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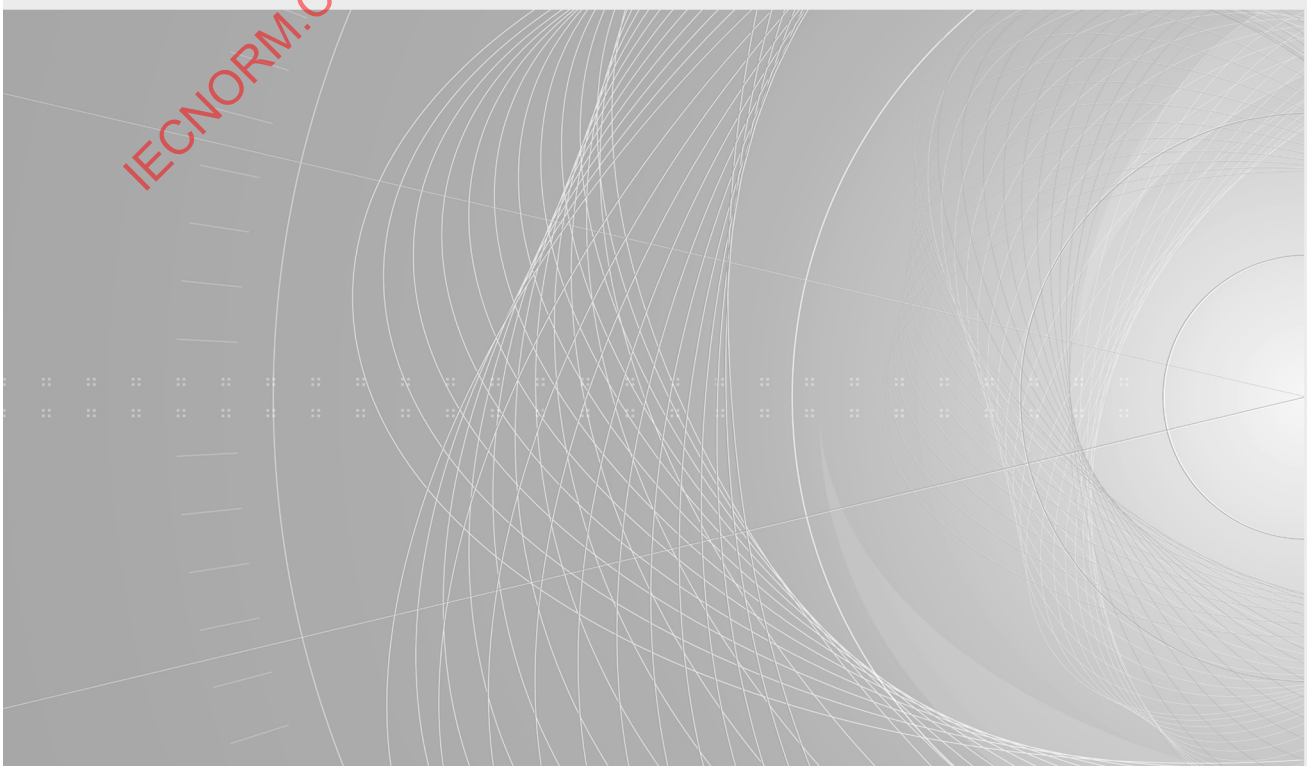
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TECHNICAL REPORT

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Framework for energy market communications – Part 103: Review of information exchanges within the deregulated European style retail energy market from a CIM perspective

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FRAMEWORK FOR ENERGY MARKET COMMUNICATIONS –

Part 103: Review of information exchanges within the deregulated European style retail energy market from a CIM perspective

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IEC TR 62325-103, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
57/1896/DTR	57/1932/RVDTR

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62325 series, under the general title: *Framework for energy market communications*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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INTRODUCTION

This part of IEC 62325, which is a Technical Report, is part of the IEC 62325 series for deregulated energy market communications.

The common information model (CIM), i.e. the IEC 62325-301, IEC 61970-301 and IEC 61968-11 standard series, specifies the basis for the semantics for message exchange.

In this document it is investigated how CIM can be used and updated to include most parts of the information exchanges within the deregulated European style retail energy market.

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FRAMEWORK FOR ENERGY MARKET COMMUNICATIONS –

Part 103: Review of information exchanges within the deregulated European style retail energy market from a CIM perspective

1 Scope

ebIX®[1] (the European forum for energy Business Information eXchange) is a group representing a significant number of European countries. ebIX® defines harmonised information exchanges for the deregulated European style retail energy market. ebIX® will follow the rules of the European Union where applicable. This part of IEC 62325, which is a Technical report, provides information about how the ebIX® information model can be mapped to CIM. In addition, this document shows what may be needed to be added or changed within CIM in order to cover the specific set of information exchange within the deregulated European style retail energy market. The scope is to study the exchange of market information between the actors in the energy market.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Abbreviated terms

3.2.1
BIM
Business Information Model

3.2.2
BRS
Business Requirement Specification

3.2.3
CIM
Common information model

[1] This information is given for the convenience of users of this document and does not constitute an endorsement.

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3.2.4
DSO
Distribution System Operator

3.2.5
MP
Metering Point

3.2.6
TSO
Transmission System Operator

4 Overview

The principal objective of the IEC 62325 series of standards is to produce standards which facilitate the integration of market application software developed independently by different vendors into a market management system, between market management systems and market participant systems. This is accomplished by defining message exchanges to enable these applications or systems access to public data and exchange information independent of how such information is represented internally.

IEC 62325-301 is the part of CIM that contains market extensions required for market management systems and for market operation systems, see [27][2].

This document gives an indication of the feasibility of mapping deregulated European style retail energy market information to CIM and what may be needed to be added or changed within CIM in order to cover that specific set of information exchange within the deregulated European style retail energy market.

In order to describe the roles and domains in the European energy market, the harmonised electricity role model from ENTSO-E, EFET and ebIX® is used, see [3].

The liaison organization ebIX® has adopted UN/CEFACT's Modelling Methodology (UMM) as the standard for its modelling of information exchange processes and the information exchanged. Based on UMM ebIX® has made business requirement specifications (BRS's), business information models (BIM's) for information exchanges needed for the deregulated European style retail energy market. This document uses data from most of these business requirement specifications, see [4] to [23], to see how they can be mapped onto CIM.

UN/CEFACT's Modelling Methodology (UMM) is a UML modelling approach to design the business services that each partner must provide in order to collaborate, see [2] . The Business Operations View (BOV) in Open-edi is defined as "a perspective of business transactions limited to those aspects regarding the making of business decisions and commitments among organizations", and as such comparable to business requirement specifications (BRS's) as used by ebIX®.

NOTE UN/CEFACT's Modeling Methodology (UMM) is a UML modeling approach to design the business services that each partner must provide in order to collaborate. It provides the business justification for the services to be implemented in a service-oriented collaboration architecture. UMM focuses on developing a global choreography of inter-organizational business processes and their information exchanges. UMM models are notated in UML syntax and are platform independent models. The platform independent UMM models identify which services have to be realized in a service-oriented architecture implementing the business collaboration. This approach provides insurance against technical obsolescence.

The UMM is the formal description technique for describing any Open-edi scenario as defined in ISO/IEC 14662 Open-edi reference model. An Open-edi scenario is a formal means to specify a class of business transactions

2 Numbers in square brackets refer to the bibliography.

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having the same business goal, such as, purchasing or inventory management. The primary scope of UMM is the Business Operations View (BOV) and not the Functional Service View (FSV) as defined in ISO/IEC IS 14662. The BOV is defined as "a perspective of business transactions limited to those aspects regarding the making of business decisions and commitments among organizations", while the FSV is focused on implementation specific, technological aspects of Open-edi. The commitments of the BOV layer are reflected in the choreography of the inter-organizational business process and its information exchanges. At the FSV layer this choreography shall be implemented by a set of composite services. It follows, that UMM on the BOV layer defines what the business is about and technologies on the FSV layer define how to implement the business by a service-oriented architecture.

[SOURCE: UN/CEFACT, [2], [24]

5 Use cases

5.1 Overview

5.1.1 General

In this clause processes and use cases from the deregulated European Energy market are described, as can further be studied in documents from ebIX®, see [1].

Figure 1 shows the different use cases within the deregulated European Energy market. Here Measure, Settle and Structure are selected and further detailed in the next subclauses. Roles used in the use cases are having the stereotype <<Harmonized Role>>. These roles are further described in the Harmonised electricity role model from ENTSO-E, EFET and ebIX®, see [3].

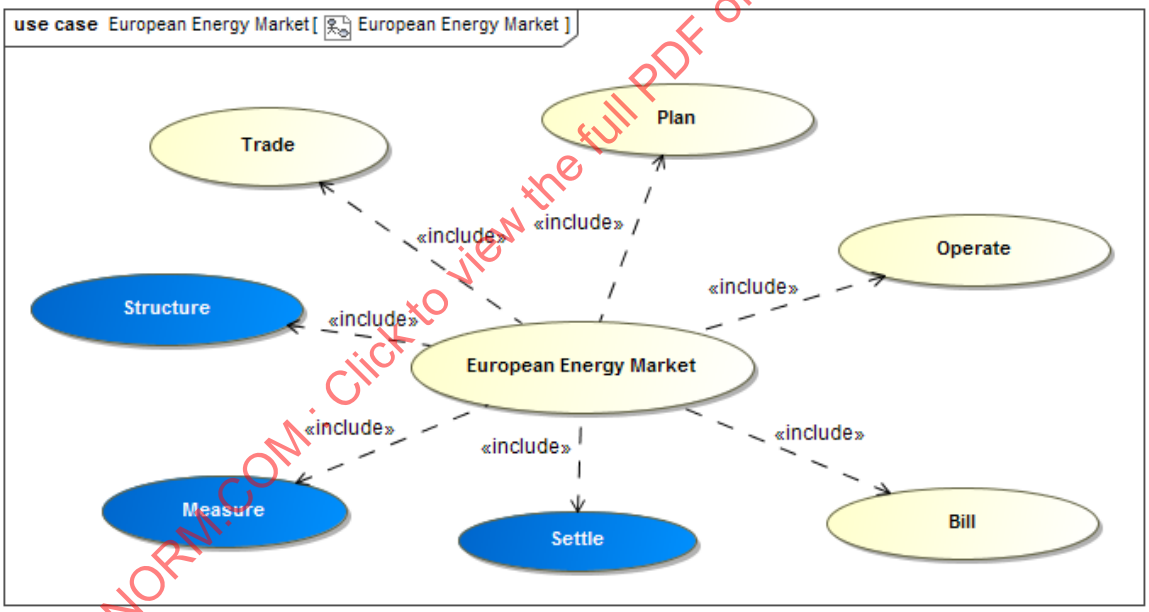
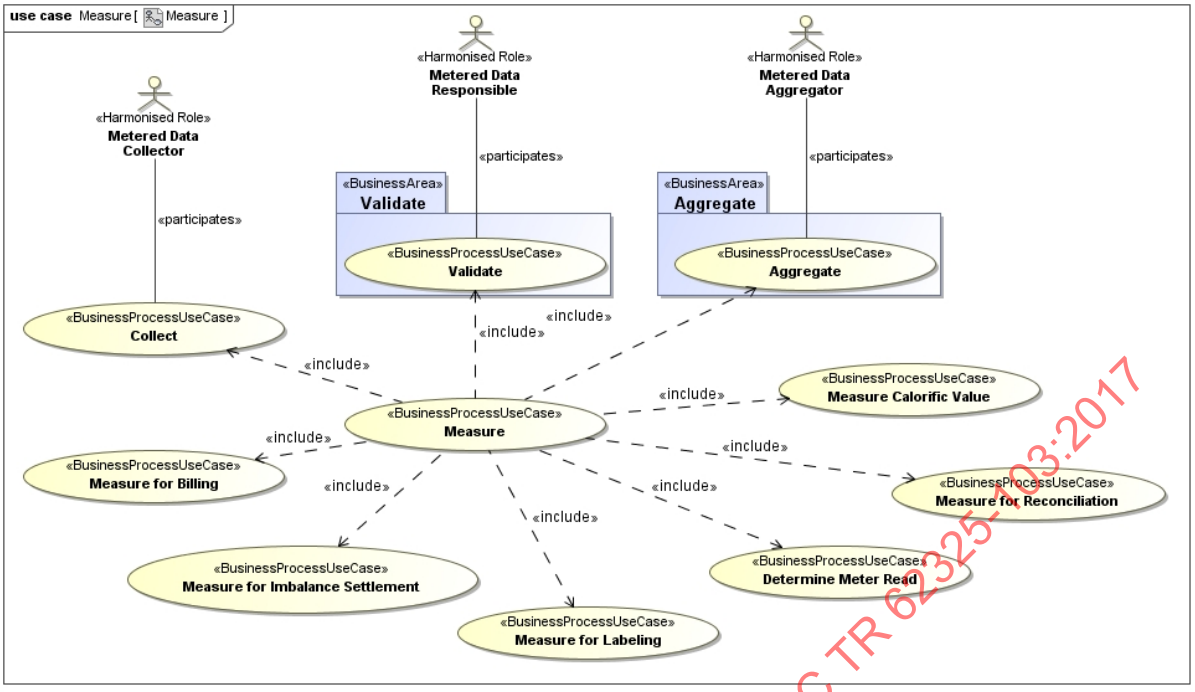


Figure 1 – Business domain use cases within the European Energy Market

5.1.2 The Measure process and its individual processes

Each of the processes above can be broken down into individual processes. As an example, the Measure process can be described with the use cases in Figure 2.

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Figure 2 – The Measure process and its use cases within the European Energy Market

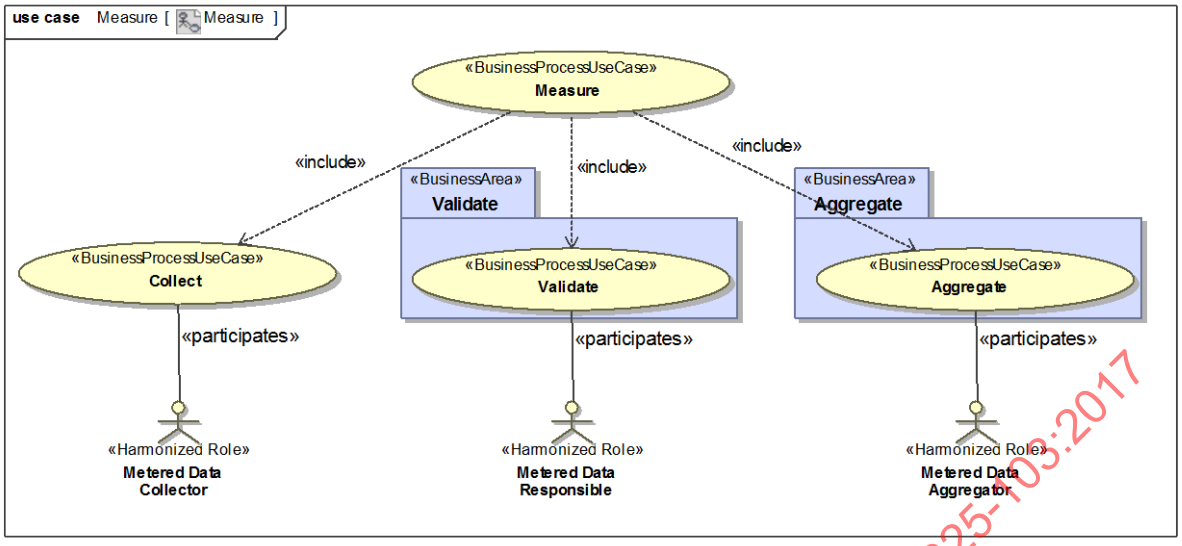
The above use cases are further detailed in Subclauses 5.2 to 5.7 and 5.9.

5.1.3 The Business Areas for Measure

Another way of describing the Measure process is to break it down into different Business areas. According to UMM-2: "A business area usually corresponds to a division of an enterprise. Business areas might be structured recursively. A business area is a category of decomposable business areas or process areas (on the lowest UN/CEFACT – UMM … level of business area hierarchy). This means that a business area collates either other business areas, process areas or business process use case", see [2].

In the model for Measure the business areas contain business processes as clustered around the responsible role. In this way Collect is clustered around the role *Metered Data Collector*, Validate is clustered around the role *Metered Data Responsible* and Aggregate is clustered around the role *Metered Data Aggregator*. See Figure 3.

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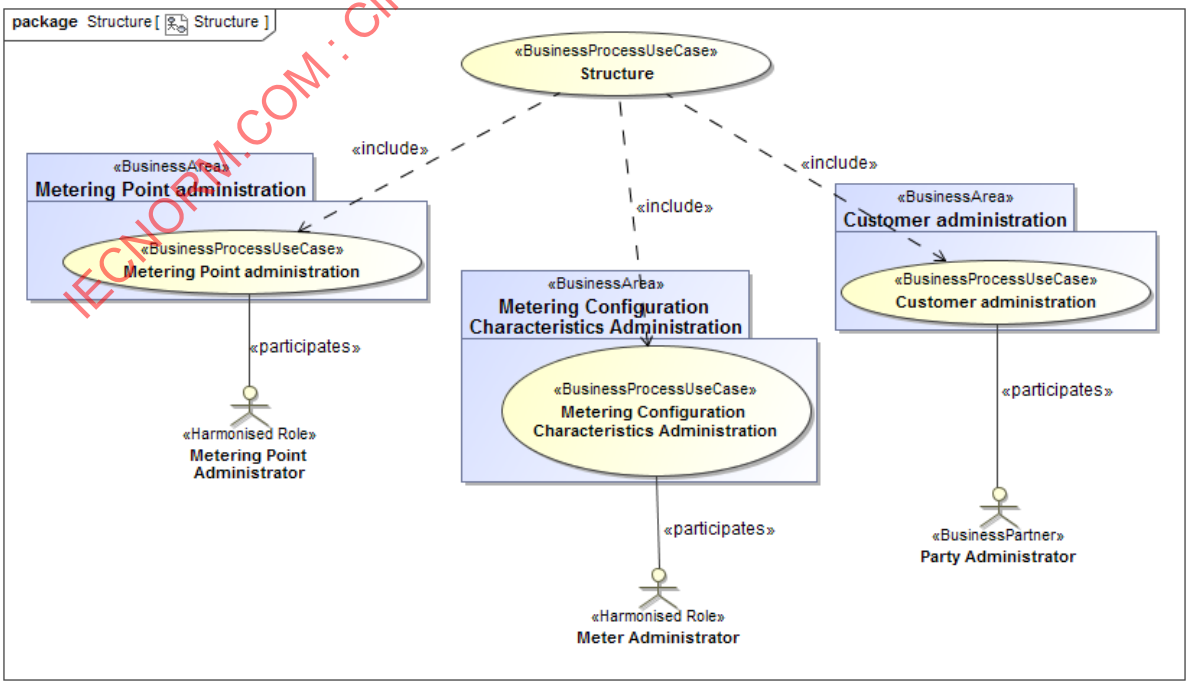
Figure 3 – The business areas for Measure within the European Energy Market

The Business process use case for “Collect” is regarded to represent just one business process, in contrast to “Validate” and “Aggregate” which do not represent one business process in itself. These are in contrast clusters of different (sub-)processes belonging to different business processes but having the responsible <<Harmonized Role>> role in common. Regarding harmonised roles, see [3].

5.1.4 The Business Areas for Structure and its individual processes

The Structure use case is split into the Business Areas “Metering Point Administration”, “Metering Configuration Characteristics Administration” and “Customer administration”, each having different responsible roles, see Figure 4. Regarding Customer administration – for which the use cases are not further detailed in this document – the Party Administrator, in a supply centric model, is mapped to the Harmonised role Balance supplier. Regarding harmonised roles, see [3].

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Figure 4 – The business areas for Structure within the European Energy Market

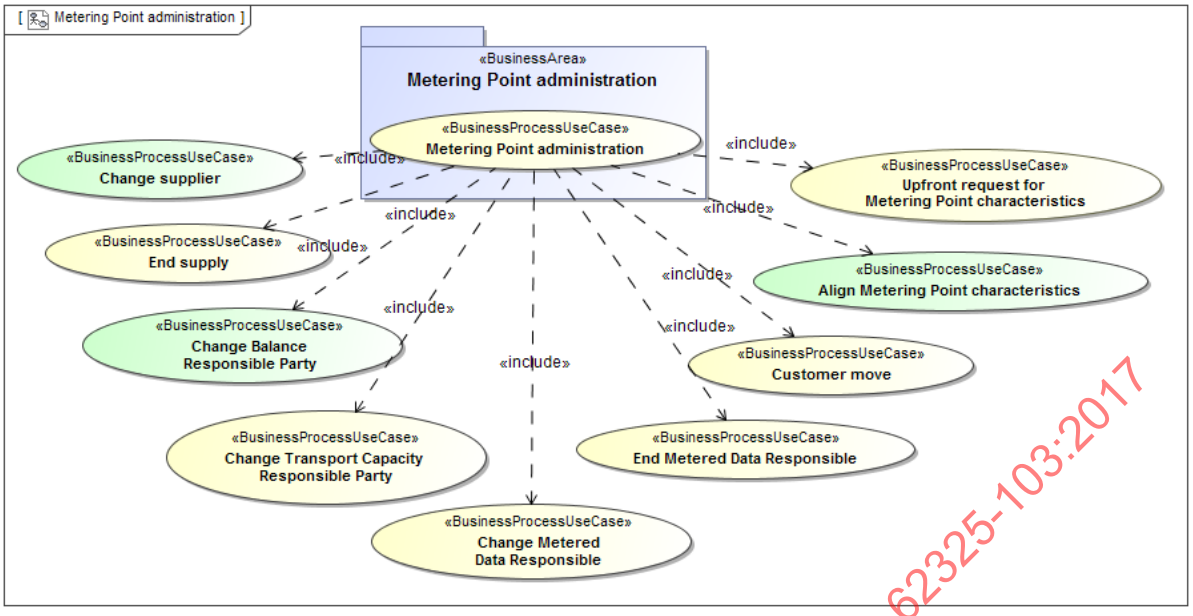


Figure 5 – The Metering Point administration process and its use cases within the European Energy Market

From the Metering Point administration process, see Figure 5, the use cases Change of Supplier, Change of Balance Responsible Party and Align Metering Point Characteristics are selected and further detailed in Subclauses 5.10 to 5.12.

Within Metering Configuration Characteristics Administration (see Figure 4) only the use case Align Metering Configuration Characteristics, is further detailed in 5.13.

5.2 Measure Collected Data

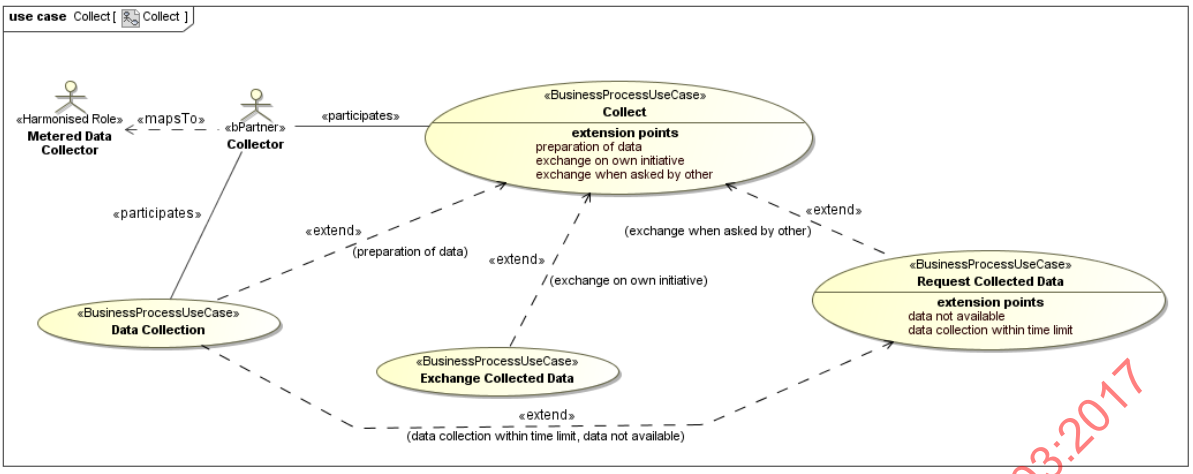
5.2.1 General

The process provides collected data between commercial actors, i.e. by a Collector to other partners in the energy sector. Note that the process does not include the collection of data from the meter itself. See further [4].

5.2.2 The business process Use Case for Collect

Figure 6 shows the business process use case for *Collect* from the business area shown in Figure 3.

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Figure 6 – The business process use case for Collect

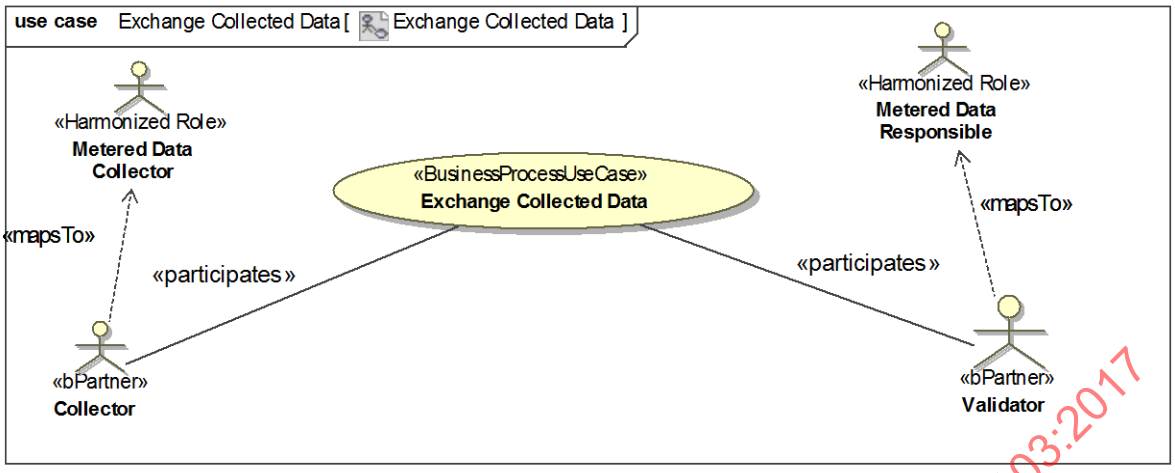
Description

UseCase description: Collect	
Definition	Providing collected data by a Collector to other partners in the energy sector.
beginsWhen	The Collector decides to or is requested to.
Precondition	Collector should know which register to read and therefore have access to relevant master data
endsWhen	– Data collection has been ended successfully (no need for exchange) or – The distribution of the Collected Data has been accomplished or – the request for collected data has been (positively or negatively) answered.
postCondition	– Collected are available for the register or – Collected data have been exchanged or – The request is rejected.
Exceptions	– No data available within time limit – Collected data delivered to the wrong addressee

5.2.3 Use case for the business process Exchange Collected Data

Figure 7 shows the business process use case for Exchange Collected Data from the business processes shown in Figure 6.

