** NO (A negative indication)
Disconnect	[0..1]	**A01** YES (A positive indication) **A02** NO (A negative indication)
Reconnect Night	[0..1]	**A01** YES (A positive indication) **A02** NO (A negative indication)
Reconnect Night In Time	[0..1]	Connect Night in time, expressed in UTC as, HH:MM:SSZ
Reconnect Night Out Time	[0..1]	Connect Night out time, expressed in UTC as, HH:MM:SSZ

Reconnect Time	[0..1]	Time necessary to reconnect the equipment if reconnect is possible, expressed in UTC as, HH:MM:SSZ
Category	[0..1]	**X01** Generation **X02** Transmission
Affected TSOs	[1..*]	Identification of affected TSOs (repeatable)
UMM	[0..1]	**X01** Generation **X02** Transmission
	[1..*]	**Outage Subject**
Asset Type	[1]	**X01** AC line (within same control area) **X02** AC tie line (between two control areas) **X03** Busbar **X04** Generator **X05** HVDC Line **X06** HVDC Tie line **X07** Series Capacitor **X08** Transformer **X09** Substation (Misc. Device)
Affected Asset	[0..1]	Identification of the asset
Affected Interconnector	[0..1]	Not used
Installed Effect	[0..1]	Installed Effect
Available Effect	[0..1]	Available Effect
	[0..1]	**Affected Interconnector**
Corridor Type	[1]	**X01** Day-ahead corridor **X02** Cut corridor **X03** External corridor
	[1]	**Direction1**
In Area	[0..1]	Identification of the In Area
Out Area	[0..1]	Identification of the Out Area
Impact Type	[1]	**X01** Absolute **X02** Delta **X03** Percentage
Impact Value	[1]	The total capacity that is effected by the outage
	[0..1]	**Direction2**
In Area	[0..1]	Identification of the In Area
Out Area	[0..1]	Identification of the Out Area
Impact Type	[1]	**X01** Absolute **X02** Delta **X03** Percentage
Impact Value	[1]	The total capacity that is effected by the outage
	[0..*]	**Reason**
Reason Code	[1]	The reason code identifying the outage reason : NOIS codes:

		X20 Annual revision **X21** Condition control **X22** Essential fault correction **X23** Mechanical **X24** Protective gear **X25** Reconstruction **X26** Replacements **X27** Routine maintenance **X28** Waterways **X29** Work in control system **X30** Work while voltage on **X31** Complementary information **X32** Other **X33** Until further notice **X34** Duration unknown **X35** Back in operation **X36** Yearly maintenance **X37** Required maintenance **X38** Maintenance **X39** New estimated start-up time Danish codes: **Z01** Operational (The given unit has a status of operational) **Z02** Reduced Operational (The given unit has a status of reduced operational) **Z03** Non Operational (The given unit has a status of non-operational) **Z04** Revision (The given unit is under revision) **Z05** Suspended (The given unit is suspended) **Z06** Crashed (The given unit is crashed) **Z07** Discarded (The given unit is discarded)
Reason Text	[0..1]	Optional textual additional information concerning the reason for the outage
	[3]	**Description**
Description	[1]	**X01** Work Description **X02** Contact person **X03** Contact phone
Description Text	[0..1]	Optional textual additional information concerning the description of the outage

Table 16: Usage of Outage document

7 Business rules

7.1 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 schedule document received before cut-off time is the valid schedule.
2. A time series shall be sent for each unique combination of the product, business type, object aggregation, in area, out area, metering point identification, in party, out party, capacity contract type and capacity agreement identification.
3. Resending of schedules:
   Denmark: All time series in a document must be sent in all retransmitted documents. If a *Market schedule* is left out, it is interpreted as the time series will be deleted. If an *Operational schedule* is left out the document is rejected.

   Finland: TBD

   Norway: If changes to a time series, it is enough to resend the changed time series. However, in the case of errors, the whole document (all time series in a document) will be rejected. There shall always be a whole day-and-night in a schedule.

   Sweden: If changes to a time series, it is enough to resend the changed observations. In case of errors only the observations in error are rejected.
4. All version numbers shall be positive integer values and leading zeros shall be suppressed.
5. All scheduling documents received shall have an acknowledgement (acceptance, rejection or errors).
6. All the time series information that has been validated in phase 1 (validation at document level) for formal correctness may be used to balance their complementary time series as soon as these become available.
7. 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.
8. 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).
9. The time interval defined in the period class shall always be a multiple of its resolution.
10. For a schedule document the time interval of a period class shall always be equal to the Schedule time interval.
11. Negative quantities for a time series are only permitted for certain categories of time series, such as for netted time series.
12. An *Operational schedule* cannot be cancelled or deleted. However, it is possible to send zero-value schedules.
13. It is preferred that the quantity for a *Balance Responsible* time series in a day-ahead and an intraday schedule is given in power units' as the average value over the time interval, i.e. MW (code MAW).
14. 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.