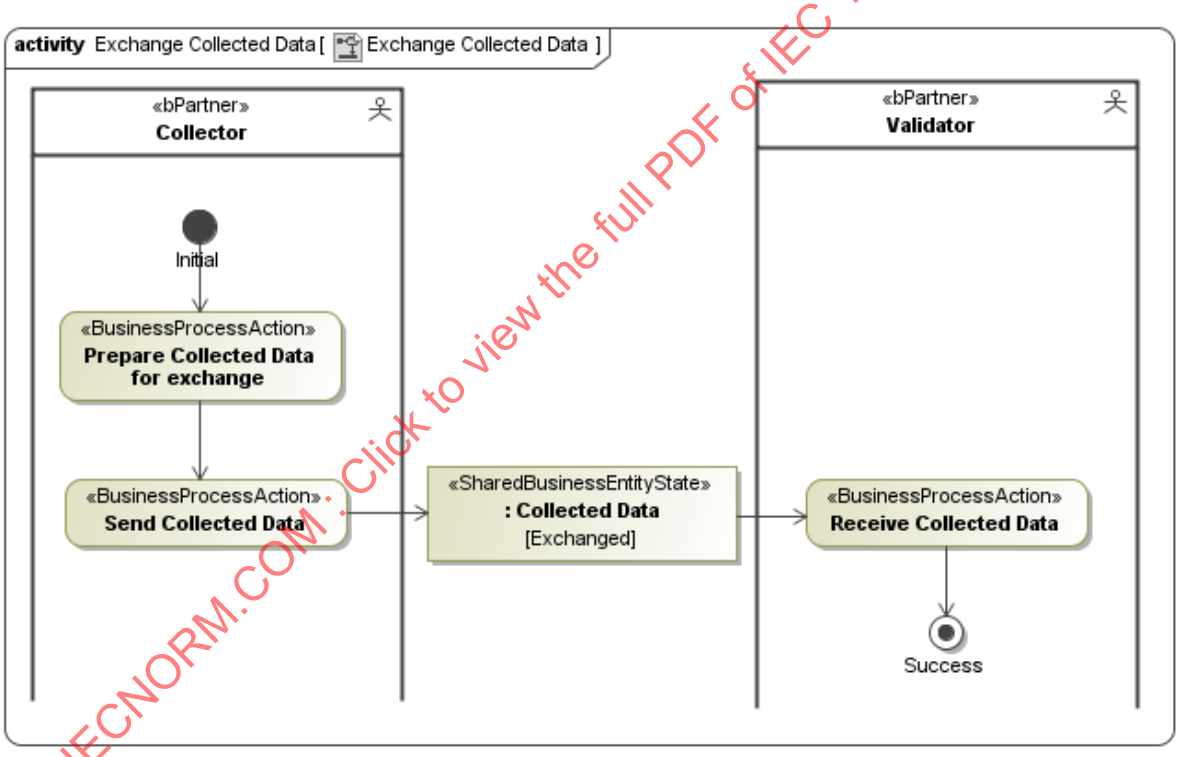
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Figure 7 – Use case for the business process Exchange Collected Data

Figure 8 shows the activity diagram for the use case Exchange Collected Data shown in Figure 7.

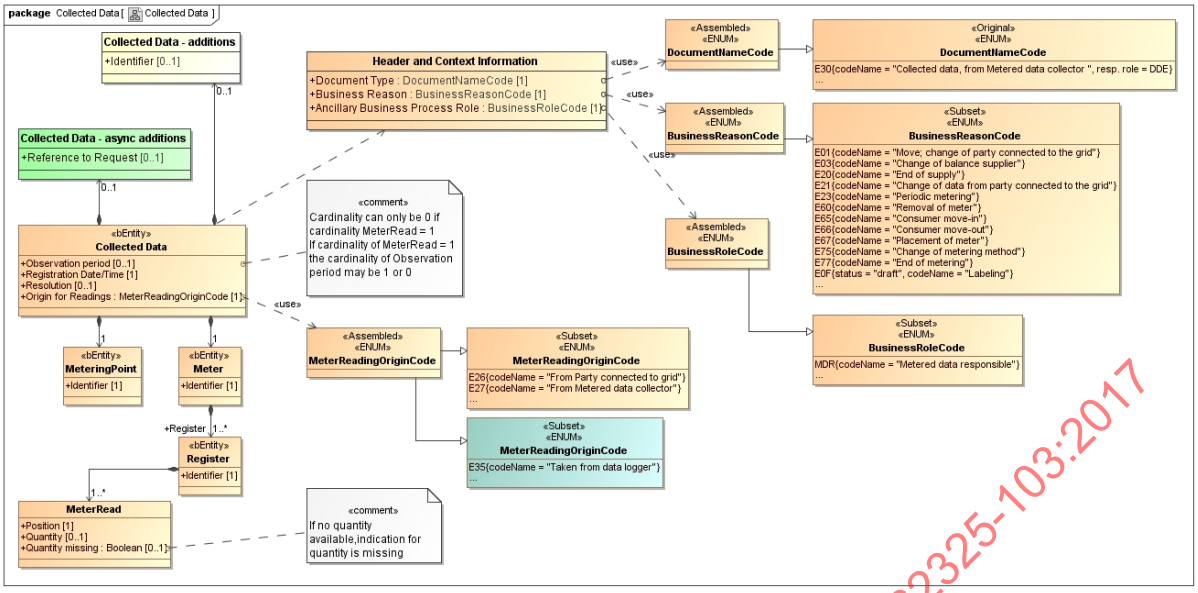


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Figure 8 – Activity diagram for the business process Exchange Collected Data

Figure 9 shows the class diagram for the exchanged Collected Data as shown in Figure 8.

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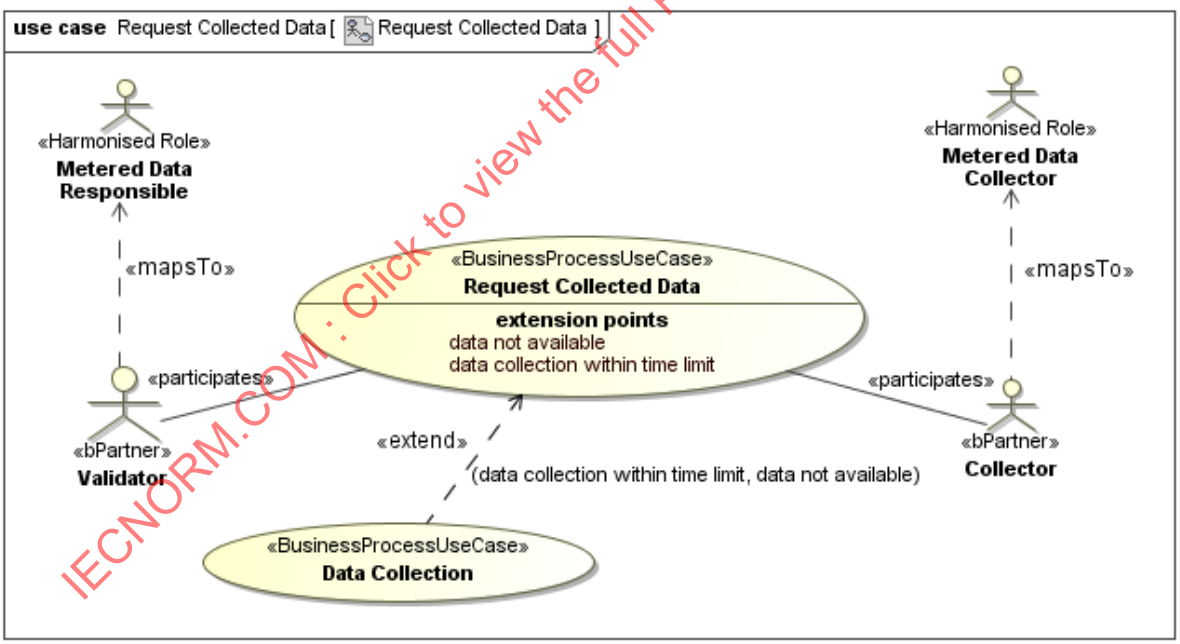


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Figure 9 – Class diagram for Collected Data

5.2.4 Request Collected Data (business process use case)

Figure 10 shows the business process use case for Request Collected Data from the business processes shown in Figure 6.

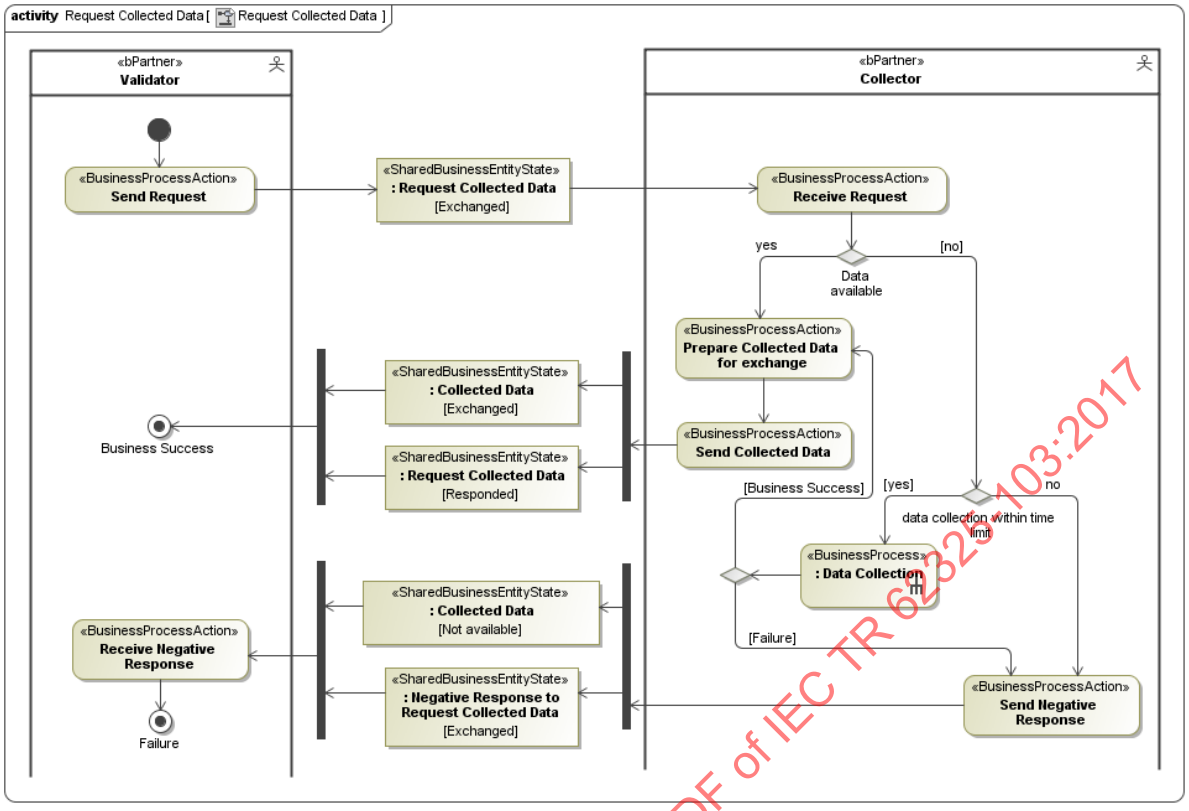


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Figure 10 – Use case for the business process Request Collected Data

Figure 11 shows the activity diagram for the use case Request Collected Data shown in Figure 10.

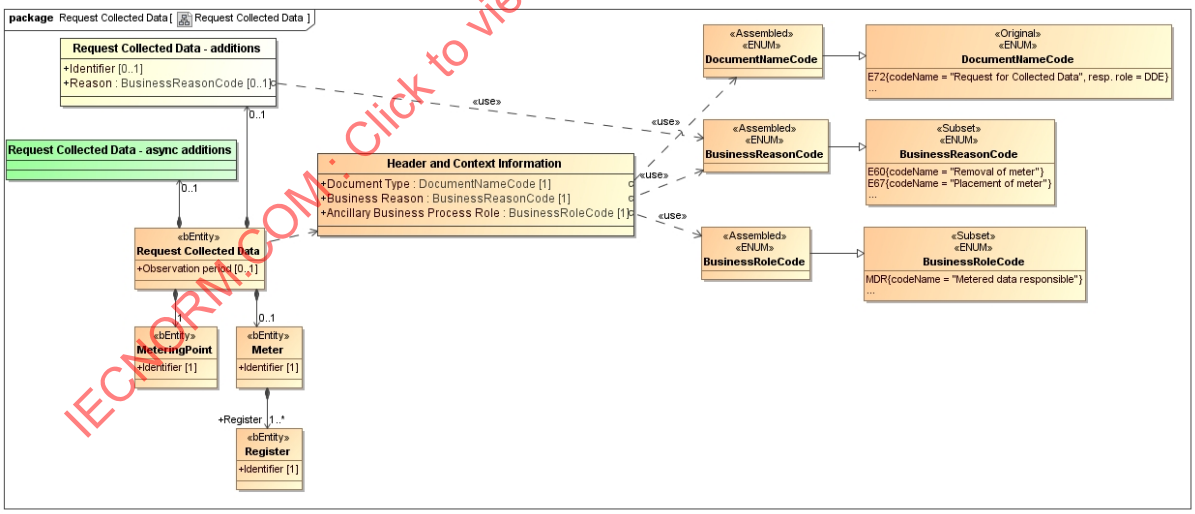
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Figure 11 – Activity diagram for the business process Request Collected Data

Figure 12 shows the class diagram for the response Request Collected Data as shown in Figure 11.

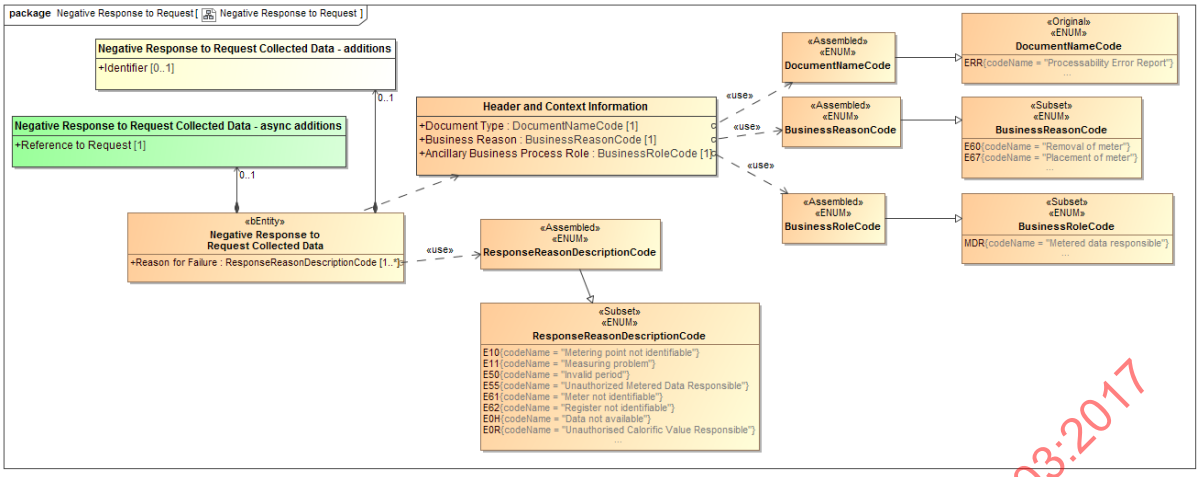


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Figure 12 – Class diagram for Request Collected Data

Figure 13 shows the class diagram for the exchanged Negative Response to Request Collected Data as shown in Figure 11.

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Figure 13 – Class diagram for Negative Response to Request Collected Data

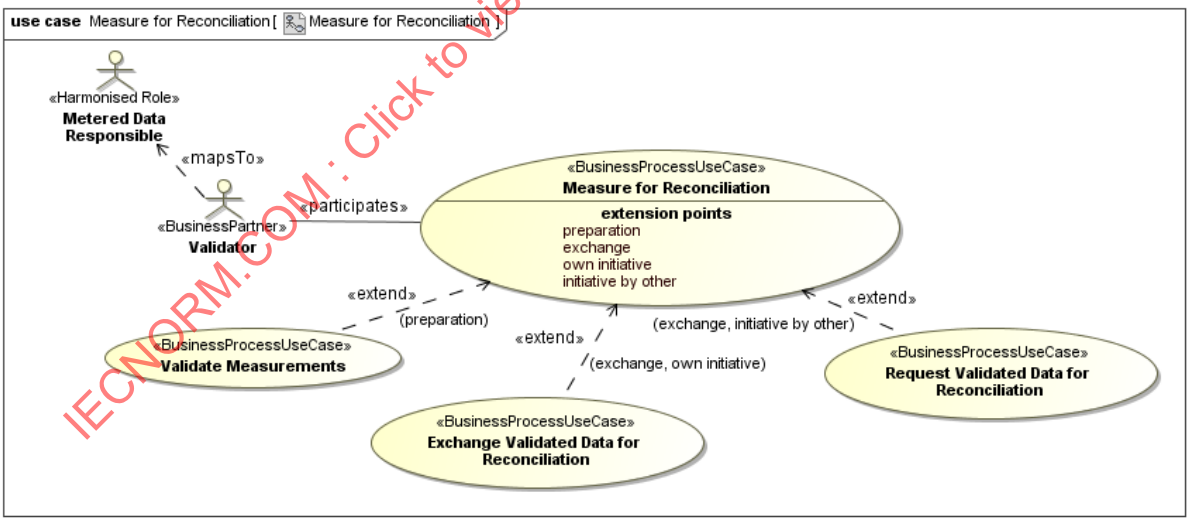
5.3 Measure for Reconciliation

5.3.1 General

Within the Measure process, the sub process Measure for Reconciliation is one of the simplest with regard to exchange of validated measured data. The process provides validated data for use in the reconciliation process to partners involved in this process. See further [5]. For the Business Process Settle for Reconciliation, see 5.6.

5.3.2 The business process use case for Measure for Reconciliation

Figure 14 shows the business process use case for Measure for Reconciliation from the use cases shown in Figure 2.



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Figure 14 – Business process use case for Measure for Reconciliation

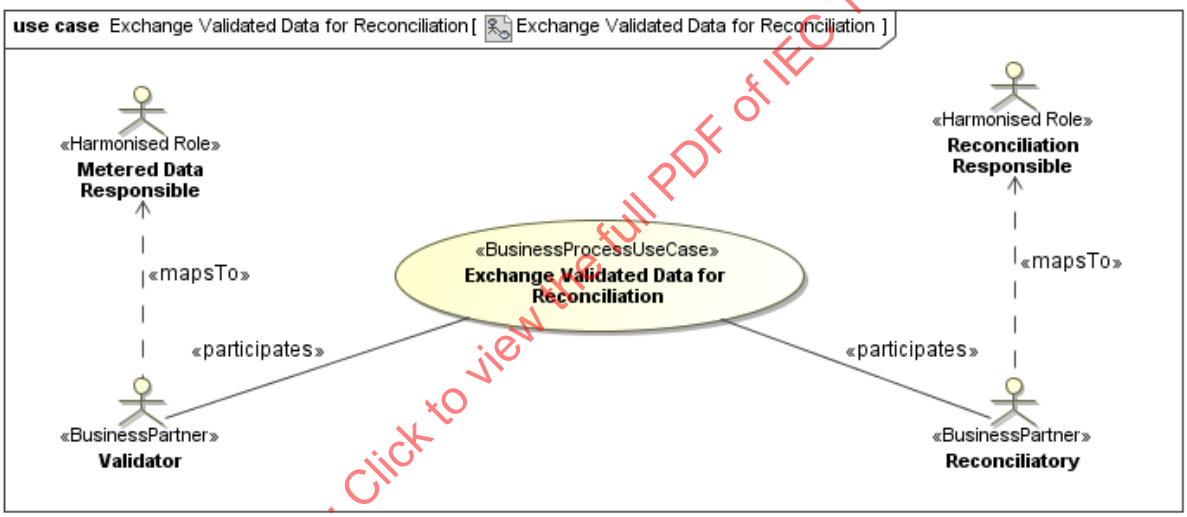
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Description

UseCase description: Measure for Reconciliation	
Definition	Provides validated data for use in the reconciliation process to partners involved in this process.
beginsWhen	The timing of the various processes is guided by a time schedule (nationally defined). As a general rule can be stated, that the processes are executed on a monthly basis.
precondition	Partners responsible for the execution of the processes should have access to relevant master data.
endsWhen	All processes included in the time schedule have been executed.
postCondition	All validated data are available at the partners so that the reconciliation process can be executed and the results can be verified.
Exceptions	No data available

5.3.3 Use case for the business process Exchange Validated Data for Reconciliation

Figure 15 shows the business process use case for Exchange Validated Data for Reconciliation from the business processes shown in Figure 14.

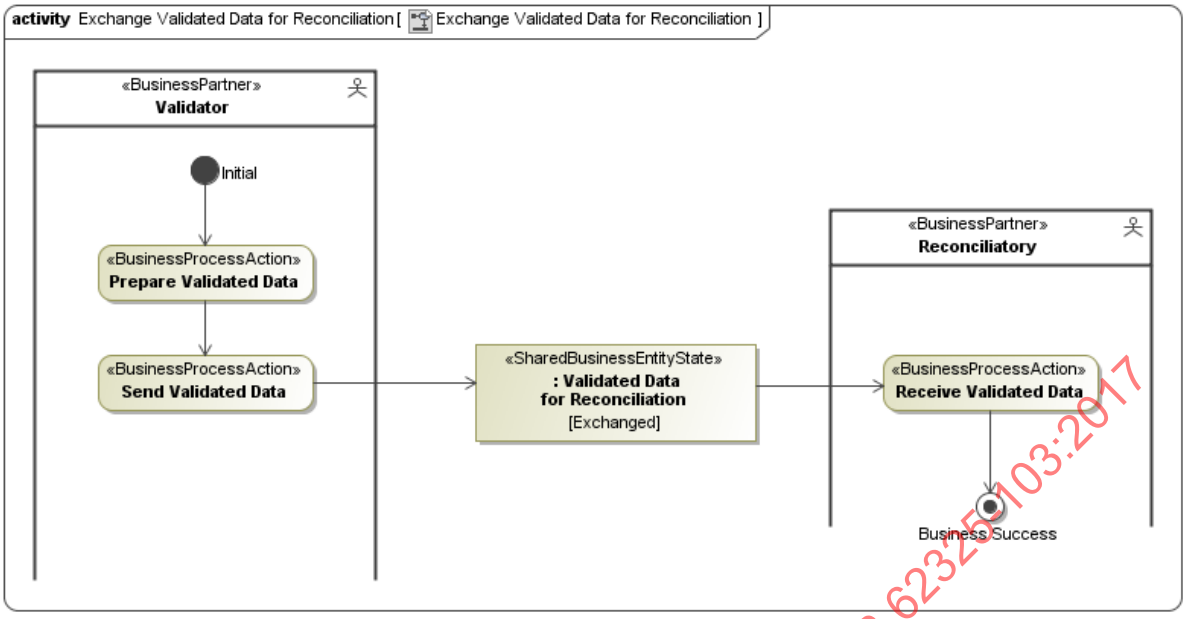


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Figure 15 – Use case for the business process Exchange Validated Data for Reconciliation

Figure 16 shows the activity diagram for the use case Exchange Validated Data for Reconciliation shown in Figure 15.

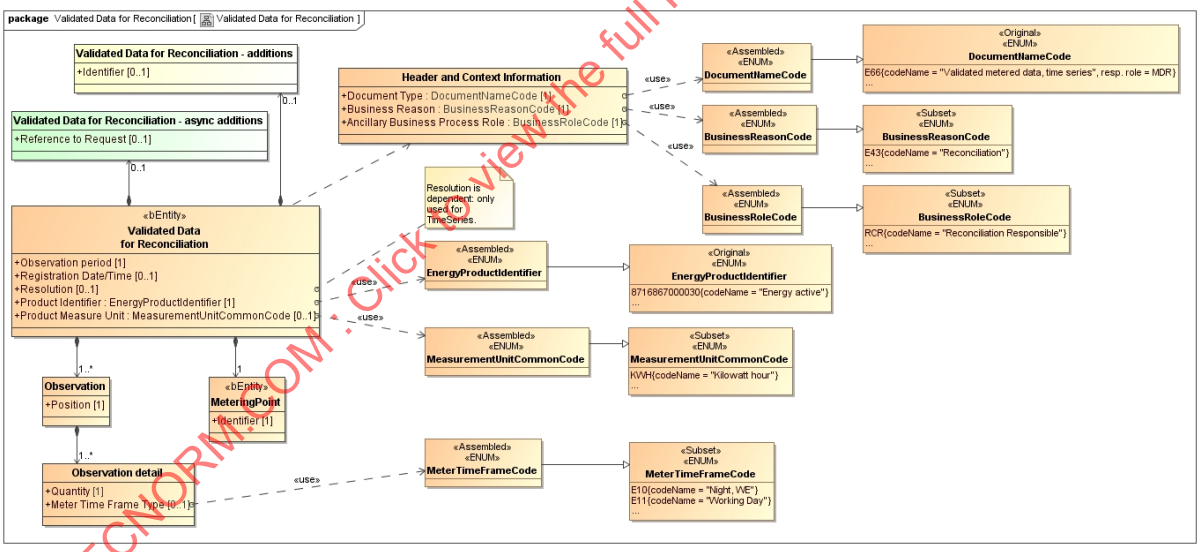
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Figure 16 – Activity diagram for the business process Exchange Validated Data for Reconciliation

Figure 17 shows the class diagram for the exchanged Validated Data for Reconciliation as shown in Figure 16.



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Figure 17 – Class diagram for Exchange Validated Data for Reconciliation

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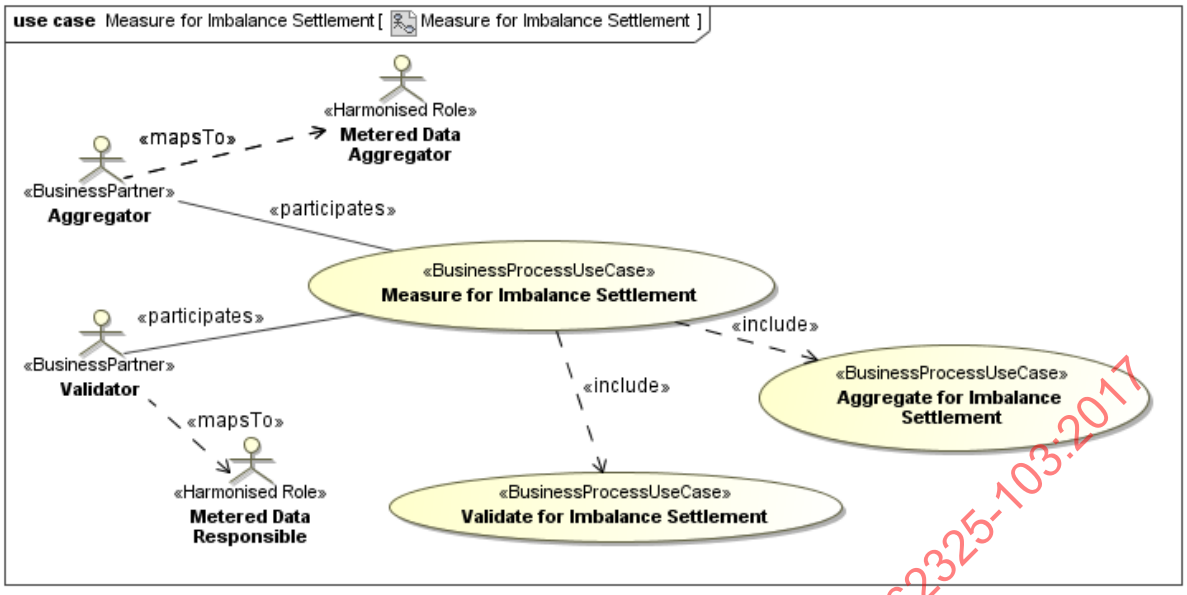
5.4 Measure for Imbalance Settlement

5.4.1 General

Within the Measure process, the sub process Measure for Imbalance Settlement includes the validation and aggregation of measured data including the exchange, to be used in the imbalance settlement process. For the latter see IEC 62325-451-4. See further [6].

5.4.2 The business process use case for Measure for Imbalance Settlement

Figure 18 shows the business process use case for Measure for Imbalance Settlement from the use cases shown in Figure 2.



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Figure 18 – Business process use case for Measure for Imbalance Settlement

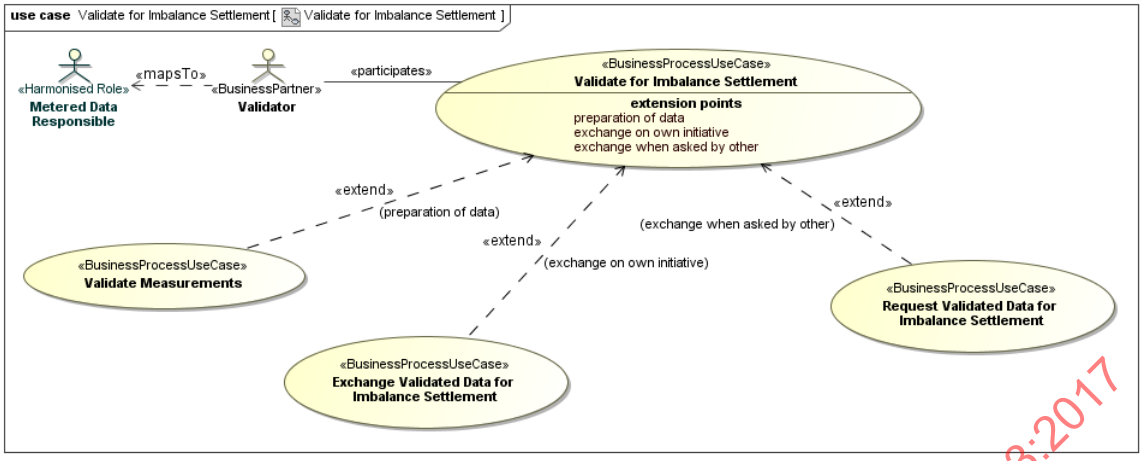
Description

UseCase description: Measure for Imbalance Settlement	
Definition	Provides validated and aggregated data for use in the imbalance settlement process to partners involved in this process.
beginsWhen	The timing of the various processes is guided by a time schedule (nationally defined). As a general rule can be stated, that the processes are executed on a daily basis.
preCondition	Business partners responsible for the execution of the processes should have access to relevant master data. Collected data are available
endsWhen	All processes included in the time schedule have been executed.
postCondition	All validated and aggregated measured data are available at the business partners so that the imbalance settlement process can be executed and the results can be verified.
Exceptions	No data available

5.4.3 Use case for the business process Validate for Imbalance Settlement

Figure 19 shows the business process use case for Validate for Imbalance Settlement from the business processes shown in Figure 18.

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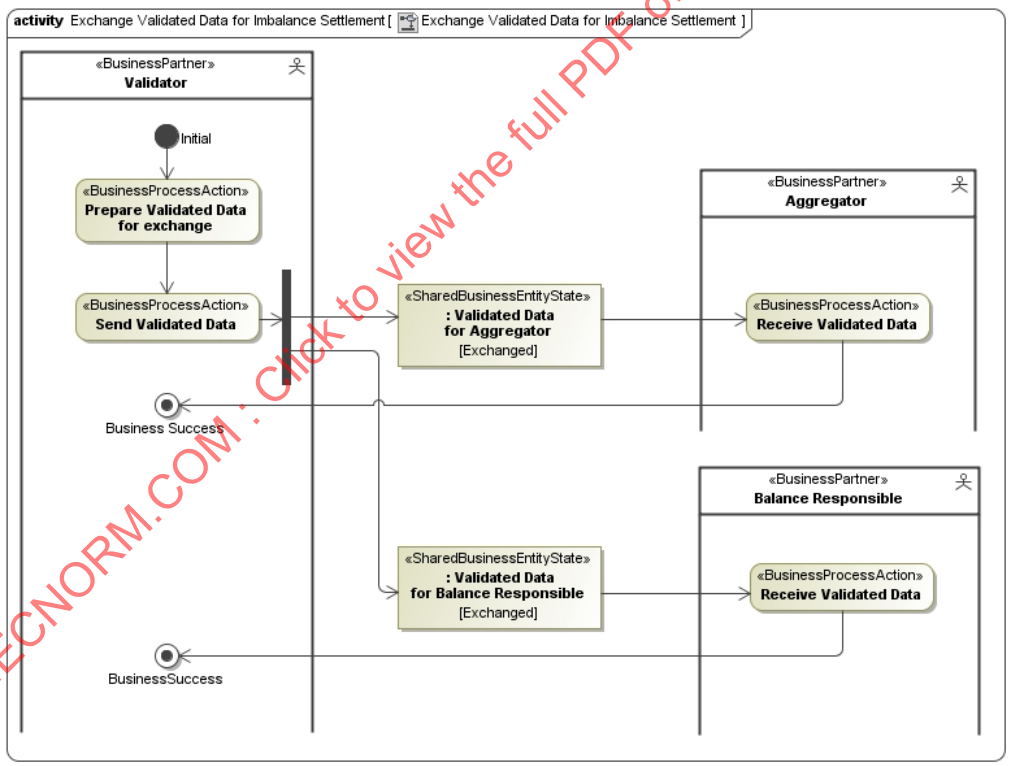


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Figure 19 – Use case for the business process Validate for Imbalance Settlement

In Figure 20 to Figure 22 the business process Request Validated Data for Imbalance Settlement is not further elaborated.

Figure 20 shows the activity diagram for the use case Exchange Validated Data for Imbalance Settlement shown in Figure 19.

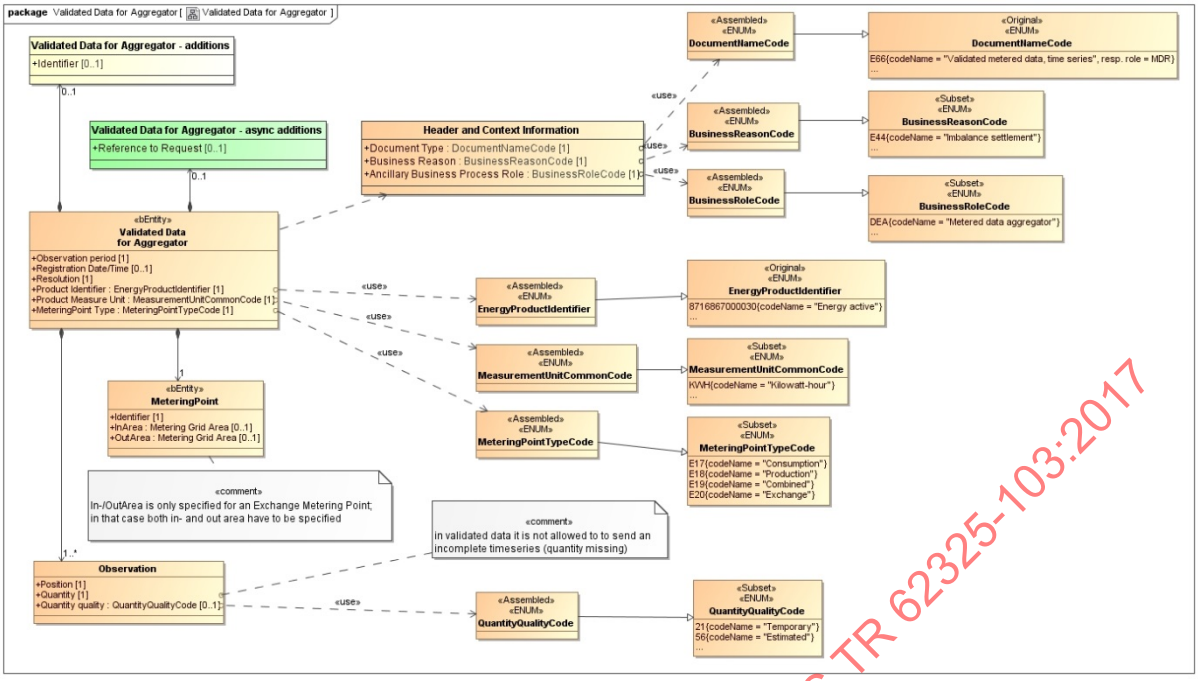


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Figure 20 – Activity diagram for the business process Exchange Validated Data for Imbalance Settlement

Figure 21 shows the class diagram for the exchanged Validated Data for Aggregator as shown in Figure 20.

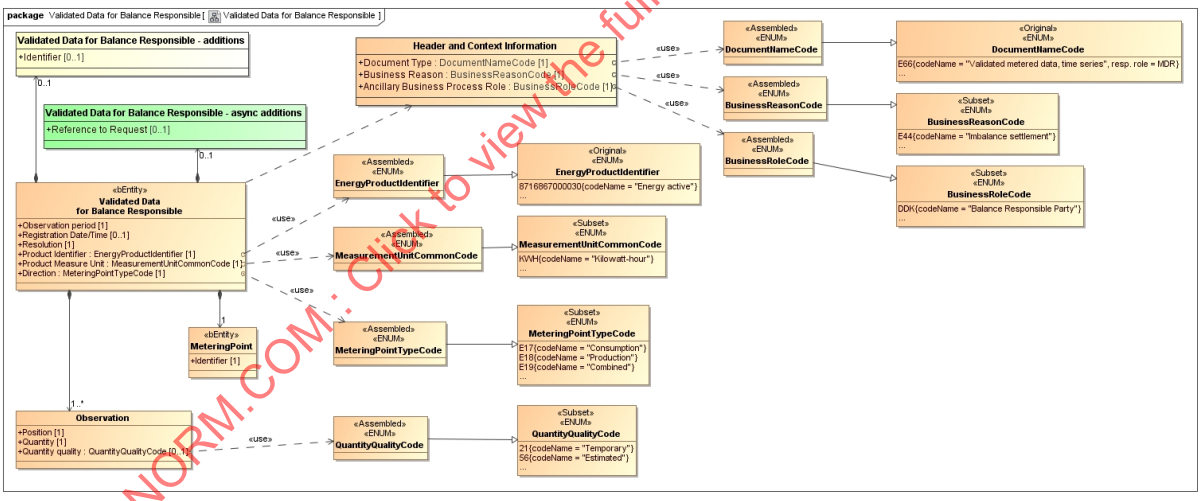
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Figure 21 – Class diagram for Validated Data for Imbalance Settlement to Aggregator

Figure 22 shows the class diagram for the exchanged Validated Data for Balance Responsible as shown in Figure 20.



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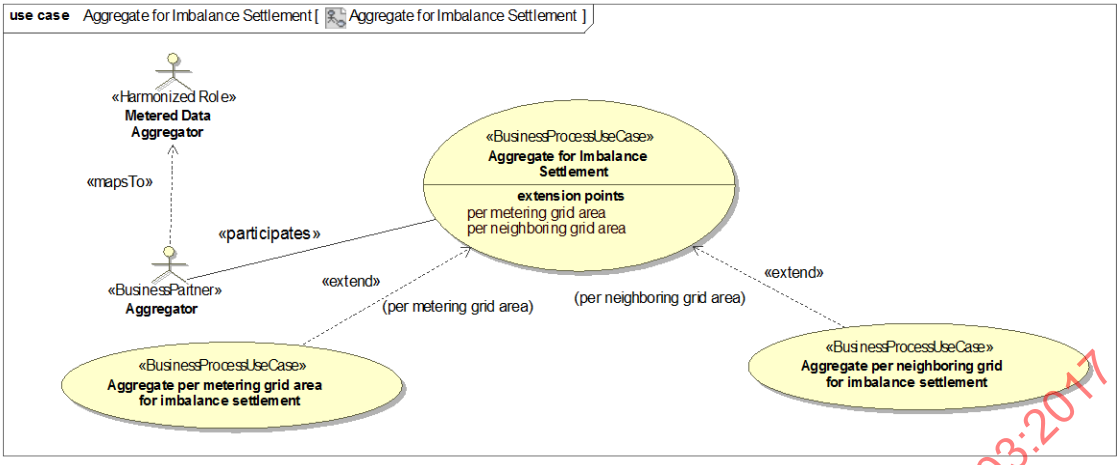
Figure 22 – Class diagram for Validated Data for Imbalance Settlement to Balance Responsible

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5.4.4 Use case for the business process Aggregate for Imbalance Settlement

The business process Aggregate for Imbalance Settlement is described in two sub processes, see Figure 23 and Figure 24, but the details are not included here.

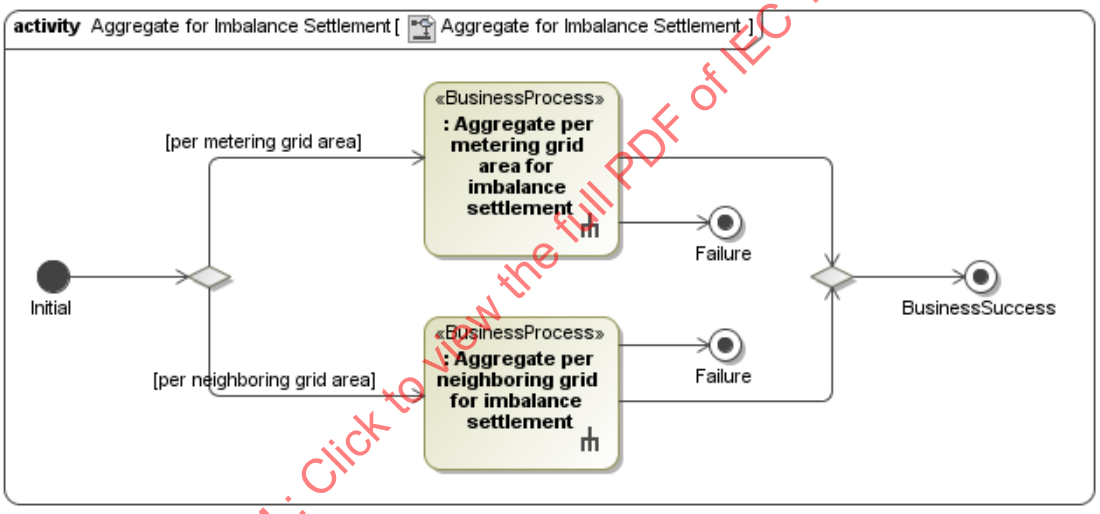
Figure 23 shows the business process use case for Aggregate for Imbalance Settlement from the business processes shown in Figure 18.



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Figure 23 – Use case for the business process Aggregate for Imbalance Settlement

Figure 24 shows the activity diagram for the use case Aggregate for Imbalance settlement shown in Figure 23.

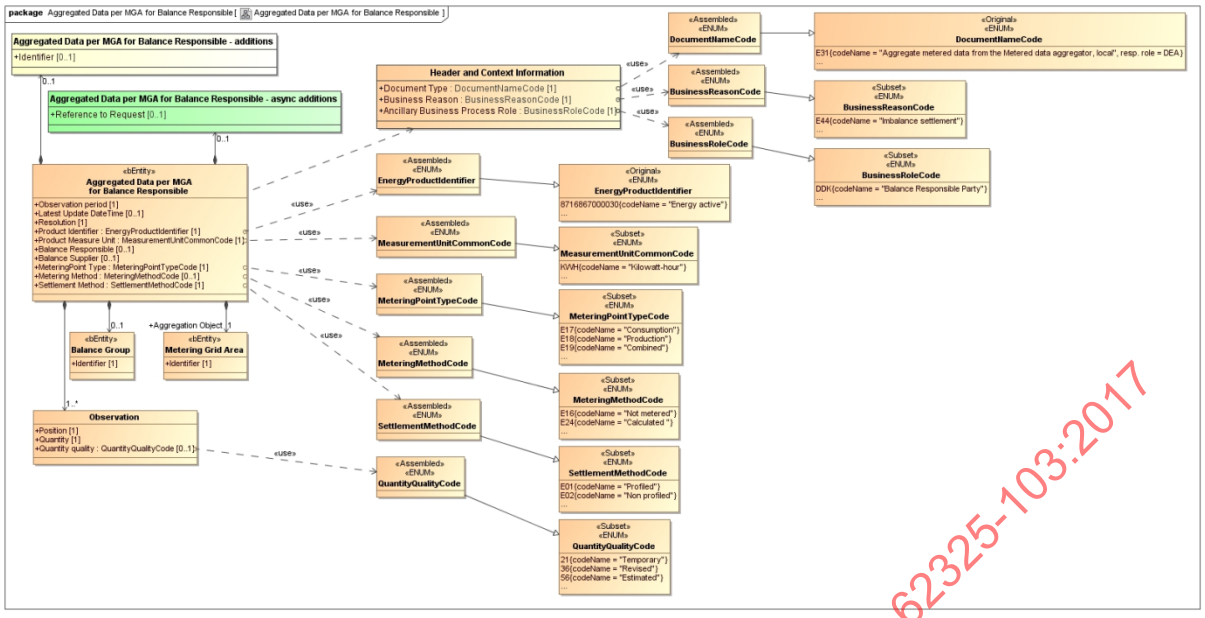


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Figure 24 – Activity diagram for the business process Aggregate for Imbalance Settlement

Figure 25 shows the class diagram for the exchanged Aggregated Data per Metering Grid Area when sent to Balance Responsible.

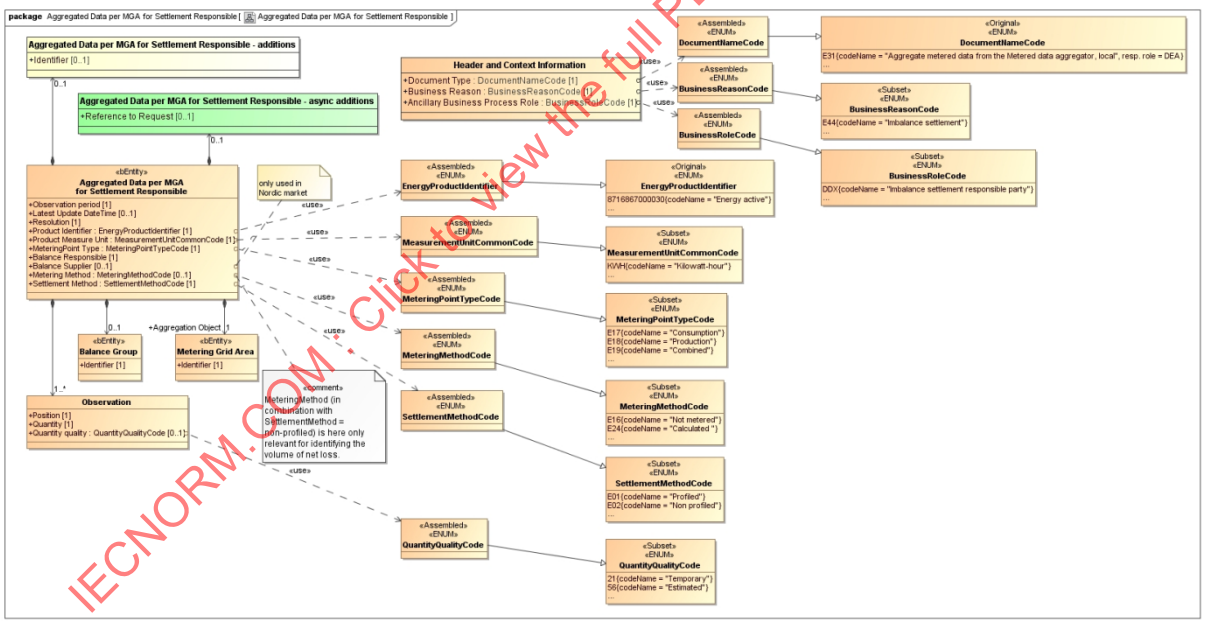
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Figure 25 – Class diagram within Imbalance Settlement for Aggregated Data per Metering Grid Area to Balance Responsible

Figure 26 shows the class diagram for the exchanged Aggregated Data per Metering Grid Area when sent to Settlement Responsible.

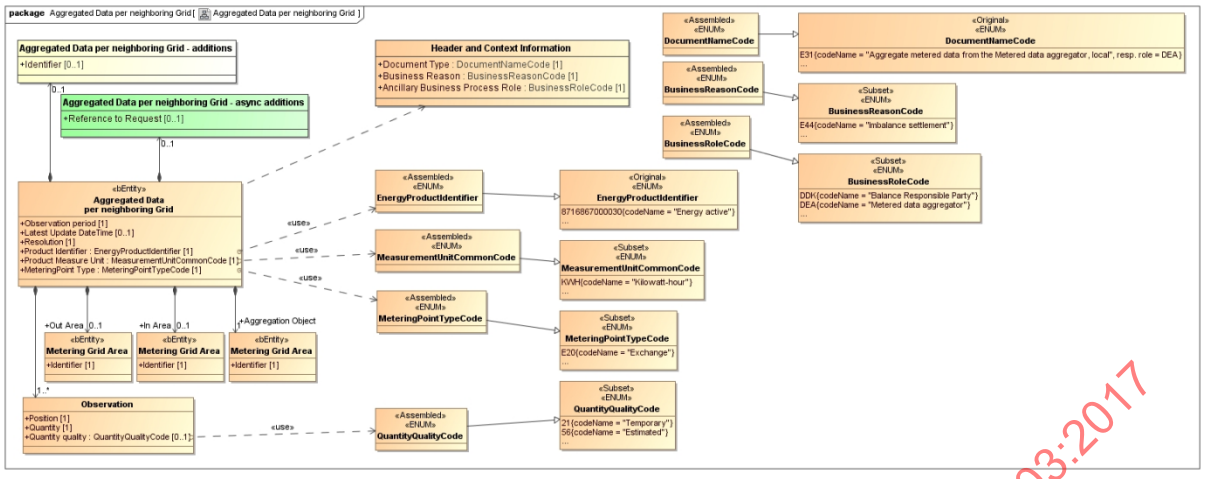


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Figure 26 – Class diagram within Imbalance Settlement for Aggregated Data per Metering Grid Area to Settlement Responsible

Figure 27 shows the class diagram for the exchanged Aggregated Data per neighbouring Grid when sent to neighbouring aggregator and to settlement responsible.

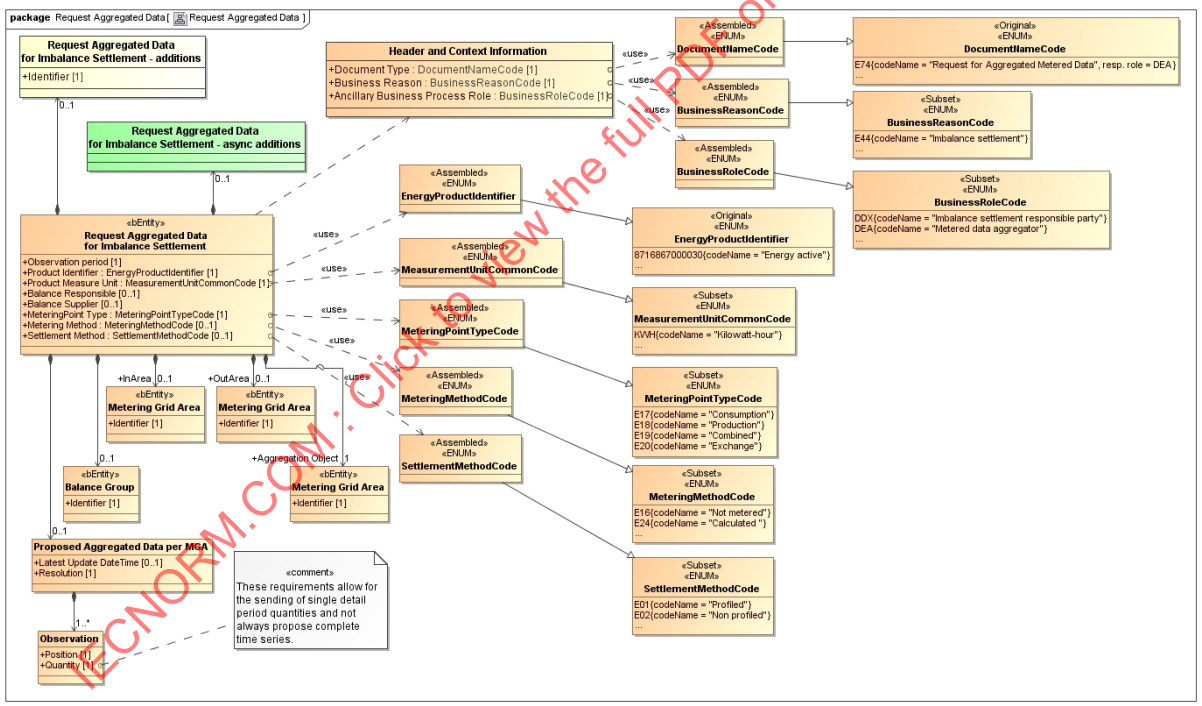
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Figure 27 – Class diagram within Imbalance Settlement for Aggregated Data per neighbouring Grid to neighbouring aggregator and to settlement responsible

There are two business processes for Request Aggregate for Imbalance Settlement, one for Aggregated Data per Metering Grid Area, another for Aggregated Data per neighbouring grid. The details are not shown here, only the resulting class diagram that is common for both business processes, see Figure 28.



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Figure 28 – Class diagram within Imbalance Settlement for Request Aggregated Data for Imbalance Settlement

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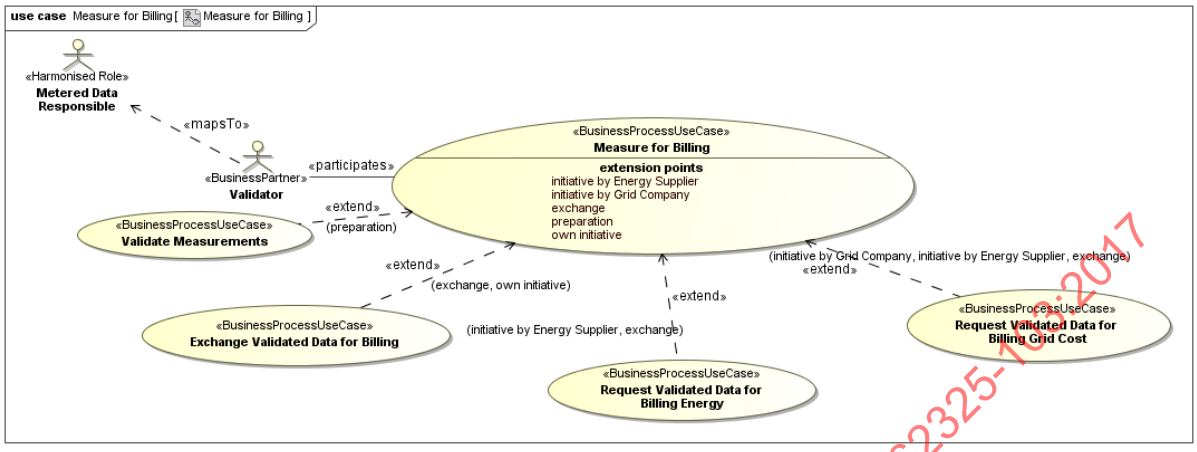
5.5 Measure for Billing

5.5.1 General

Within the Measure process, the sub process Measure for Billing includes the validation and exchange of validated data, including the meter readings, to the Energy supplier and/or the Grid Company in order for them to bill the Customer. This process also includes the exchange of validated data including the meter readings to the Customer. See further [7].

5.5.2 Use case for the business process Measure for Billing

Figure 29 shows the business process use case for Measure for Billing from the use cases shown in Figure 2.



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Figure 29 – Use case for the business process Measure for Billing

Description

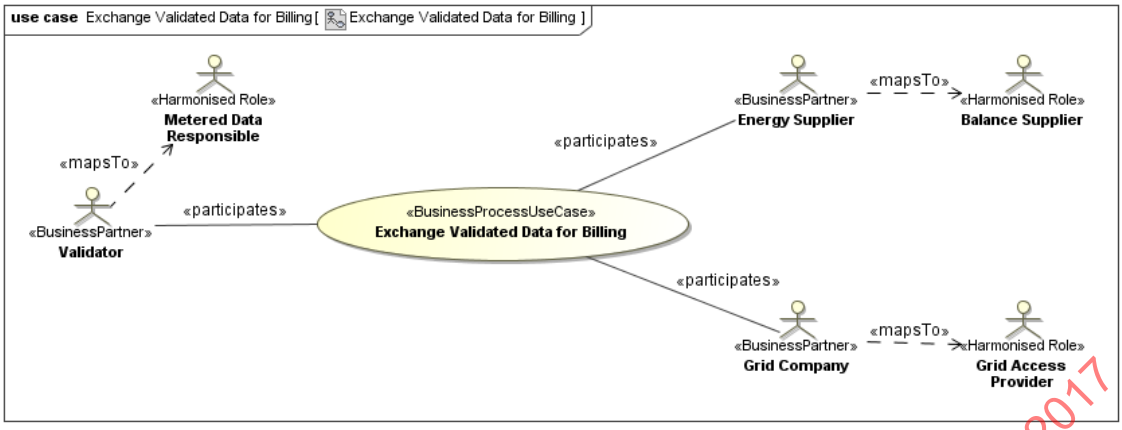
UseCase description: Measure for Billing	
Definition	Provides validated metered data for the processes of billing energy and billing grid cost.
beginsWhen	The Validator decides to.
precondition	Collected Data are available for the Validator Partners responsible for the execution of the processes should have access to relevant master data.
endsWhen	The validated data has been made available to the Energy Supplier and/or the Grid Company and/or the Customer.
postCondition	Energy Supplier and/or the Grid Company have received the metered data required for billing their respective products and services. The Customer may have received the validated metered data and the accompanying meter readings from which these data have been derived.
Exceptions	None

Only the use case Exchange Validated Data for Billing is described in 5.5.3. For more details see [7].

5.5.3 Use case for the business process Exchange Validated Data for Billing

Figure 30 shows the business process use case for Exchange Validate Data for Billing from the business processes shown in Figure 29.

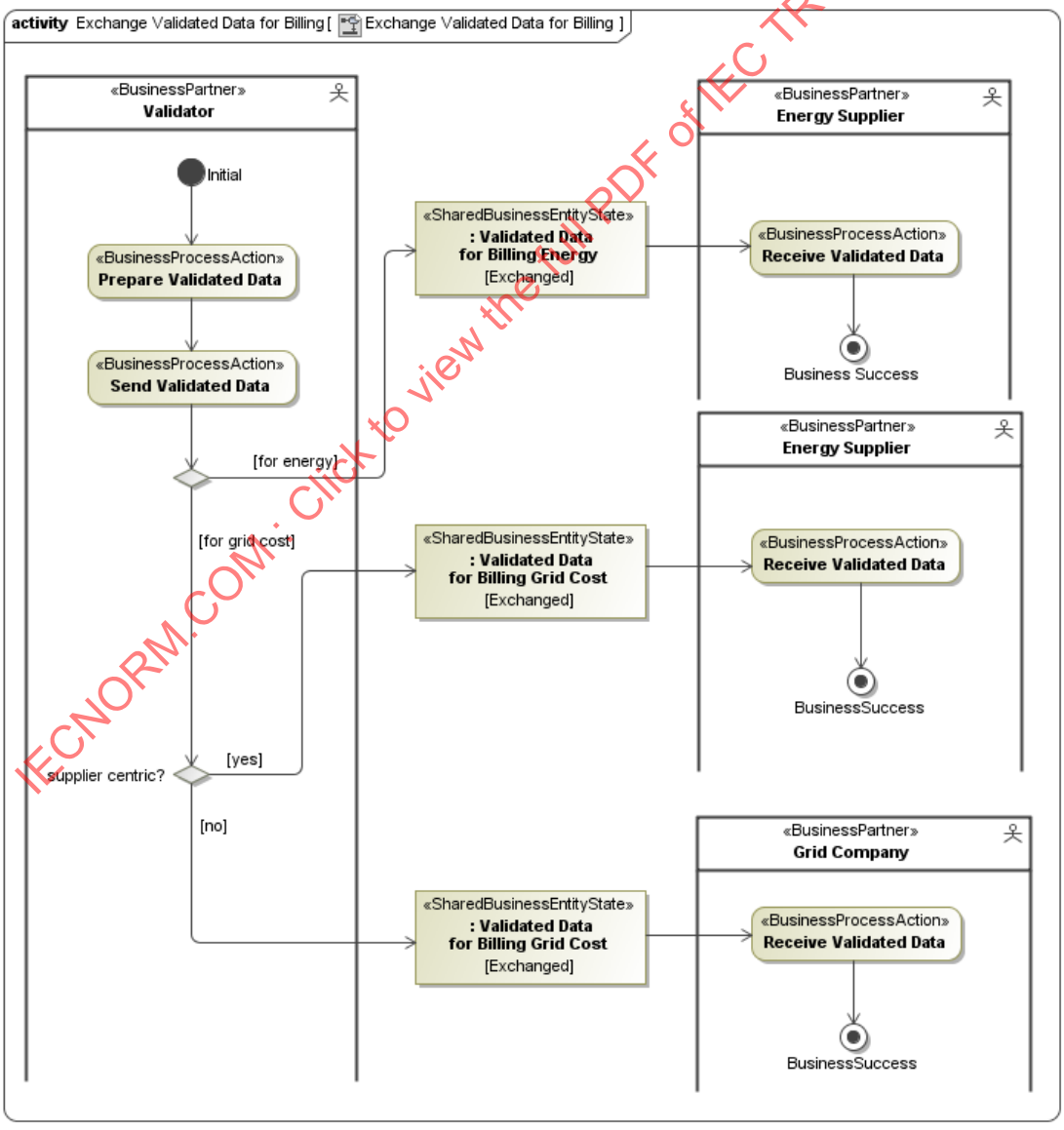
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Figure 30 – Use case for the business process Exchange Validated Data for Billing

Figure 31 shows the activity diagram for the use case Exchange Validated Data for Billing shown in Figure 30.



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Figure 31 – Activity diagram for the business process Exchange Validated Data for Billing

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Figure 32 shows the class diagram for the exchanged Validated Data for Billing Energy as shown in Figure 31.

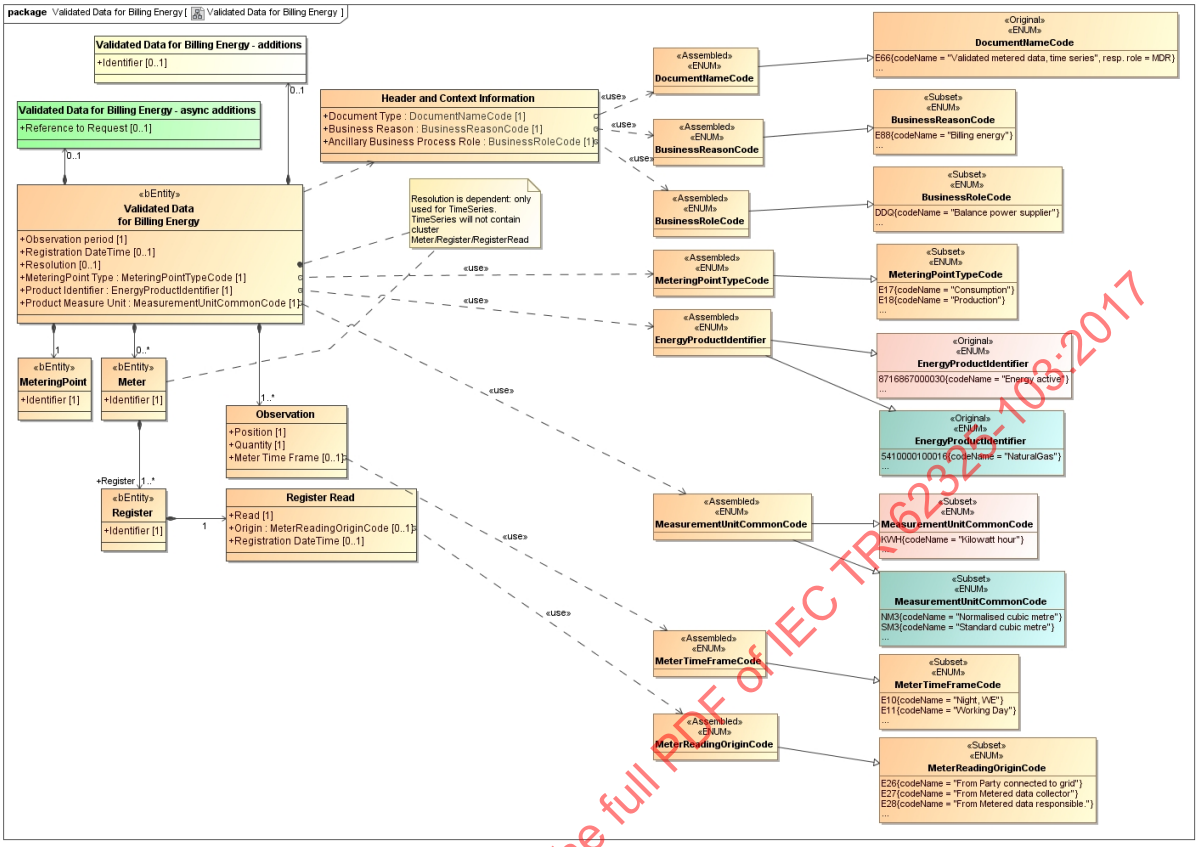


Figure 32 – Class diagram for Validated Data for Billing Energy

5.6 Measure for Labeling

5.6.1 General

Within the Measure process, the sub process Measure for Labeling includes validation and exchange of validated data for the purpose of the creation of green certificates. See further [8].

5.6.2 Use case for the business process Measure for Labeling

Figure 33 shows the business process use case for Measure for Labeling from the use cases shown in Figure 2.

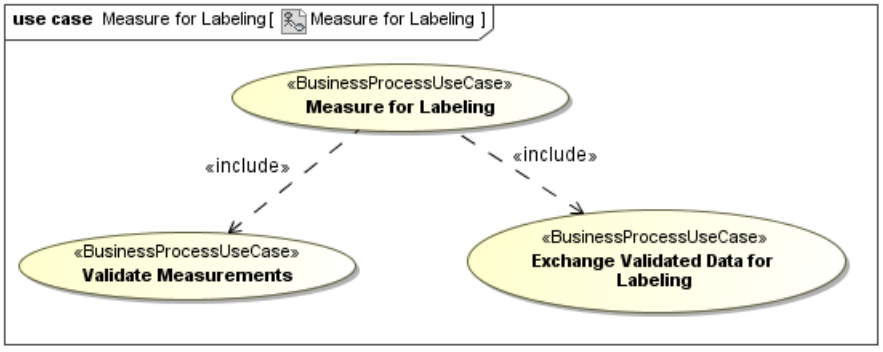


Figure 33 – Use case for the business process Measure for Labeling

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Description

UseCase description: Measure for Labeling	
Definition	Provides validated data for use in the labeling process to partners involved in this process.
beginsWhen	The timing of the various processes is guided by a time schedule (nationally defined). As a general rule can be stated, that the processes are executed on a monthly basis.
precondition	Collected Data are available. Partners responsible for the execution of the processes should have access to relevant master data.
endsWhen	All processes included in the time schedule have been executed.
postCondition	All validated metered data are available at the partners so that the labeling process can be executed and the results can be verified.
Exceptions	– No master data available – Production device is not qualified

Only the use case Exchange Validated Data for Labeling is described in 5.6.3. For more details see [8].

5.6.3 Use case for the business process Exchange Validated Data for Labeling

Figure 34 shows the business process use case Exchange Validate Data for Labeling from the business processes shown in Figure 33.

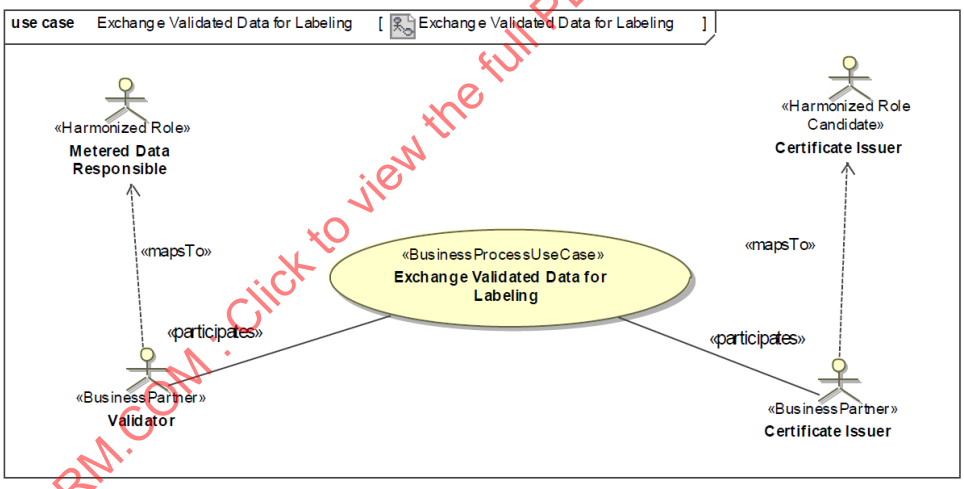


Figure 34 – Use case for the business process Exchange Validated Data for Labeling

Figure 35 shows the activity diagram for the use case Exchange Validated Data for Labeling shown in Figure 34.

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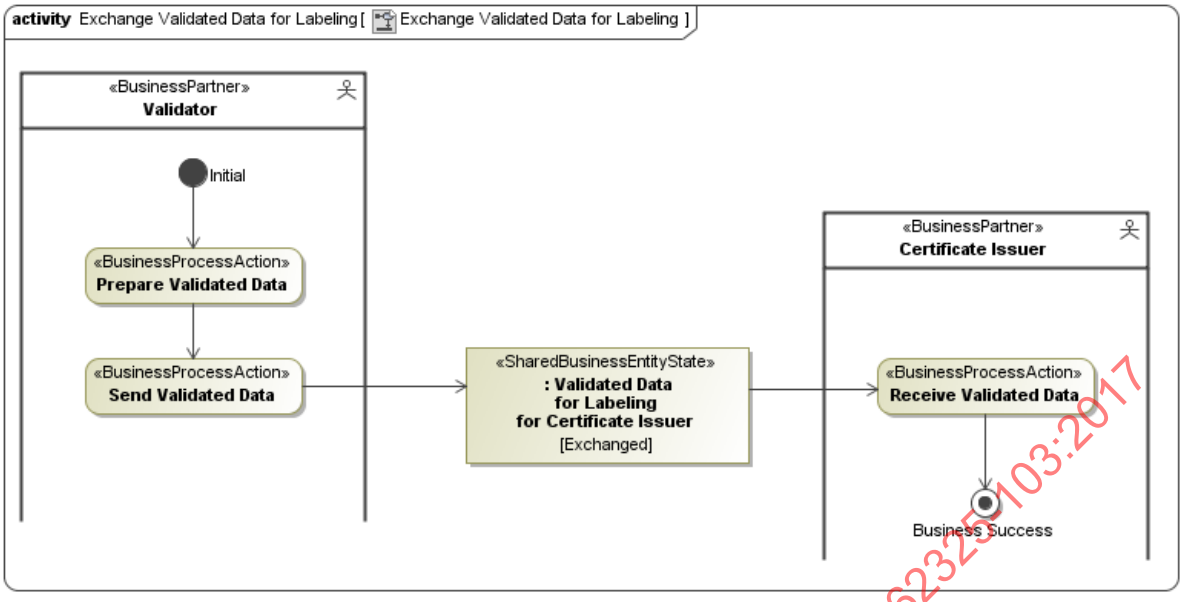


Figure 35 – Activity diagram for the business process Exchange Validated Data for Labeling

Figure 36 shows the class diagram for the exchanged Validated Data for Labeling for Certificate Issuer as shown in Figure 35.

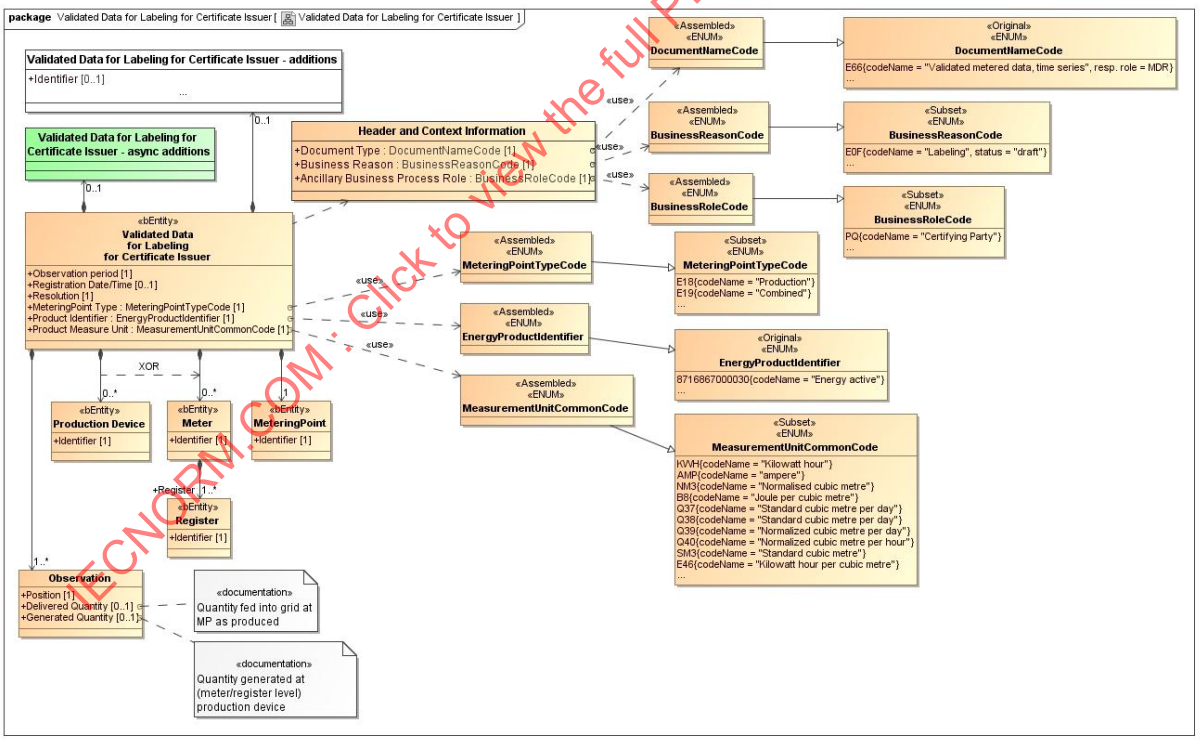


Figure 36 – Class diagram for Validated Data for Labeling

5.7 Measure Calorific Value

5.7.1 General

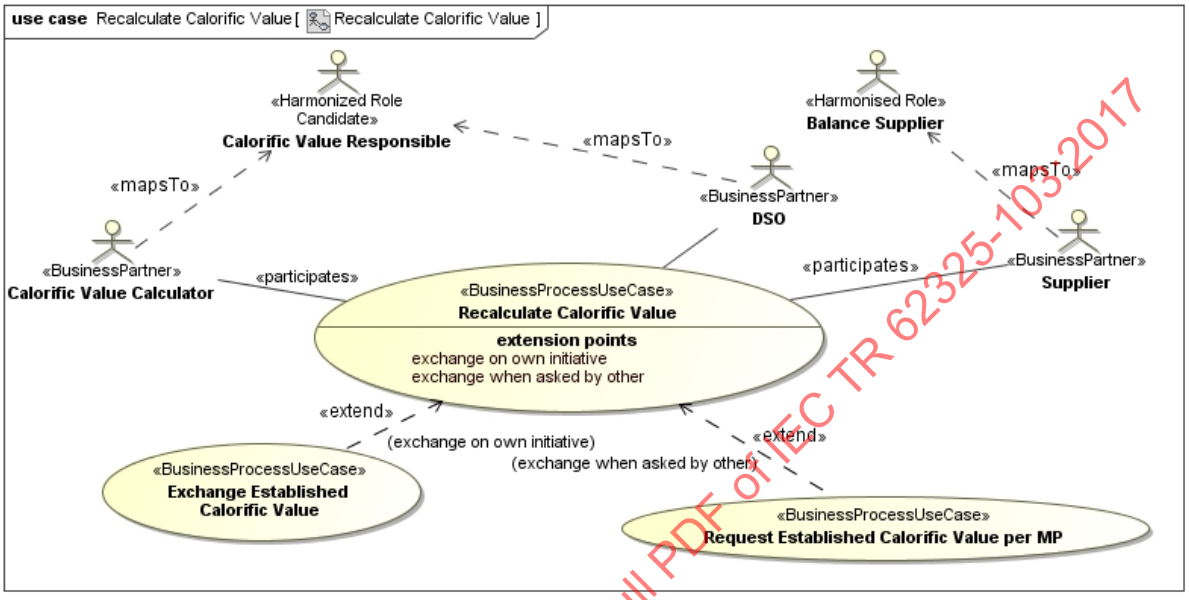
Within the Measure process, the sub process Measure Calorific Value includes the recalculation and exchange of calorific value. The established calorific value is sent to the Energy supplier and/or the Grid Company. A calorific value is established by means of a gas

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chromatograph at a Reception Station and the value is exchanged per Aggregated Reception Station (which is an administrative entity consisting of one or more Reception Stations) or per Calorific Value Area (depending on national rules). See further [9].

5.7.2 The business process use case for Measure Calorific Value

The business process Measure Calorific Value, see Figure 2, contains the sub business process Recalculate Calorific Value that is described in Figure 37.



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Figure 37 – Business process use case for Recalculate Calorific Value

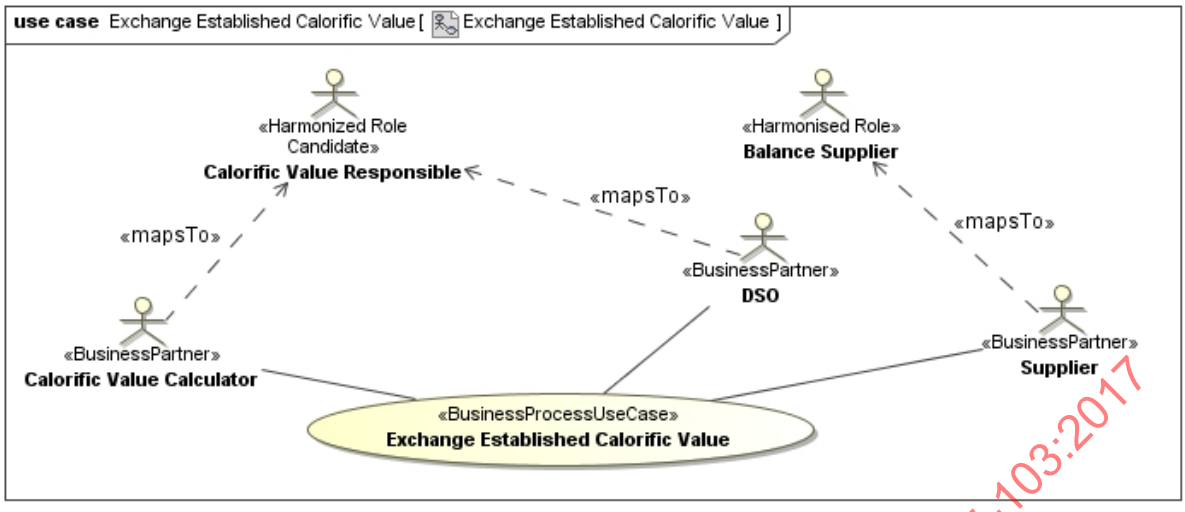
Description

UseCase description: Recalculate Calorific Value	
definition	Providing established calorific value by a Calorific Value Calculator (which often is the TSO or DSO) to a Supplier or DSO (in its capacity of Calorific Value Calculator) in the gas sector. The Calorific Value is established in a series of (re-)calculations.
beginsWhen	The Calorific Value Calculator decides to or when requested.
preCondition	Input data for calorific value from the TSO are made available to the Calorific Value Calculator for (re-)calculation. The procedure for (re-)calculation follows national rules. Partners responsible for the execution of the processes should have access to relevant master data.
endsWhen	The established calorific value has been made available to the Energy Supplier or DSO.
postCondition	Supplier or DSO has received the established calorific value.
Exceptions	None.

5.7.3 Use case for the business process Exchange Established Calorific Value

Figure 38 shows the business process use case for Exchange Established Calorific Value from the business processes shown in Figure 37.

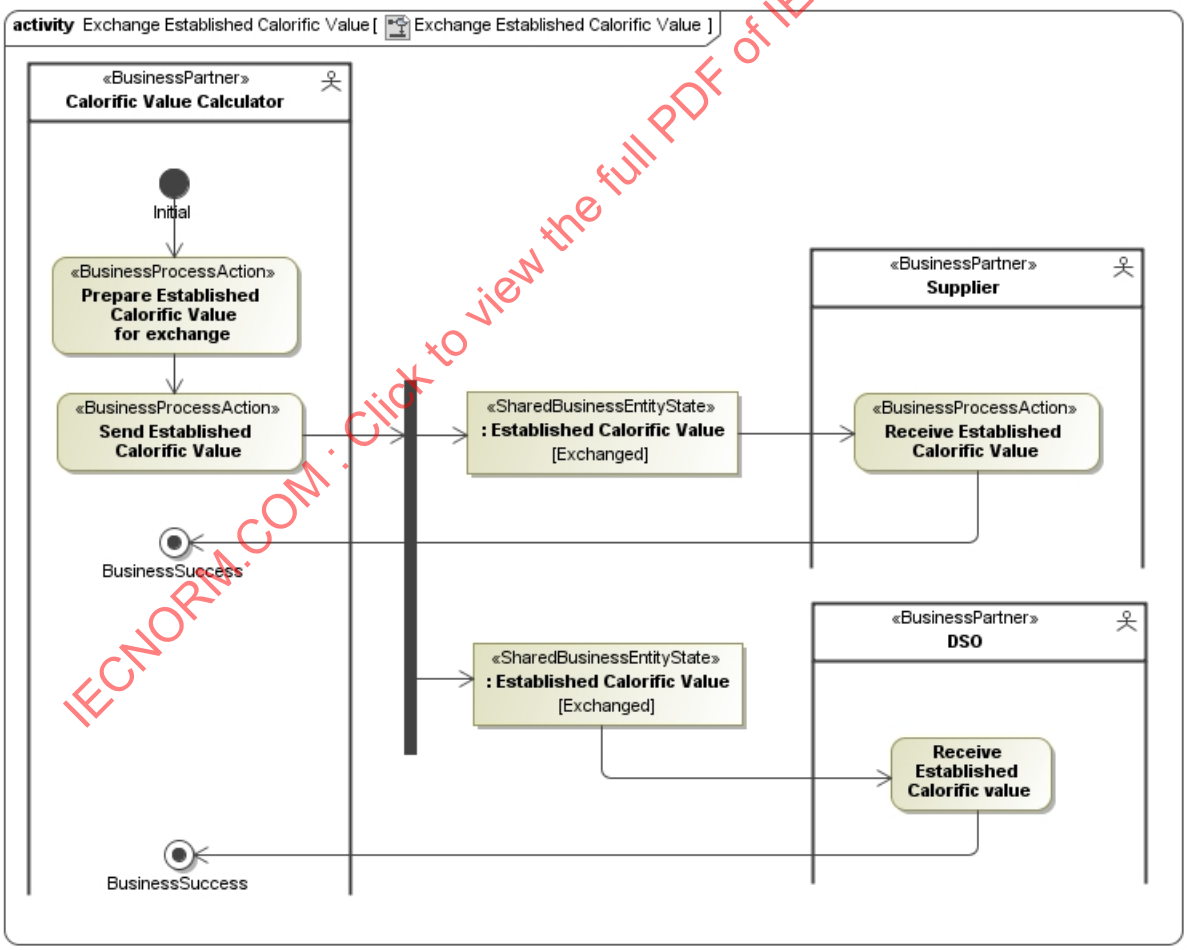
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Figure 38 – Use case for the business process Exchange Established Calorific Value

Figure 39 shows the activity diagram for the use case Exchange Established Calorific Value shown in Figure 38.

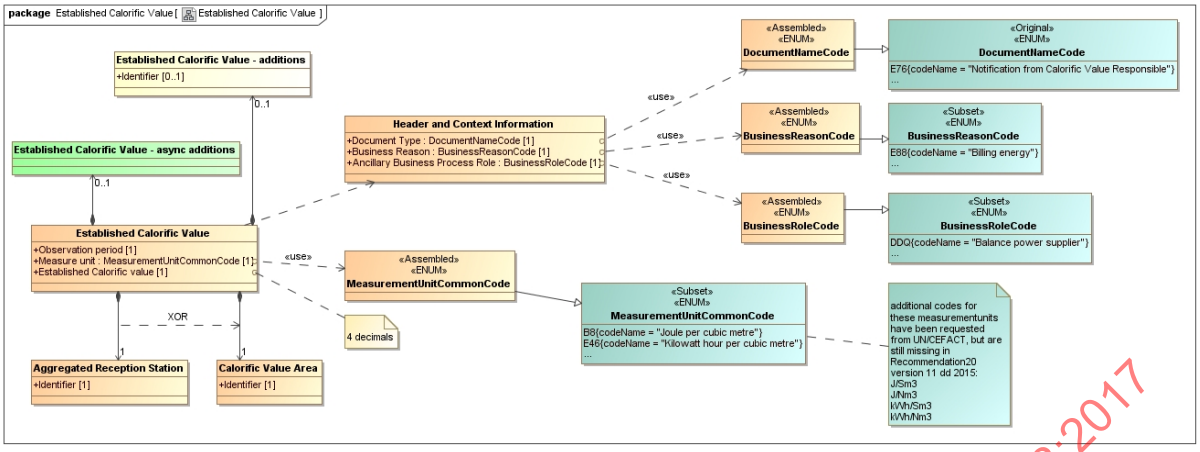


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Figure 39 – Activity diagram for the business process Exchange Established Calorific Value

Figure 40 shows the class diagram for the exchanged Established Calorific Value for Supplier and DSO as shown in Figure 39.

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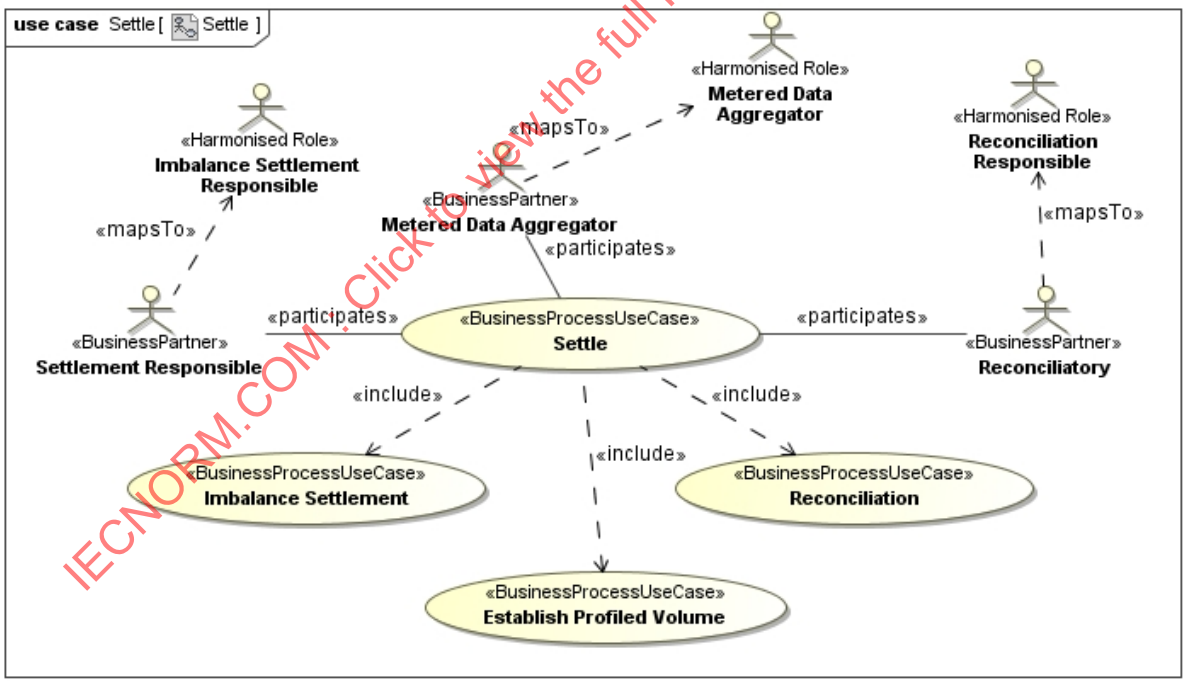
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Figure 40 – Class diagram for Exchange Established Calorific Value

5.8 Settle for Reconciliation

5.8.1 General

Within the Settle process, see Figure 41, the Imbalance settlement process is described in IEC 62325-451-4, reference [6]. The sub-process Establish Profiled Volume describes the use of master and/or measured data for the planning, settlement and reconciliation of consumption at profiled Metering points. The sub-process Reconciliation handles the final settlement for profiled Metering points.



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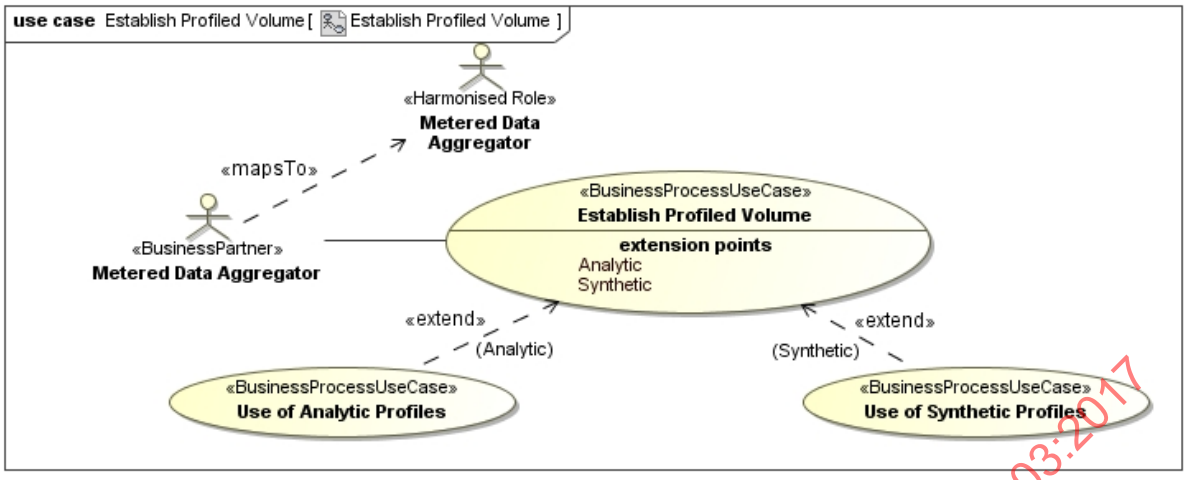
Figure 41 – Business process use case for Settle

5.8.2 The business process use case for Establish Profiled Volume

5.8.2.1 General

Figure 42 shows the business process use case for Establish Profiled Volume from the use cases shown in Figure 41.

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Figure 42 – Business process use case for Establish Profiled Volume

Description

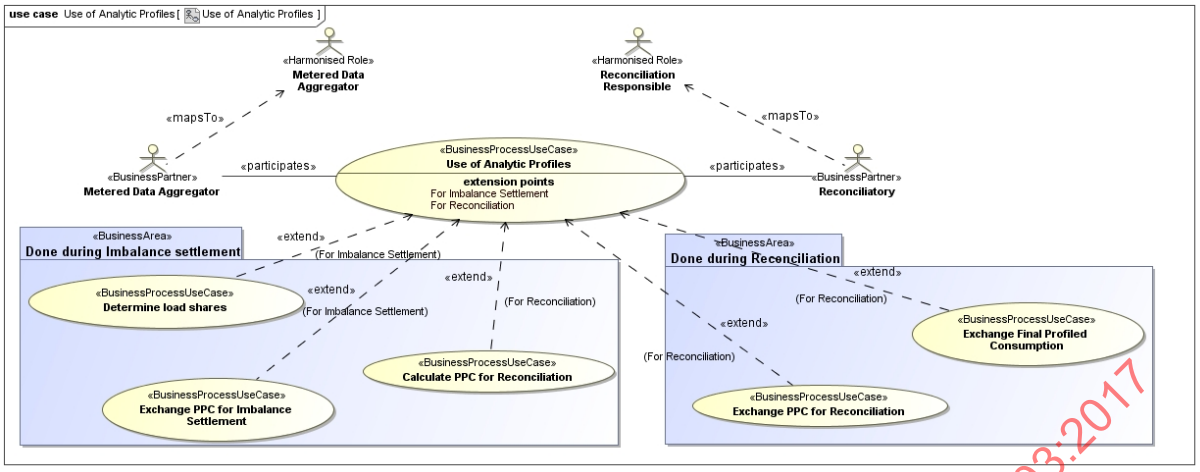
UseCase description: Establish Profiled Volume	
Definition	The use of master and/or measured data for the planning, settlement and reconciliation of consumption at profiled MeteringPoints.
beginsWhen	The timing of the various processes is guided by a time schedule (nationally defined). As a general rule can be stated, that the Imbalance Settlement processes is executed on a daily basis where the Reconciliation process is executed on a monthly basis.
precondition	Partners responsible for the execution of the processes should have access to relevant master data and input data for the process should be available.
endsWhen	All processes included in the time schedule have been executed according to the national rules and deadlines.
postCondition	The profile information is available for the calculation of volumes for either the scheduling and imbalance settlement processes or for the reconciliation process.
Exceptions	None

5.8.2.2 Use case for the business process Use of Analytic Profiles

This use case describes the use of historic measured data for the scheduling, settlement and reconciliation of profiled Metering Points. The use case is, beside Figure 43, not further elaborated in this document, see further [10].

NOTE PPC means “Preliminary Profiled Consumption”.

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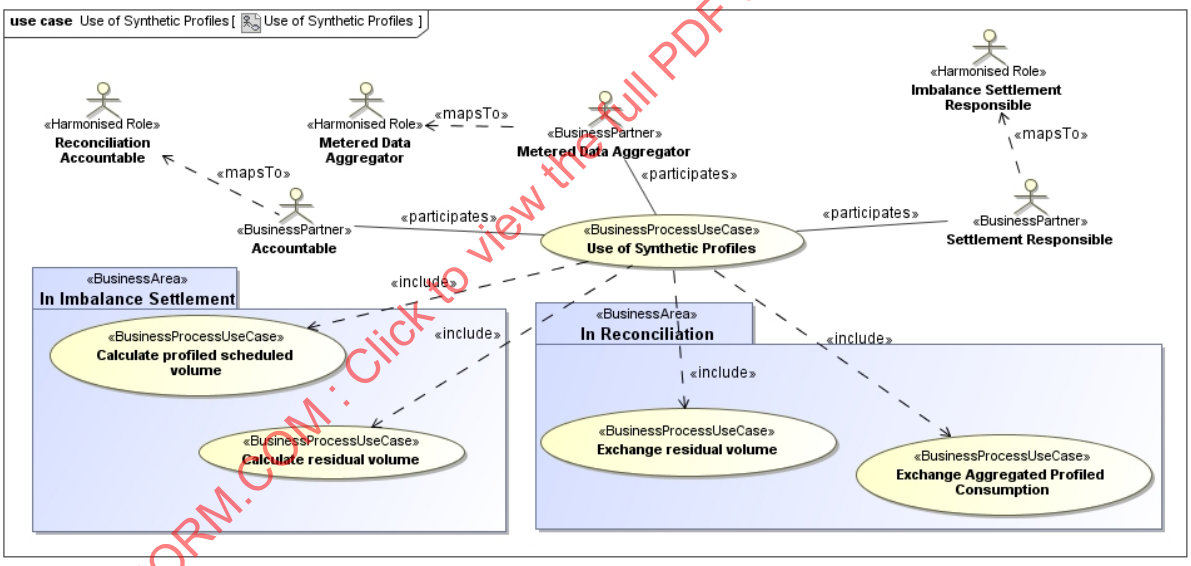
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Figure 43 – Use case for the business process Use of Analytic Profiles

5.8.2.3 Use case for the business process Use of Synthetic Profiles

5.8.2.3.1 General

Figure 44 shows the business process use case for Use of Synthetic Profiles from the use cases shown in Figure 41.



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Figure 44 – Use case for the business process Use of Synthetic Profiles

Figure 45 shows the activity diagram for the use case Use of Synthetic Profiles shown in Figure 44.

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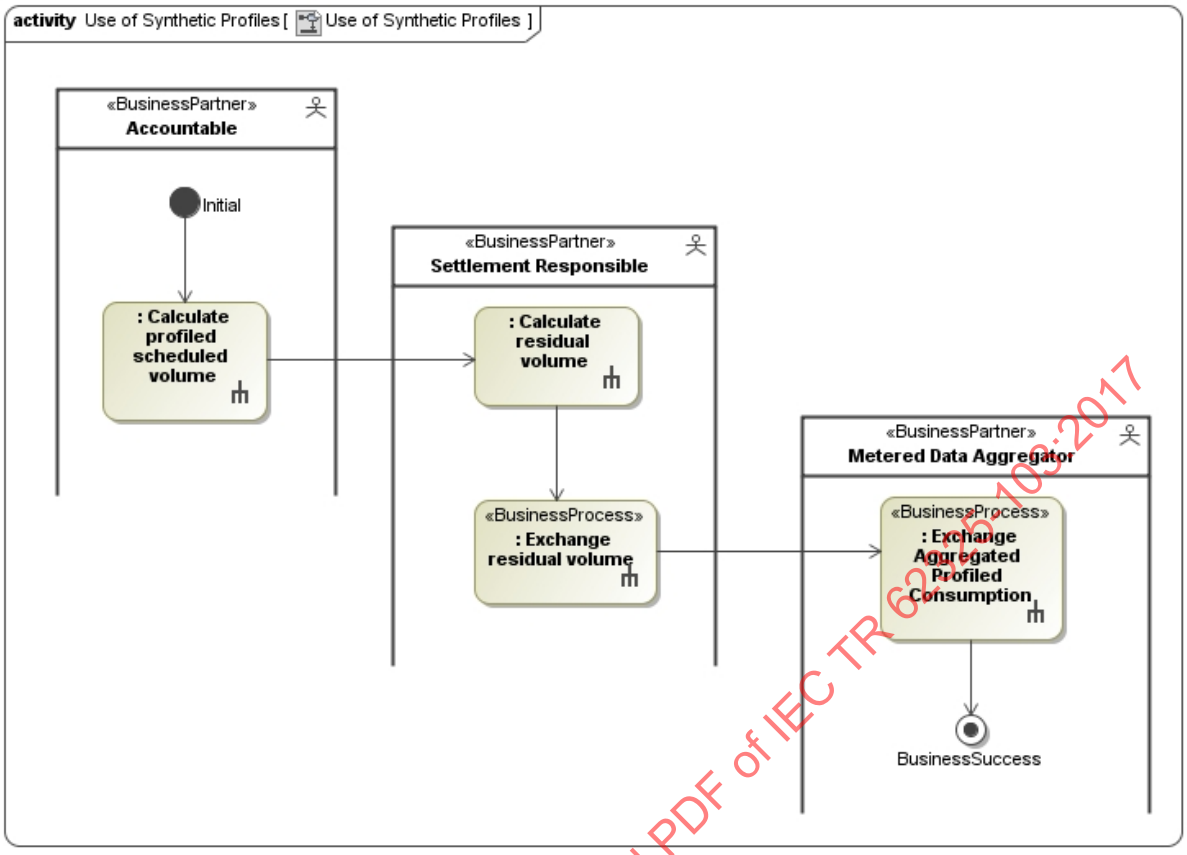


Figure 45 – Activity diagram for the business process Use of Synthetic Profiles

5.8.2.3.2 Use case for the business process Exchange residual volume

Figure 46 shows the business process use case for Exchange residual volume from the use cases shown in Figure 45.

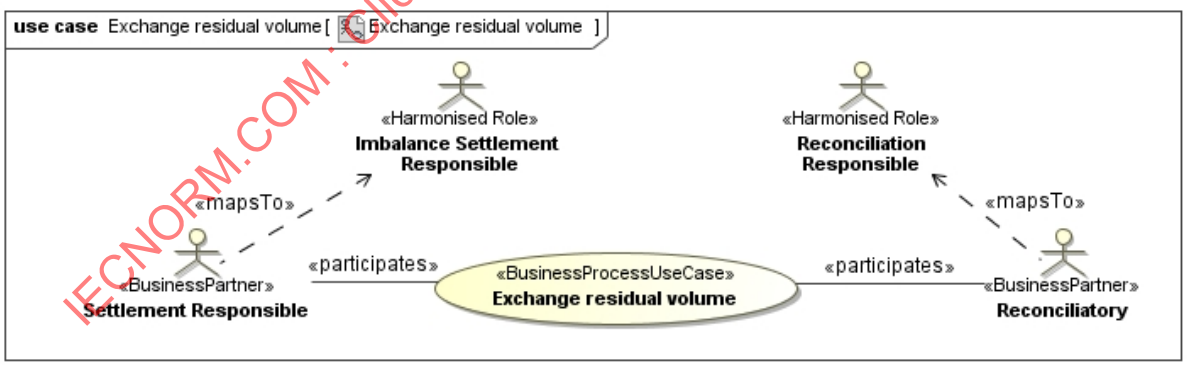
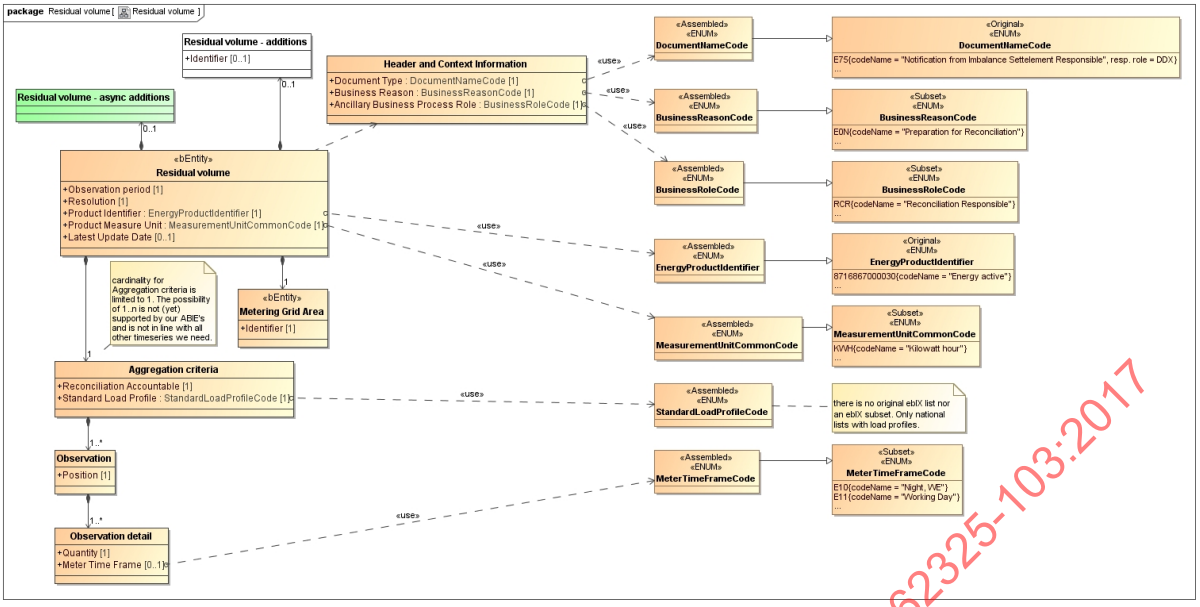


Figure 46 – Use case for the business process Exchange residual volume

Figure 47 shows the class diagram for the exchanged Residual Volume as shown in Figure 46.

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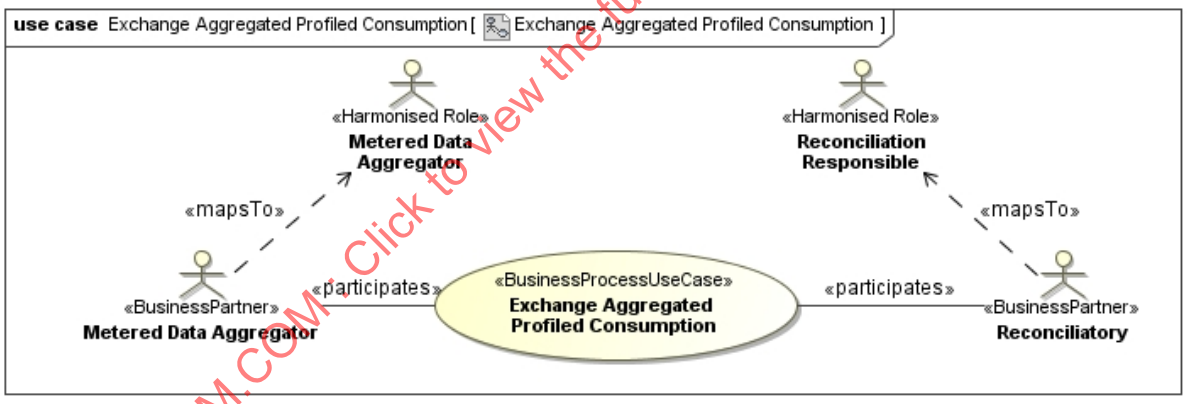


IEC

Figure 47 – Class diagram for Exchange residual volume

5.8.2.3.3 Use case for the business process Exchange Aggregated Profiled Consumption

Figure 48 shows the business process use case for Exchange Aggregated Profiled Consumption from the use cases shown in Figure 45.

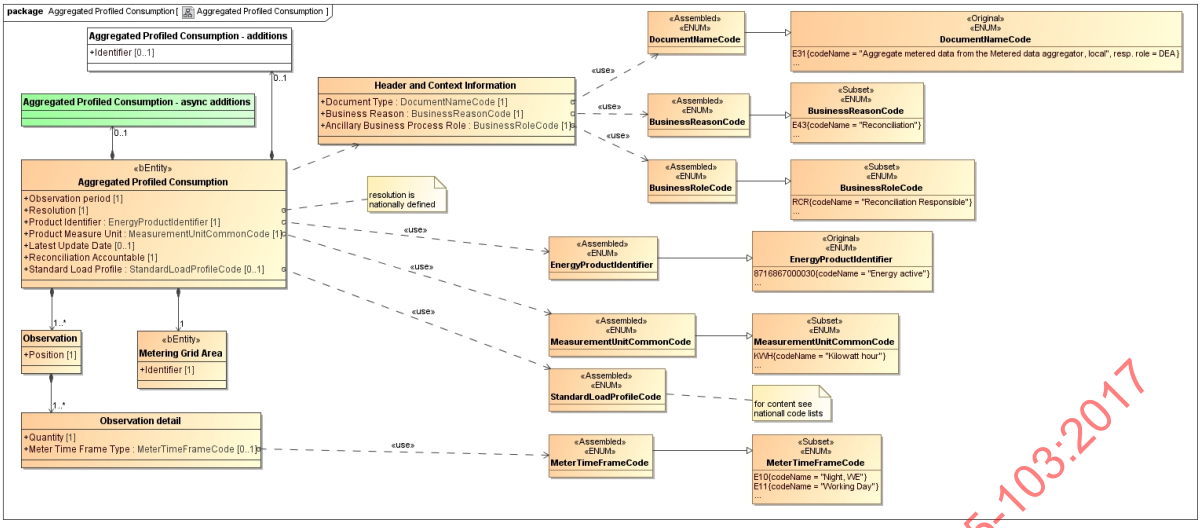


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Figure 48 – Use case for the business process Exchange Aggregated Profiled Consumption

Figure 49 shows the class diagram for the exchanged aggregated profiled consumption as shown in Figure 48.

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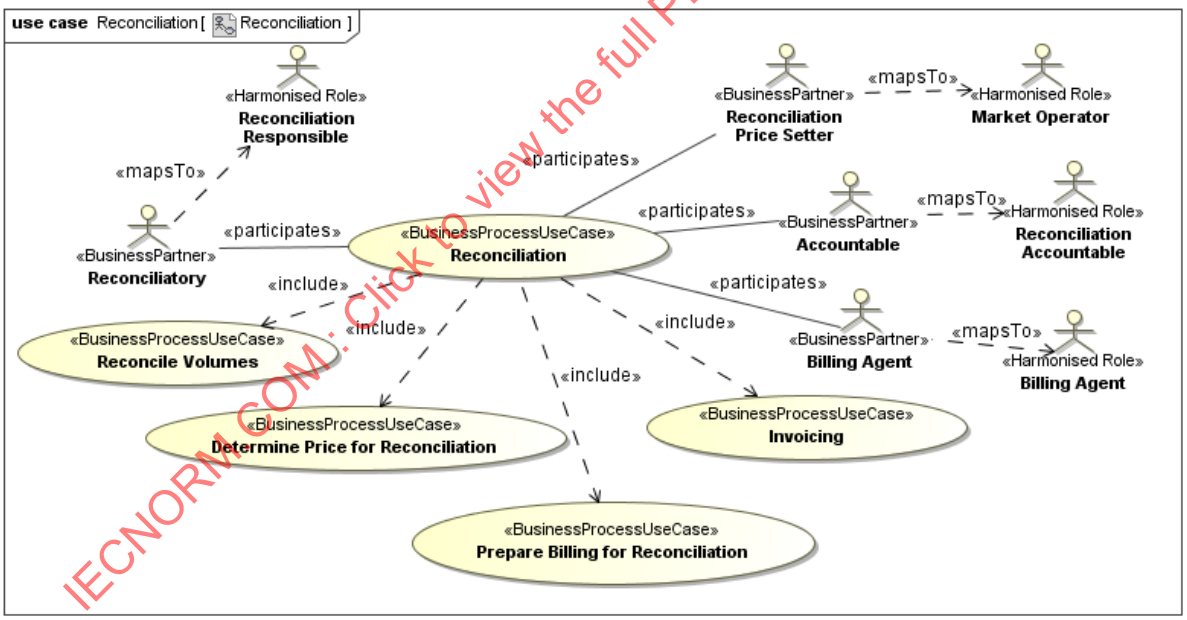
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Figure 49 – Class diagram for Exchange Aggregated Profiled Consumption

5.8.3 The business process use case for Reconciliation

5.8.3.1 General

Figure 50 shows the business process use case for *Reconciliation* from the use cases shown in Figure 41.



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Figure 50 – Business process use case for Reconciliation

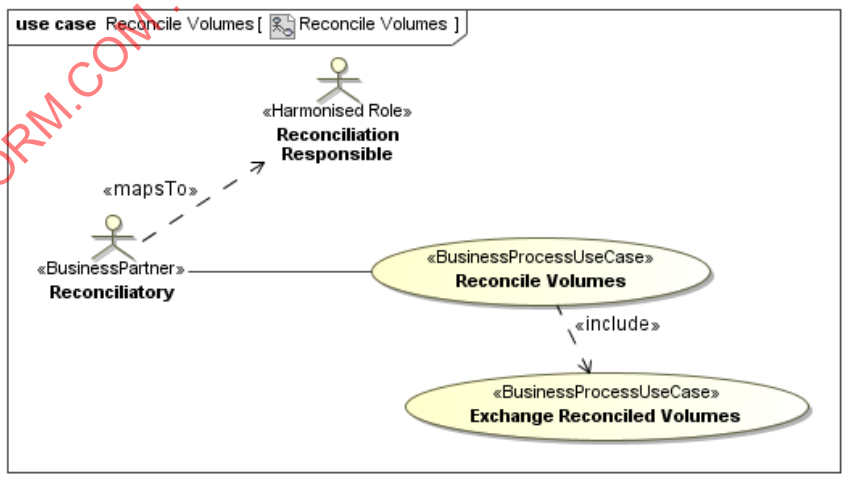
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Description

UseCase description: Reconciliation	
Definition	The party accountable for the final settlement of imbalance for a profiled Metering Point is financially charged for this imbalance.
beginsWhen	The Reconciliatory – decides to, or – when the (national) time schedule prescribes him to.
precondition	The Reconciliatory has available: – (National) Rules for reconciliation – The preliminary profiled consumption for profiled Metering Points within the Metering Grid Area resulting from Imbalance Settlement – Validated measured data for the profiled Metering Point(s) that will be part of the reconciliation – Profiled consumption per Reconciliation Accountable resulting from (according to national Reconciliation rules): • Profile category (as part of master data) for the Metering Point that will be part of the reconciliation • Preliminary profiled consumption derived from previous period – Master data for the exchange of data – Validated measured data used as input in the process “Reconcile Volumes” are supposed to be correct and up-to-date. Correction processes for incorrect data are supposed to be manual and specified according to national rules.
endsWhen	The financial accountability of all parties accountable for imbalance for one or more profiled Metering Point(s) is established.
postCondition	The party accountable for the final settlement of imbalance for a profiled Metering Point is financially charged.
Exceptions	None

5.8.3.2 Use case for the business process Exchange Reconciled Volumes

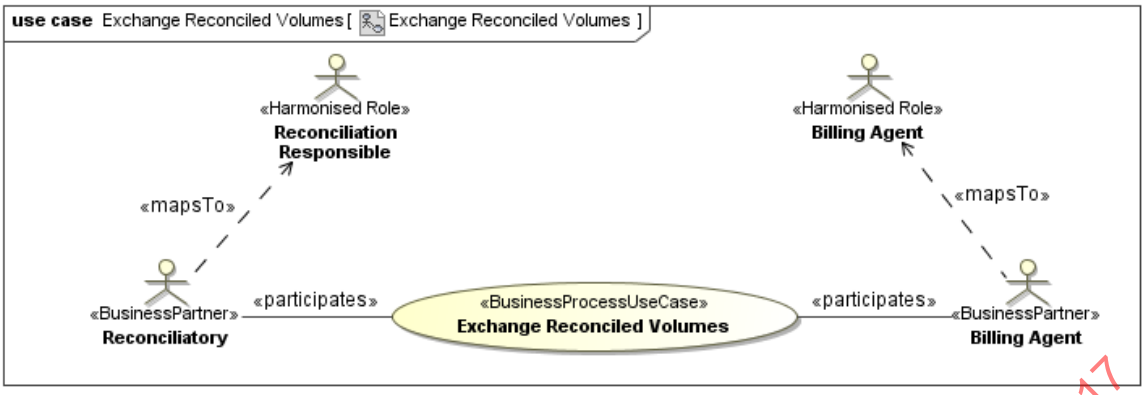
This use case, see Figure 52, is included in the use case for the business process Determine Price for Reconciliation, see Figure 51, see further [10].



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Figure 51 – Use case for the business process Reconcile Volumes

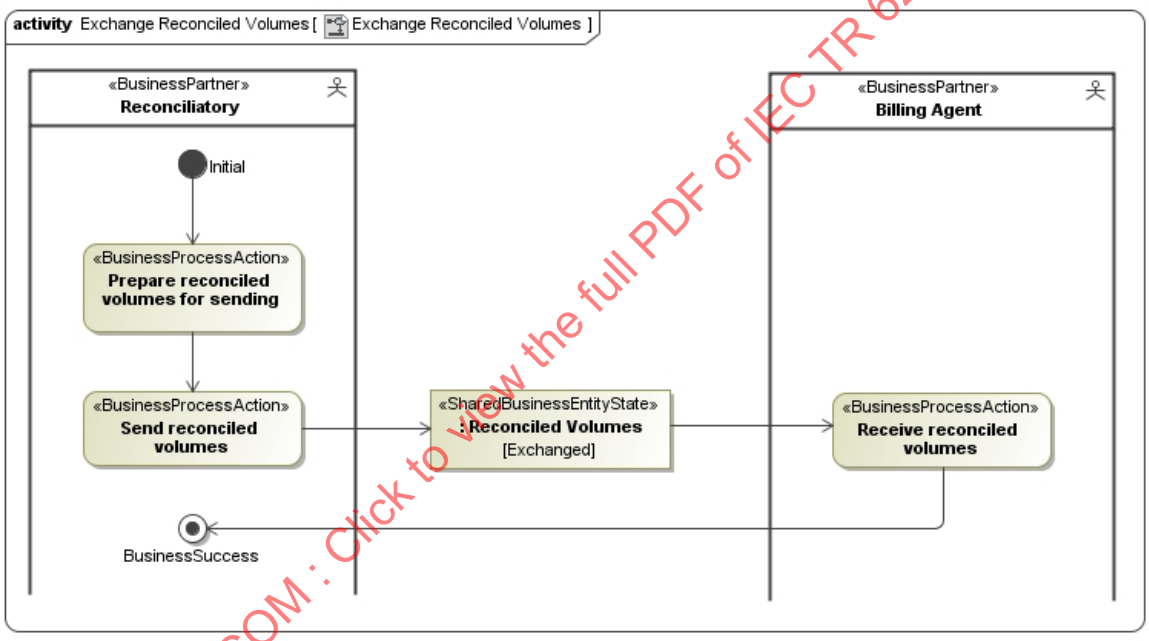
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Figure 52 – Use case for the business process Exchange Reconciled Volumes

Figure 53 shows the activity diagram for the use case Exchange Reconciled Volumes shown in Figure 52.

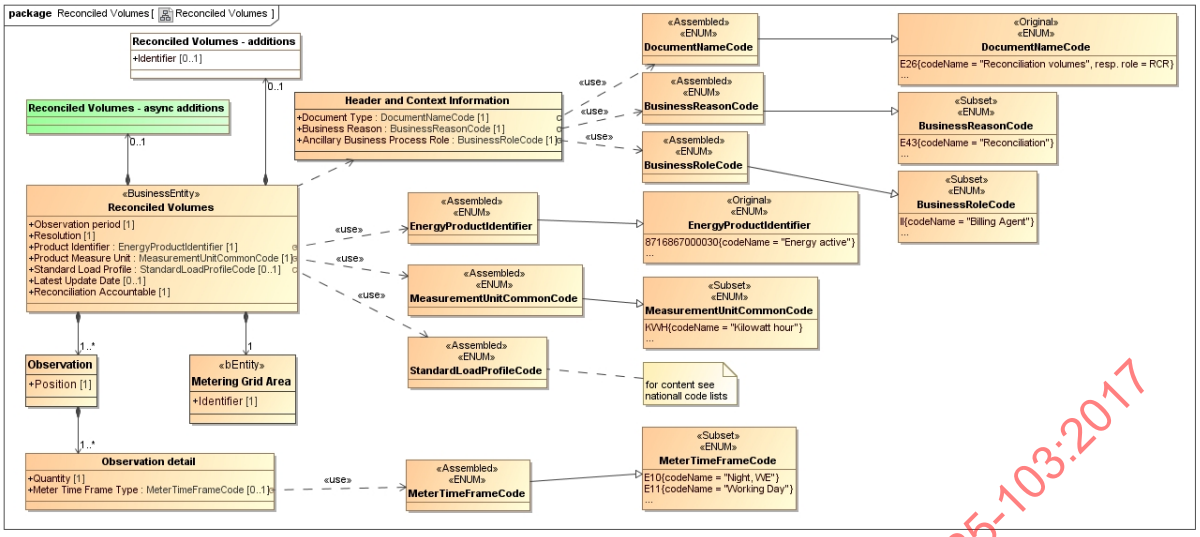


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Figure 53 – Activity diagram for the business process Exchange Reconciled Volumes

Figure 54 shows the class diagram for the exchanged Reconciled Volumes to Billing Agent as shown in Figure 53.

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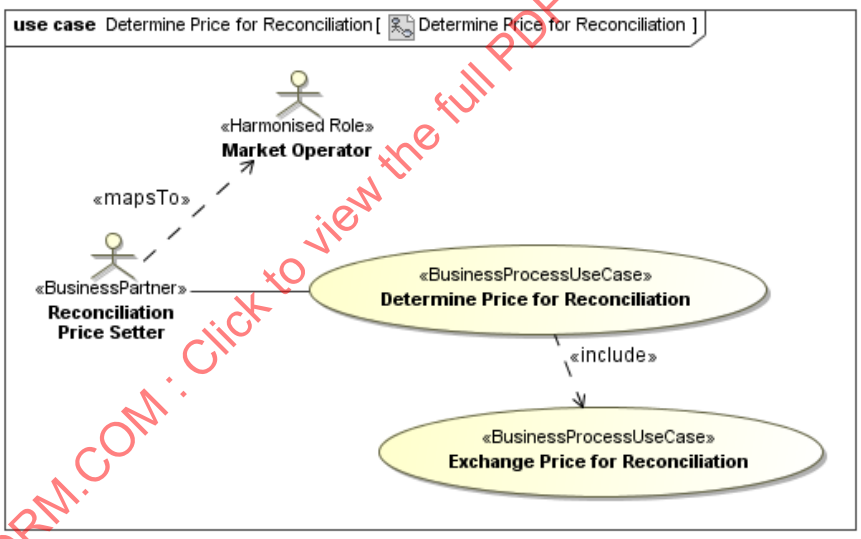


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Figure 54 – Class diagram for Exchange Reconciled Volumes

5.8.3.3 Use case for the business process Exchange Price for Reconciliation

This use case, see Figure 56, is included in the use case for the business process Determine Price for Reconciliation, see Figure 55, see further [10].



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Figure 55 – Use case for the business process Determine Price for Reconciliation

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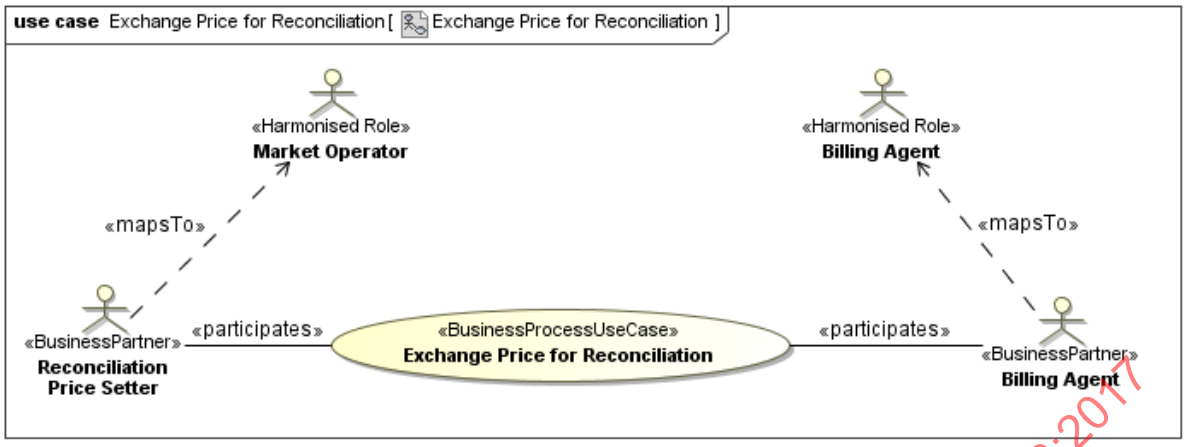


Figure 56 – Use case for the business process Exchange Price for Reconciliation

Figure 57 shows the activity diagram for the use case Exchange Price for Reconciliation shown in Figure 56.

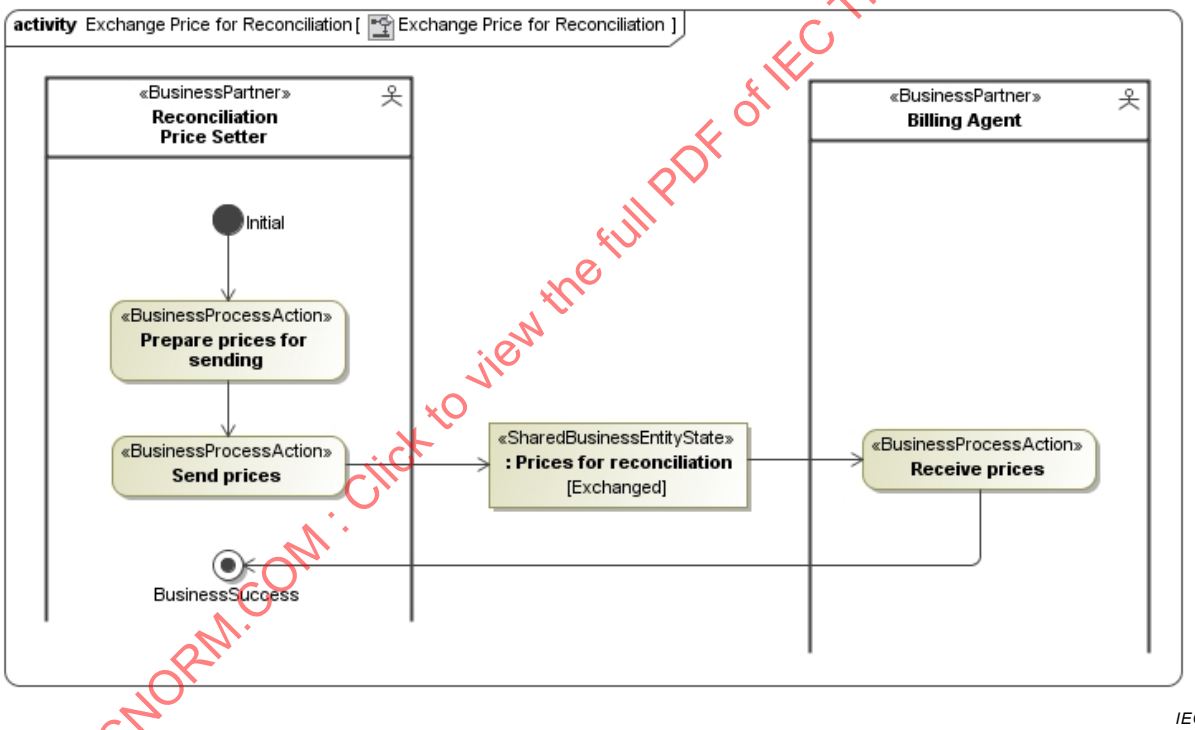
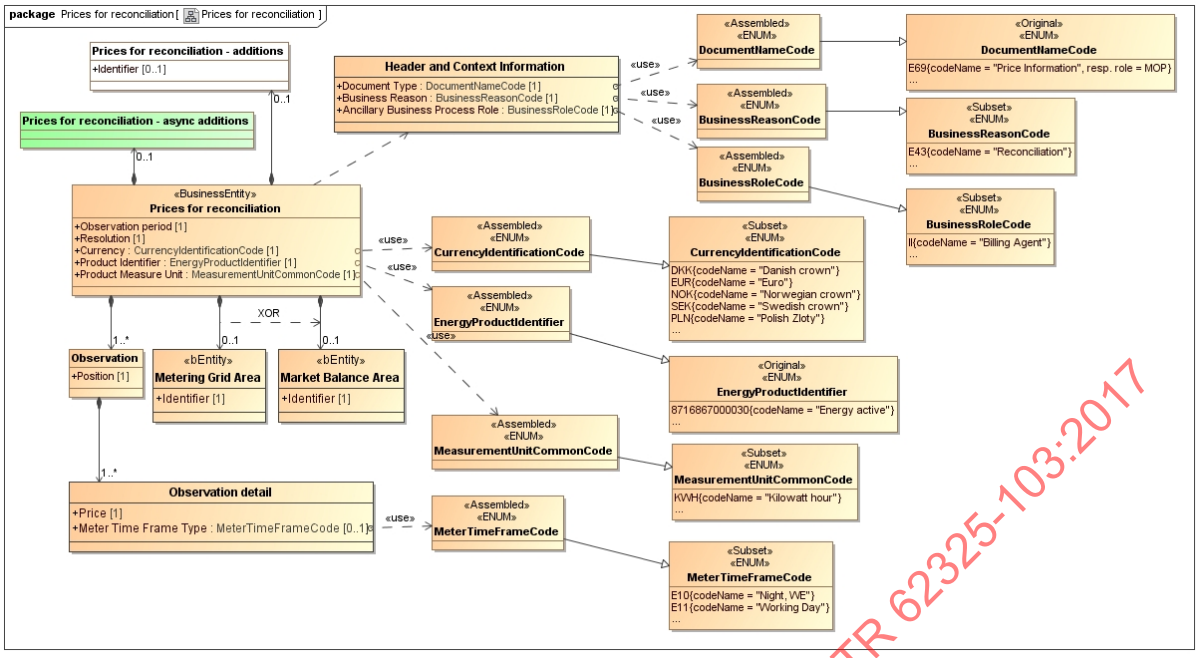


Figure 57 – Activity diagram for the business process Exchange Price for Reconciliation

Figure 54 shows the class diagram for the exchanged Prices for Reconciliation to Billing Agent as shown in Figure 57.

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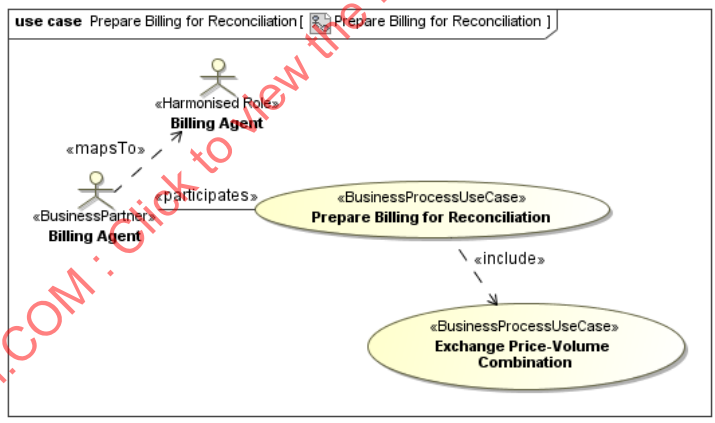


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Figure 58 – Class diagram for Exchange Price for Reconciliation

5.8.3.4 Use case for the Business Process Exchange Price-Volume combination

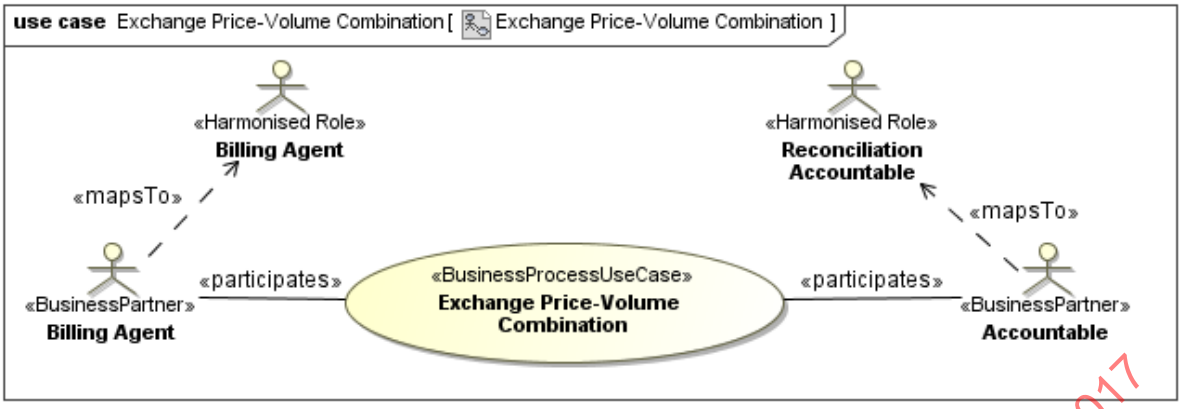
This use case, see Figure 60, is included in the use case for the business process Prepare Billing for Reconciliation, see Figure 59, see further [10].



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Figure 59 – Use case for the business process Prepare Billing for Reconciliation

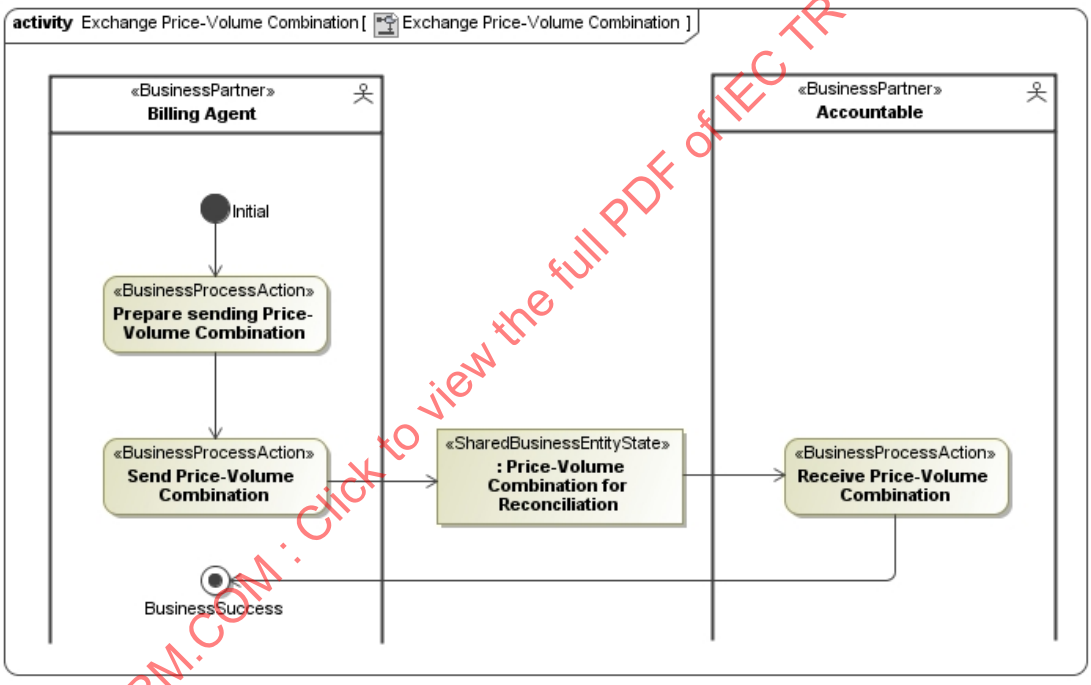
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Figure 60 – Use case for the business process Exchange Price-Volume Combination

Figure 61 shows the activity diagram for the use case Exchange Price-Volume Combination for reconciliation shown in Figure 60.

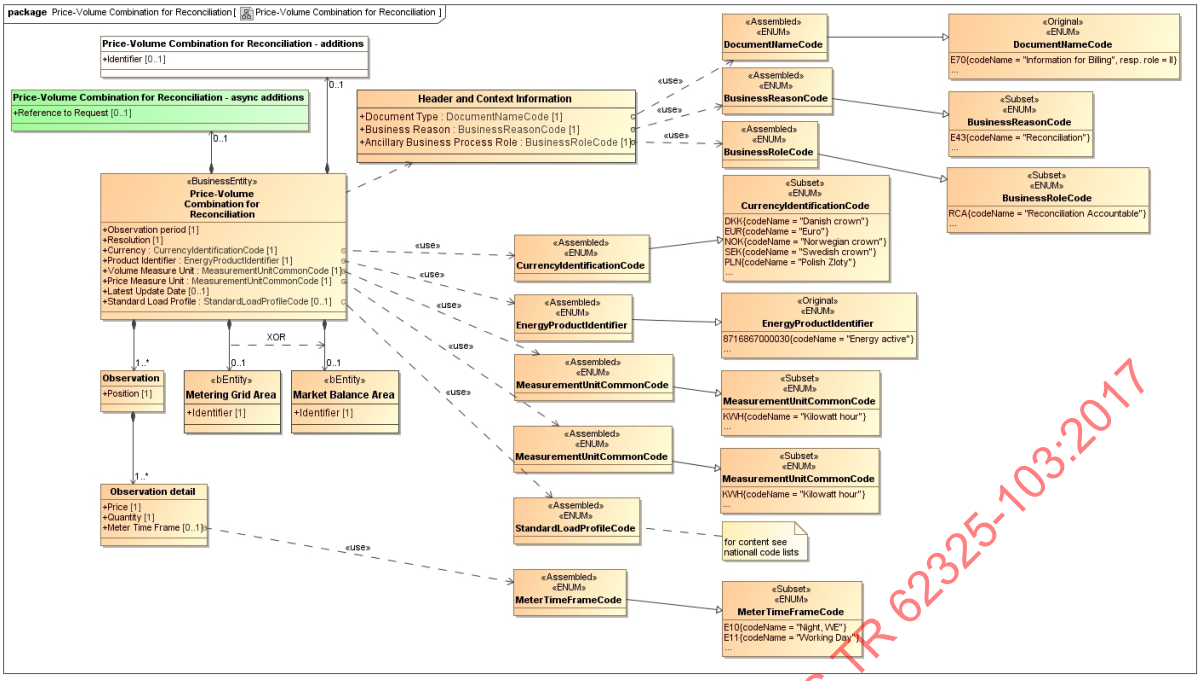


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Figure 61 – Activity diagram for the business process Exchange Price-Volume Combination for Reconciliation

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Figure 62 shows the class diagram for the exchanged Price-Volume Combination for Reconciliation to Billing Agent as shown in Figure 61.



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Figure 62 – Class diagram for Exchange Price-Volume Combination for Reconciliation

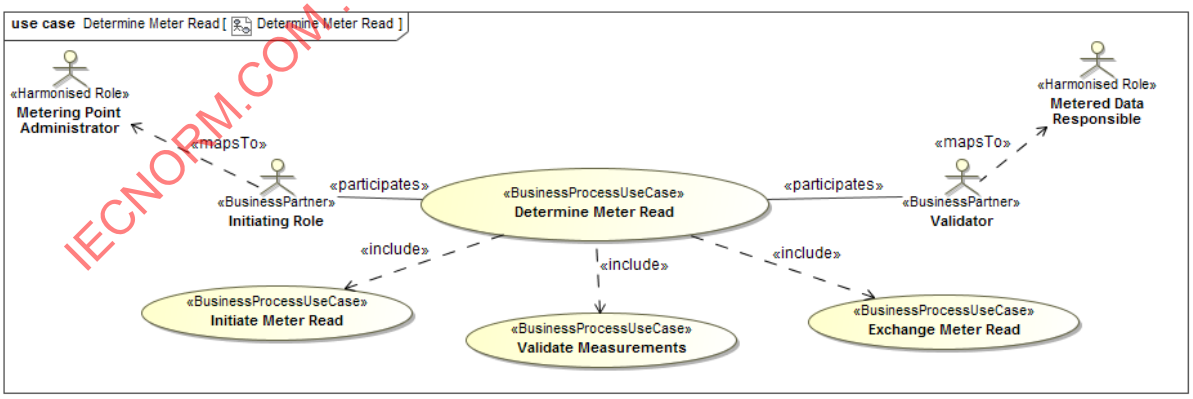
5.9 Determine Meter Read

5.9.1 General

This process can both be seen as part of the Measure process (see Figure 2) and the Structure process (see Figure 67). The result of this process is a meter read for a switch (of supplier) or a change of characteristics. See further [11].

5.9.2 The business process use case for Determine Meter Read

Figure 63 shows the business process use case for Determine Meter Read from the use cases shown in Figure 2 and Figure 67.



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Figure 63 – The business process use case for Determine Meter Read

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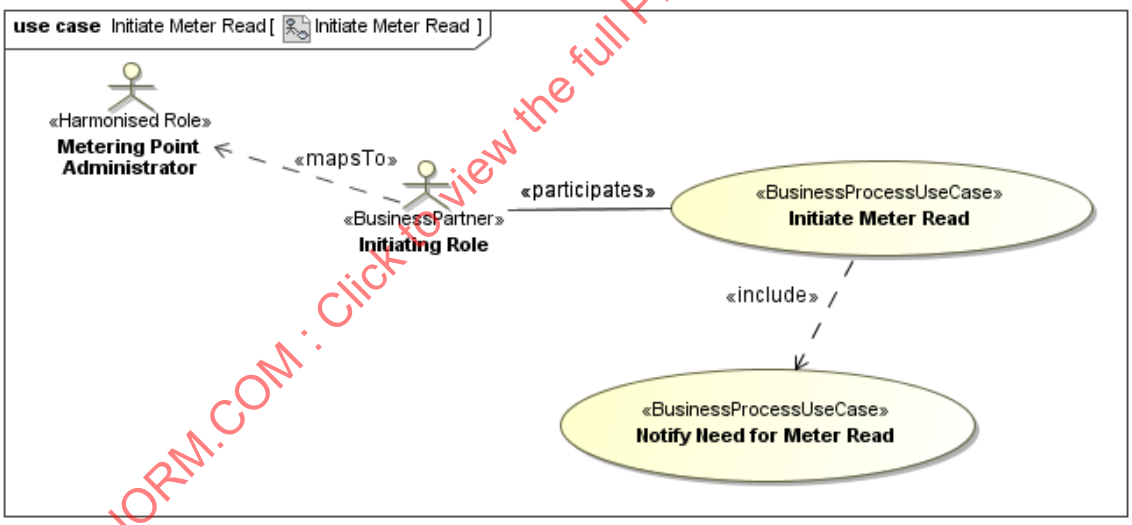
Description

UseCase description: Determine Meter Read	
Definition	Provides validated meter read for processes that need an independently established status by means of a meter read for the moment of change.
beginsWhen	The Initiating Role triggers the process.
precondition	A process in need of an independently established status by means of a meter read for the moment of change is running; Partners responsible for the execution of the processes should have access to relevant master data.
endsWhen	The Meter Read has been made available to the business process that needs an independently established status by means of a meter read for the moment of change.
postCondition	The Meter Read has become part of the metered data history; The processes that need an independently established status by means of a meter read for the moment of change can be continued.
Exceptions	None

Only the use case Initiate Meter Read is described in 5.9.3. For more details see [11].

5.9.3 Use case for the business process Initiate Meter Read

Figure 64 shows the business process use case Initiate Meter Read from the use cases shown in Figure 63.

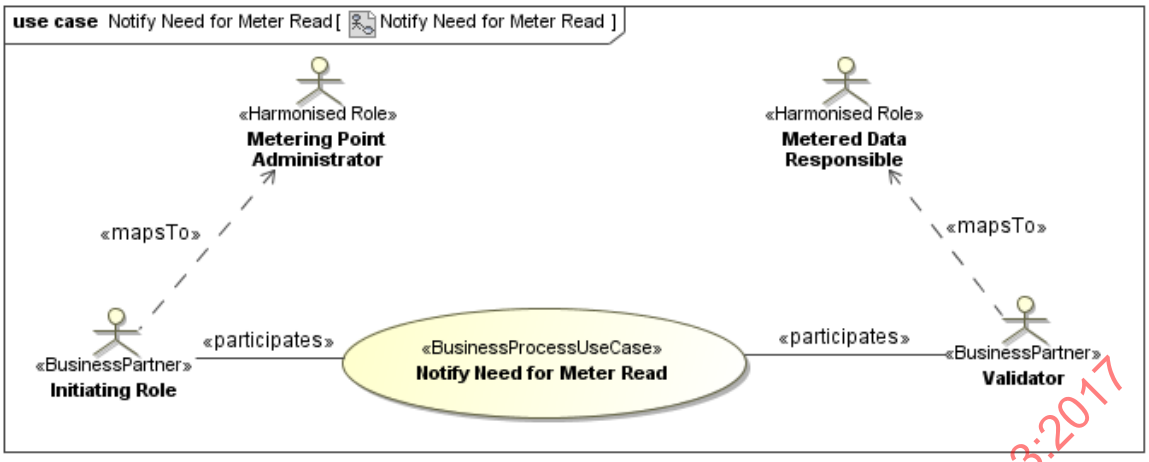


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Figure 64 – Use case for the business process Initiate Meter Read

Figure 65 shows the business process use case Notify Need for Meter Read from the use case shown in Figure 64.

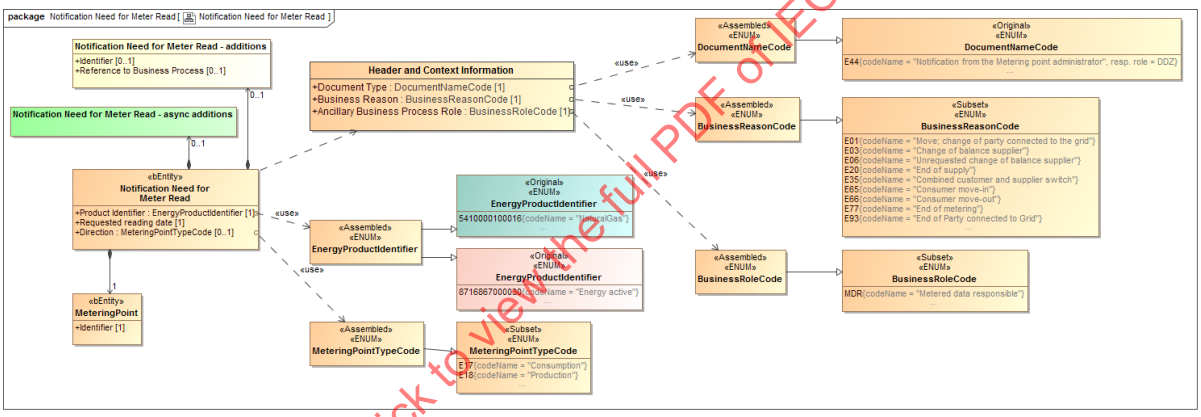
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Figure 65 – Use case for the business process Notify Need for Meter Read within the use case Initiate Meter Read

Figure 66 shows the class diagram for the exchange of Notify Need for Meter Read as shown in Figure 65.



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Figure 66 – Class diagram for Notification Need for Meter Read

5.10 Change of supplier

5.10.1 General

This is the process where a new Energy Supplier will be registered in the Metering Point register at the request of the energy supplier for the Metering Point. The DSO makes all necessary updates for the change, including distribution of master data for alignment of the business partner data bases, i.e. Master data of the Metering point has been distributed to relevant parties. See further [12].

5.10.2 The business process use case for Change of Supplier

Figure 67 shows the business process use case Change supplier from the business area shown in Figure 5.

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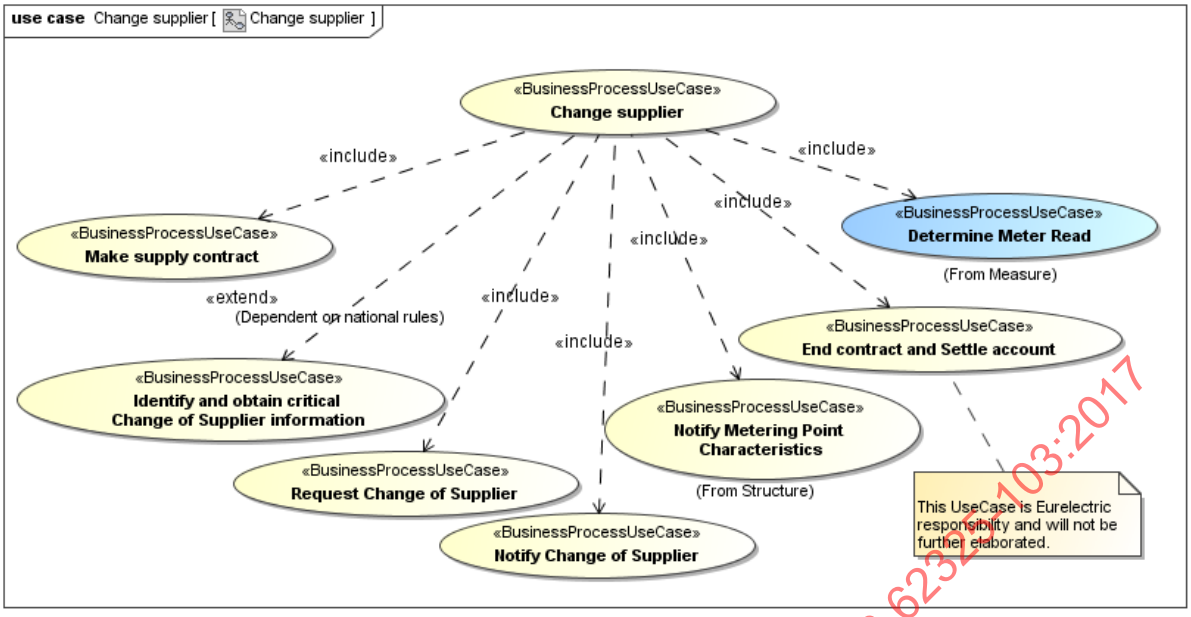


Figure 67 – Business process use case for Change of Supplier

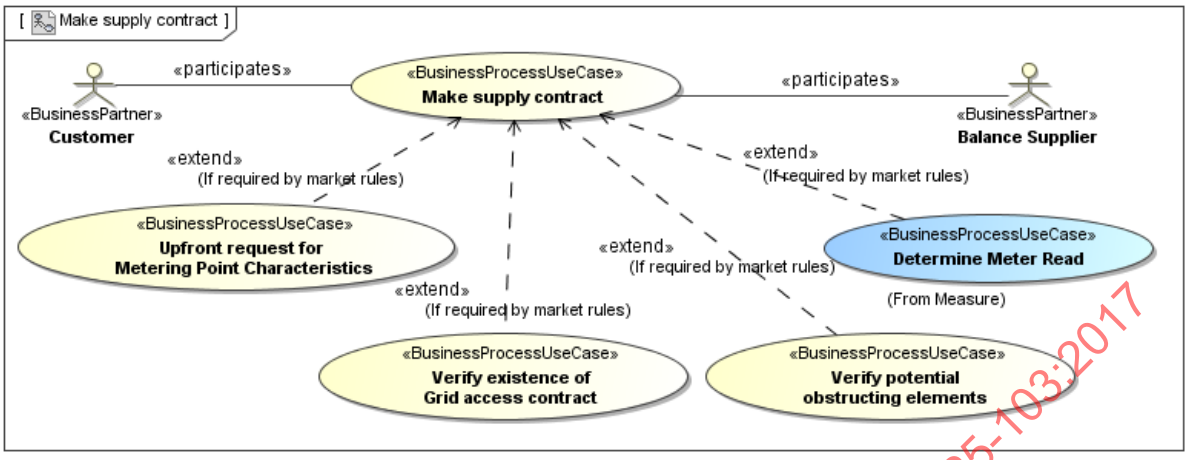
In this subclause the use cases Make supply contract, Request Change of Supplier and Notify Change of Supplier are (partly) described, regarding Determine meter read, see 5.9.

Description

UseCase description: Change of Supplier	
Definition	This is the process where a *New Balance Supplier* (together with the *Balance Responsible Party*) will be registered in the *Metering Point register* as the New Supplier for the *Metering Point*. The *Metering Point Administrator* makes all necessary updates for the Change of Supplier, including distribution of master data for alignment of the business partner databases.
beginsWhen	When a *Customer* asks for a contract with the *New Balance Supplier* and the Change of Supplier process is initiated
preCondition	The *New Balance Supplier* has all needed information to be able to request Change of Supplier
endsWhen	When the Request Change of Supplier is confirmed or rejected, and if confirmed then all relevant parties are informed about the Change of Supplier and master data of the *Metering Point* involved have been distributed to relevant parties.
postCondition	The *Customer* has changed *Balance Supplier* and all involved parties have exchanged and synchronised their master data, including determination and exchange of the meter read related to the Change of Supplier.
Exceptions	The process *Identify and obtain critical Change of Supplier information* may be run if required by national rules.

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5.10.3 Use case for the business process Make Supply Contract



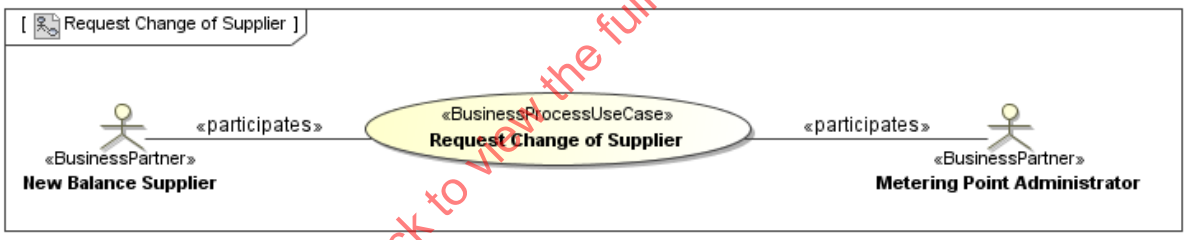
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Figure 68 – Use case for the business process Make Supply Contract

This use case, see Figure 68, is not further elaborated in this document.

5.10.4 Use case for the business process Request Change of Supplier

Figure 69 shows the business process use case Request Change of Supplier from the use cases shown in Figure 67.

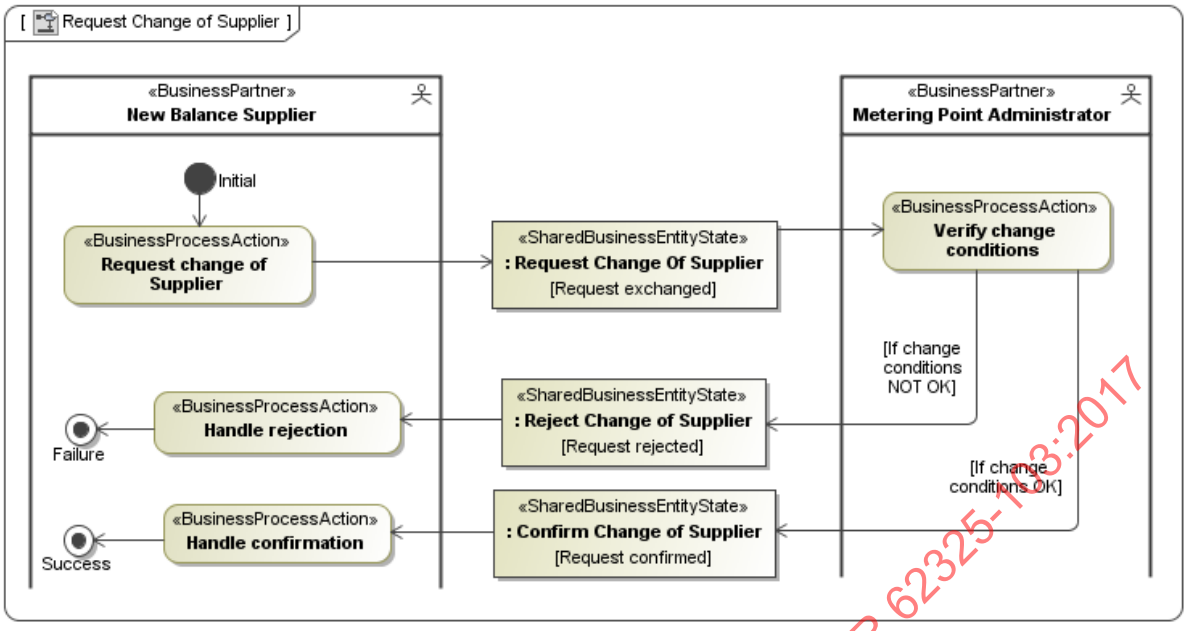


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Figure 69 – Use case for the business process Request Change of Supplier

Figure 70 shows the activity diagram for the use case Request Change of Supplier shown in Figure 69.

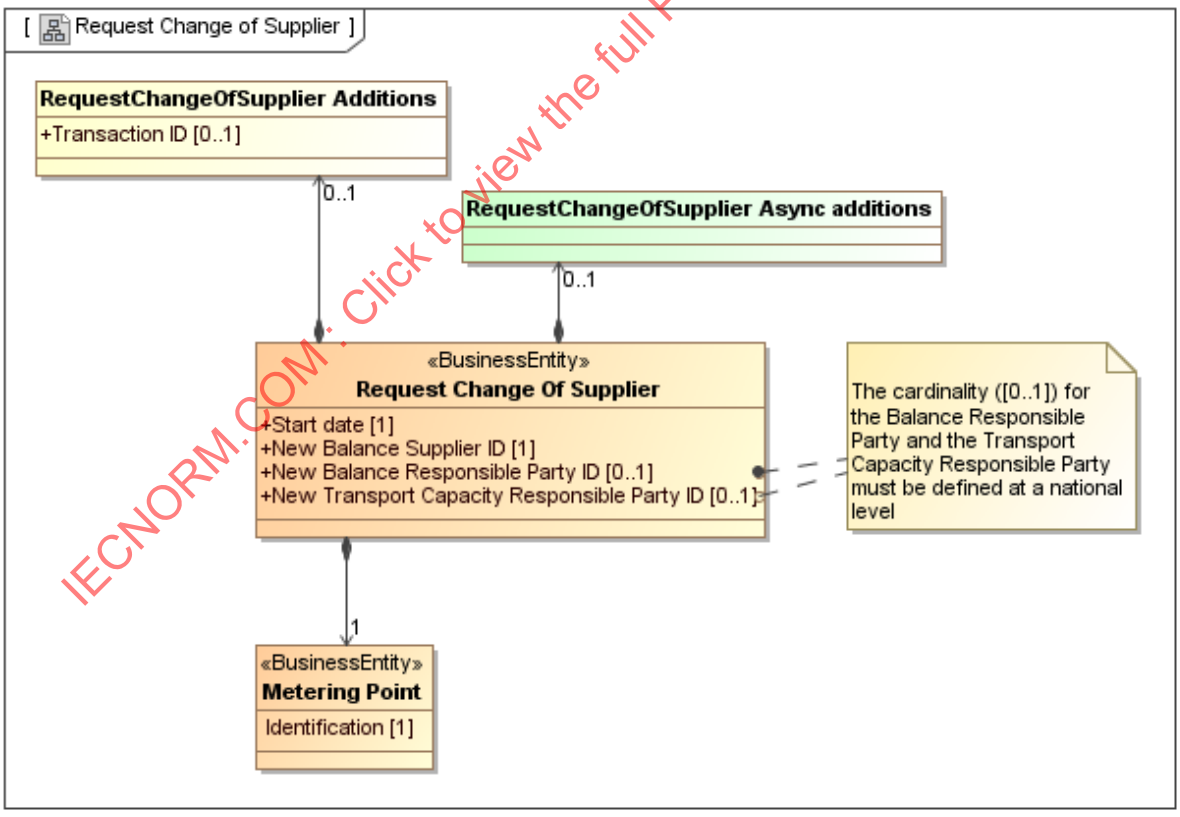
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Figure 70 – Activity diagram for the business process Request Change of Supplier

Figure 71 shows the class diagram for the exchange of Request Change of Supplier to Metering Point Administrator shown in Figure 70.

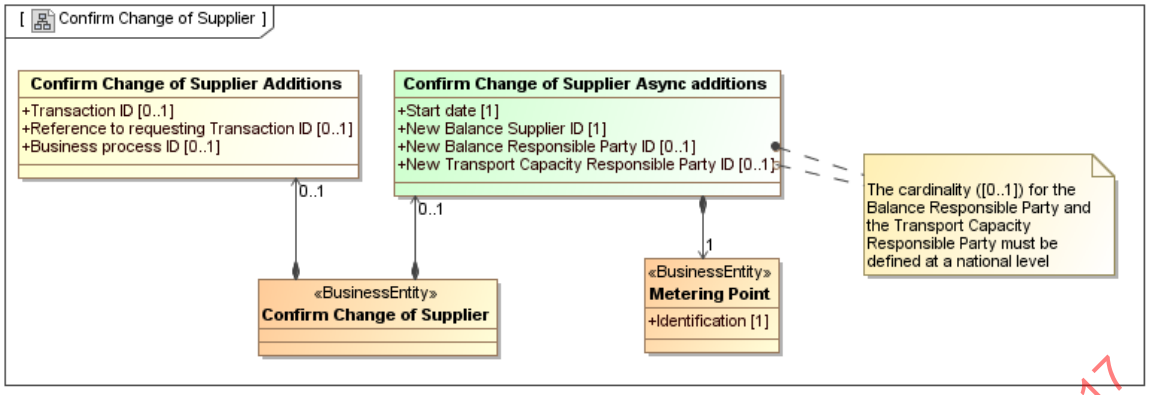


IEC

Figure 71 – Class diagram for Request Change of Supplier

Figure 72 shows the Class diagram for the exchange of Confirm Change of Supplier shown in Figure 70.

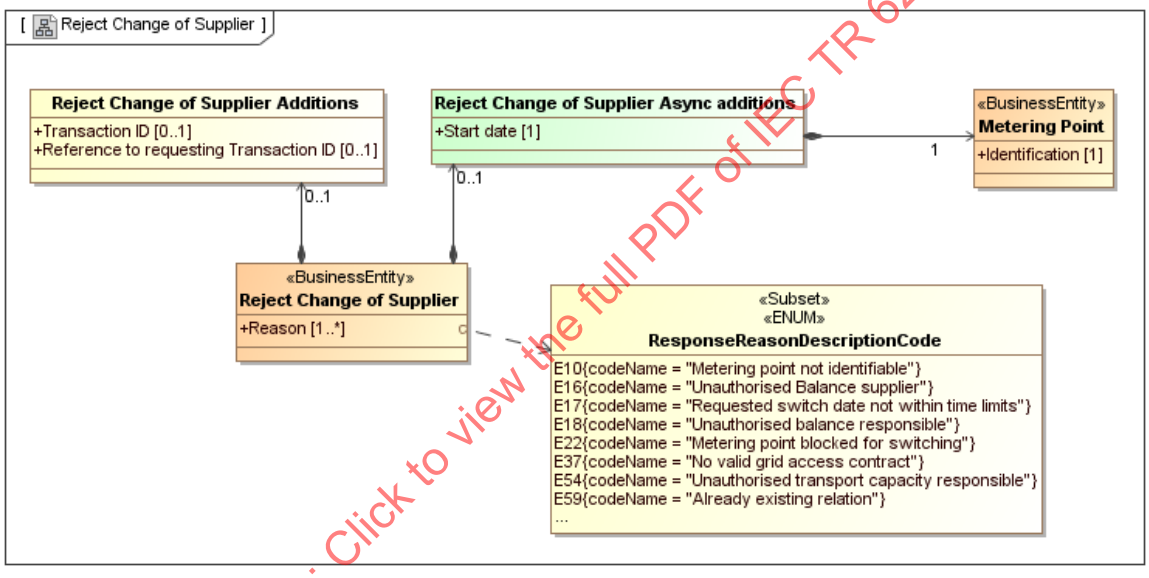
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Figure 72 – Class diagram for Confirm Change of Supplier

Figure 73 shows the class diagram for the exchange of Reject Change of Supplier shown in Figure 70.



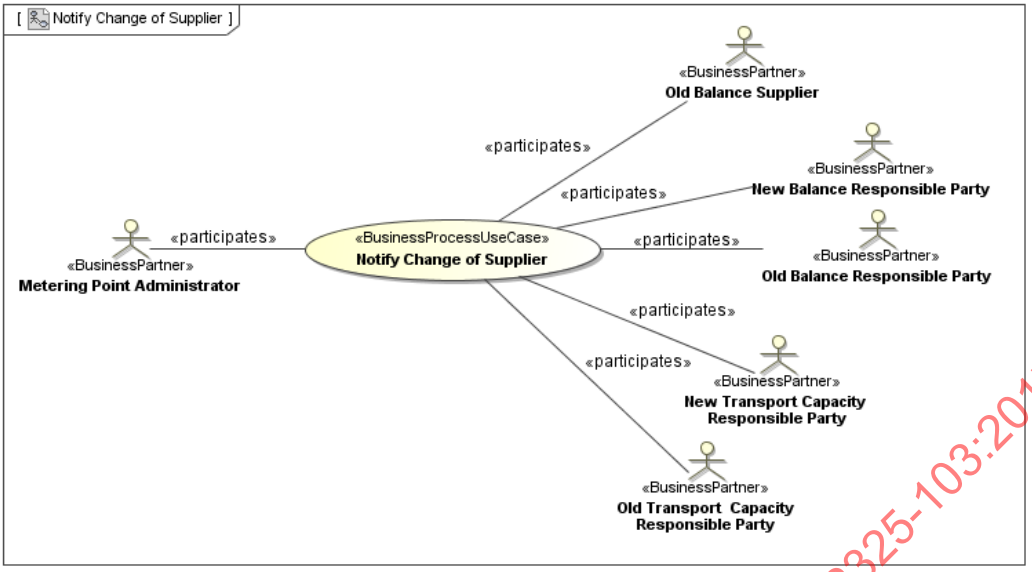
IEC

Figure 73 – Class diagram for Reject Change of Supplier

5.10.5 Use case for the business process Notify Change of Supplier

Figure 74 shows the business process use case Request Change of Supplier from the use cases shown in Figure 67.

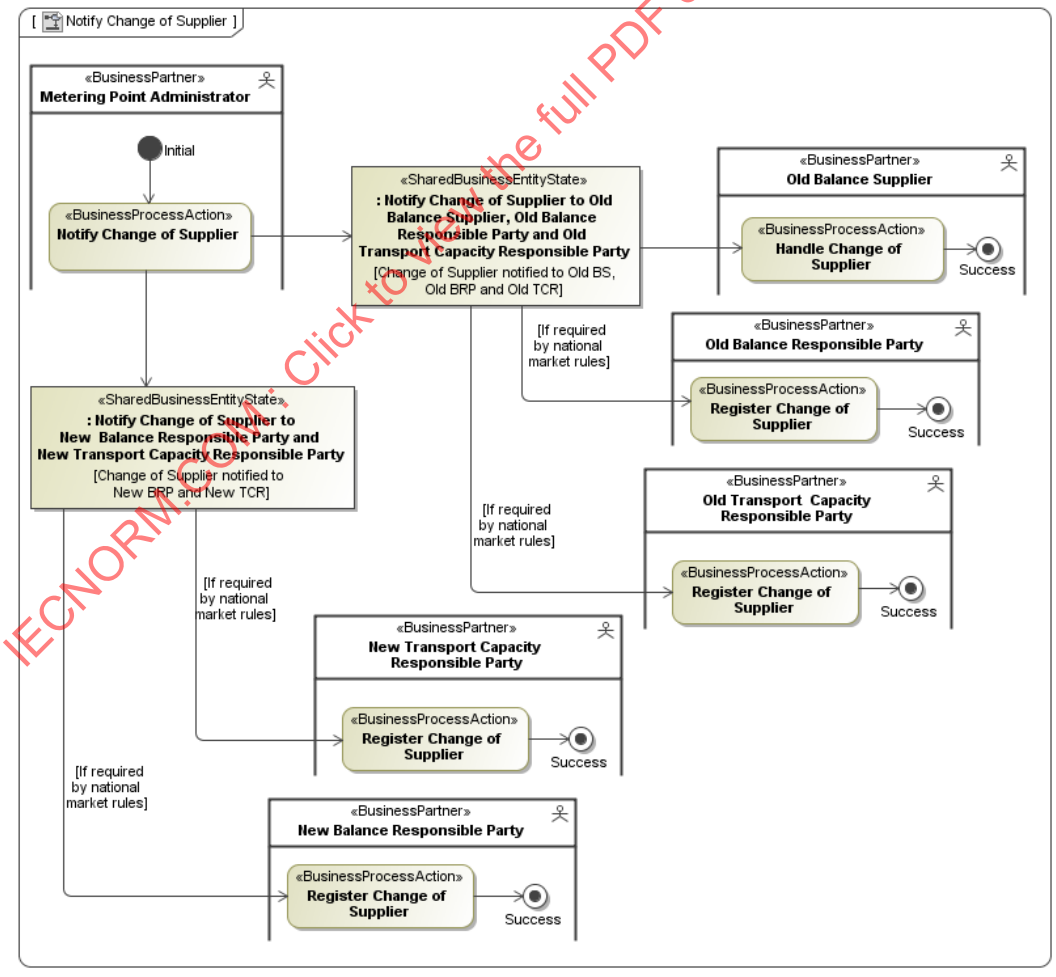
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Figure 74 – Use case for the business process Notify Change of Supplier

Figure 75 shows the activity diagram for the use case Notify Change of Supplier shown in Figure 74.

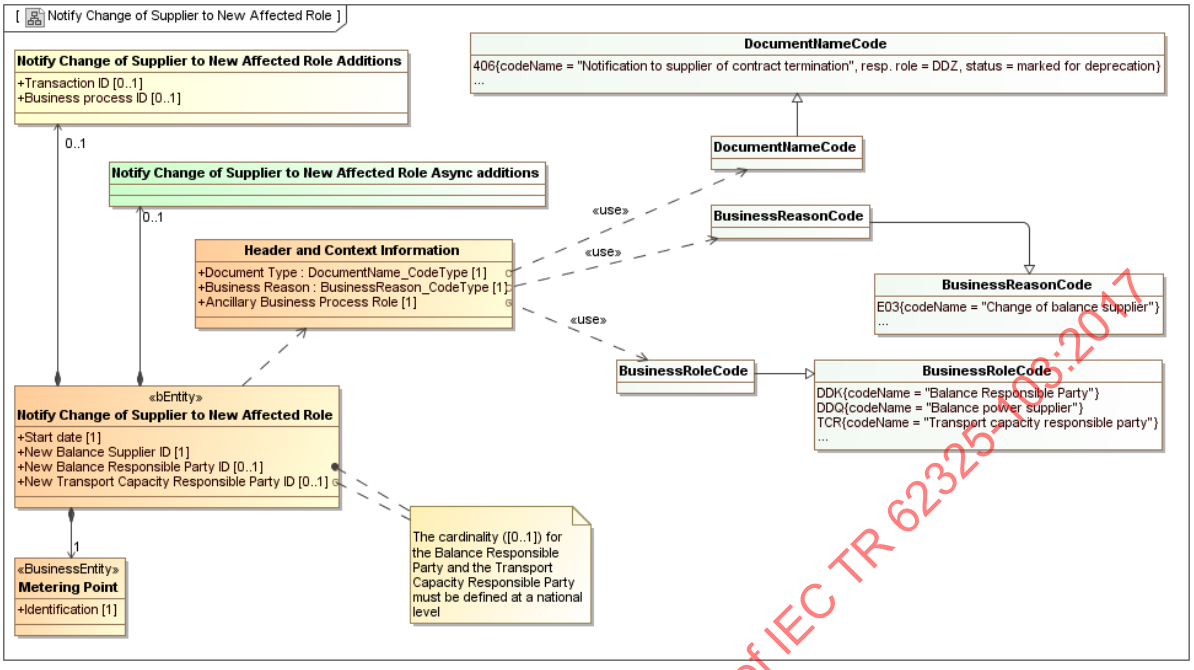


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Figure 75 – Activity diagram for the business process Notify Change of Supplier

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Figure 76 shows the Class diagram for the exchange of Notify Change of Supplier shown in Figure 75.



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Figure 76 – Class diagram for Notify Change of Supplier to New affected role

The class diagram Notify Change of Supplier to Old Affected Role is not shown here.

5.11 Change of Balance Responsible Party

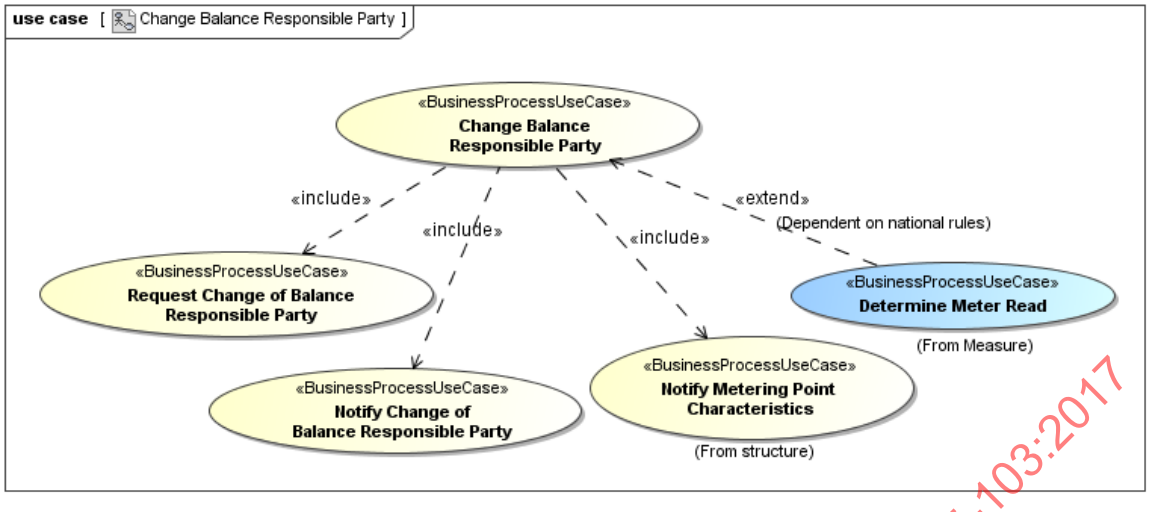
5.11.1 General

This is the process where a new Balance Responsible Party will be registered in the Metering Point register at the request of the energy supplier for the Metering Point. The DSO makes all necessary updates for the change, including distribution of master data for alignment of the business partner data bases. See further [13].

5.11.2 The business process use case for Change of Balance Responsible Party

Figure 77 shows the business process use case for Change of Balance Responsible Party from the business area shown in Figure 5.

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Figure 77 – Business process use case for Change of Balance Responsible Party

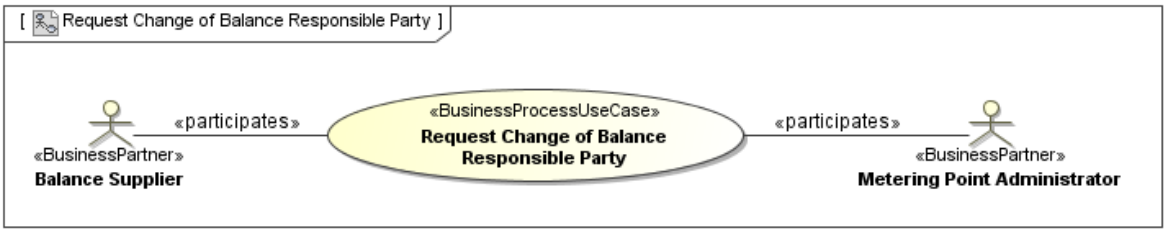
Description

UseCase description: Change of Balance Responsible Party	
Definition	This is the process where a *New Balance Responsible Party* will be registered in the *Metering Point register* at the request of the *Balance Supplier* for the *Metering Point*. The *Metering Point Administrator* makes all necessary updates for the change, including distribution of master data for alignment of the business partner data bases.
beginsWhen	When the *Balance Supplier* decides to change the *Balance Responsible Party* for the *Metering Point*.
precondition	The *Balance Supplier* supplies the *Metering Point* and the *New Balance Responsible Party* must be authorised.
endsWhen	When the change of Balance Responsible Party is confirmed or rejected, and if confirmed then all relevant parties have been notified and have received master data.
postCondition	The *New Balance Responsible Party* is linked to the Metering Point and all relevant parties have aligned master data or (in case of rejection) nothing is changed in the Metering Point register.
Exceptions	The change of *Balance Responsible Party* may at a national level be handled by other roles than the *Balance Supplier*, such as the *Balance Responsible Party* itself or the *Party Connected To Grid*.

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5.11.3 Use case for the business process Request Change of Balance Responsible Party

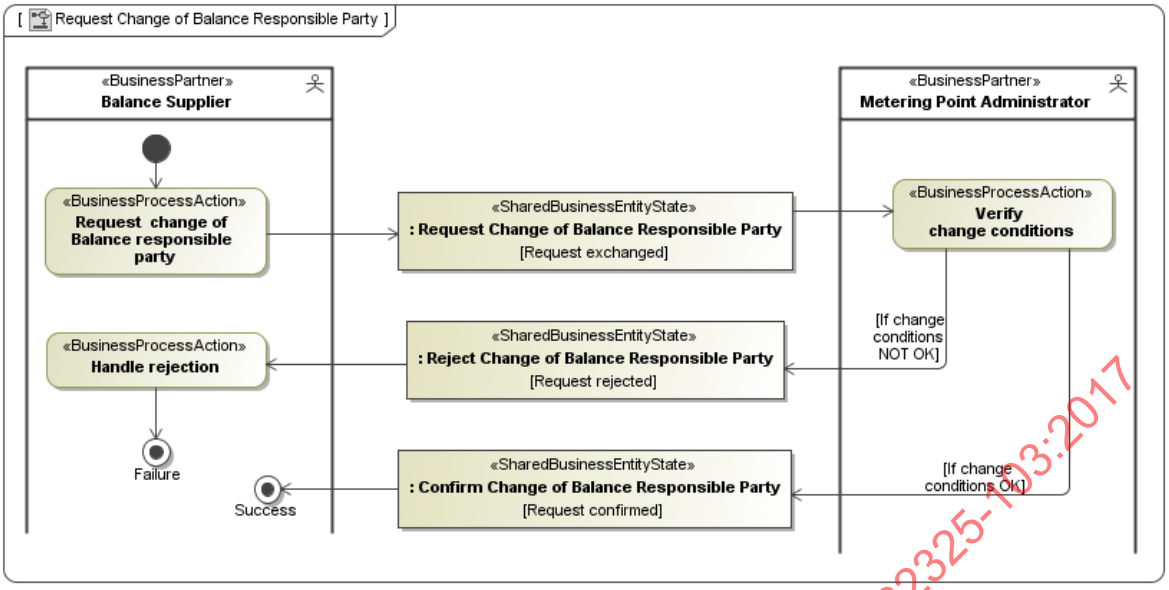
Figure 78 shows the business process use case Request Change of Balance Responsible Party from the use cases shown in Figure 77.



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Figure 78 – Use case for the business process Request Change of Balance Responsible Party

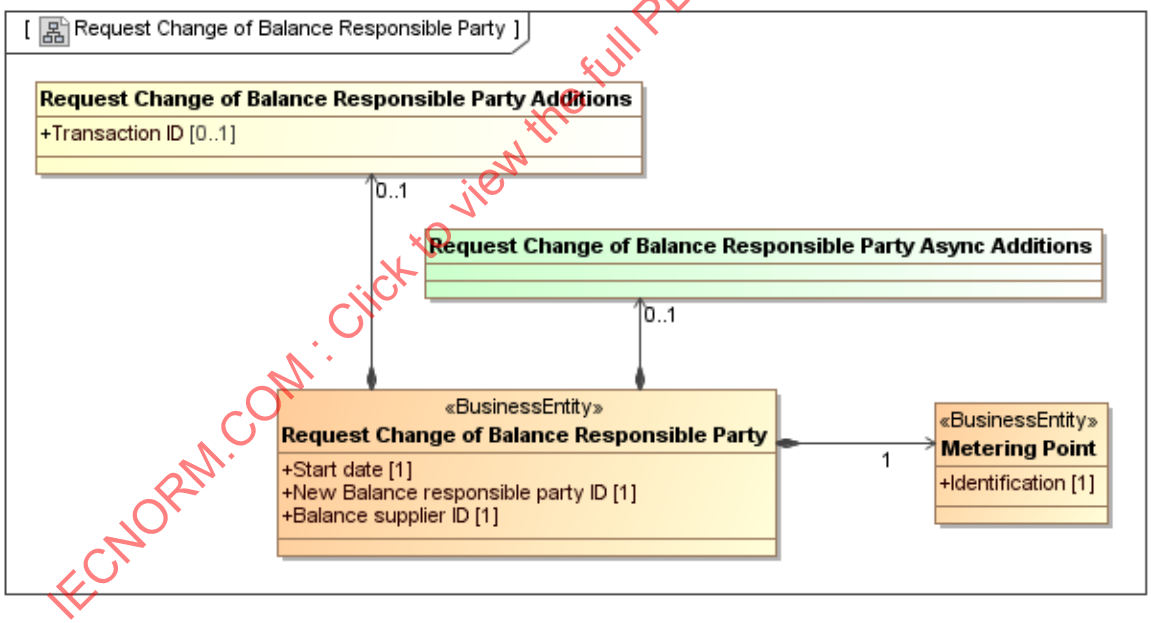
Figure 79 shows the activity diagram for the use case Request Change of Balance Responsible Party shown in Figure 78.



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Figure 79 – Activity diagram for the business process Request Change of Balance Responsible Party

Figure 80 shows the class diagram for the exchange of Request Change of Balance Responsible Party to Metering Point Administrator shown in Figure 79.



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Figure 80 – Class diagram for Request Change of Balance Responsible Party

Figure 81 shows the class diagram for the exchange of Confirm Change of Balance Responsible Party shown in Figure 79.

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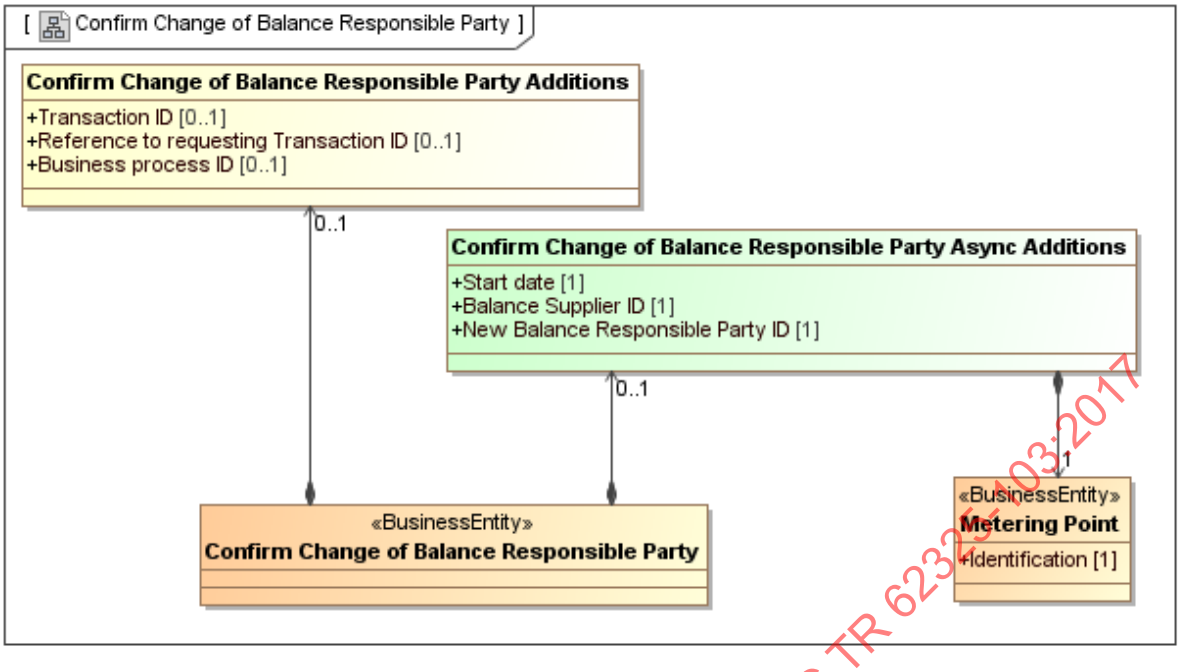


Figure 81 – Class diagram for Confirm Change of Balance Responsible Party

Figure 82 shows the class diagram for the exchange of Reject Change of Balance Responsible Party shown in Figure 79.

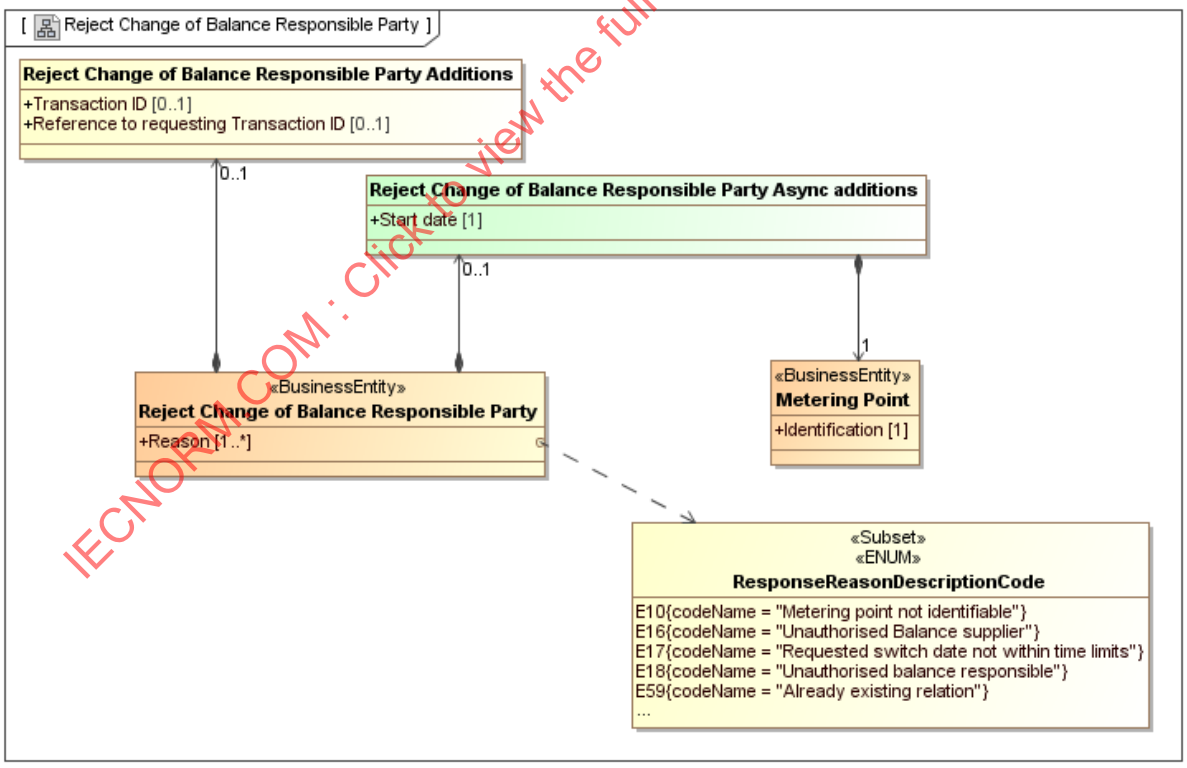


Figure 82 – Class diagram for Reject Change of Balance Responsible Party

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5.12 Align Metering Point Characteristics

5.12.1 General

Figure 83 shows the business process use case Align Metering Point Characteristics from the business area shown in Figure 5.

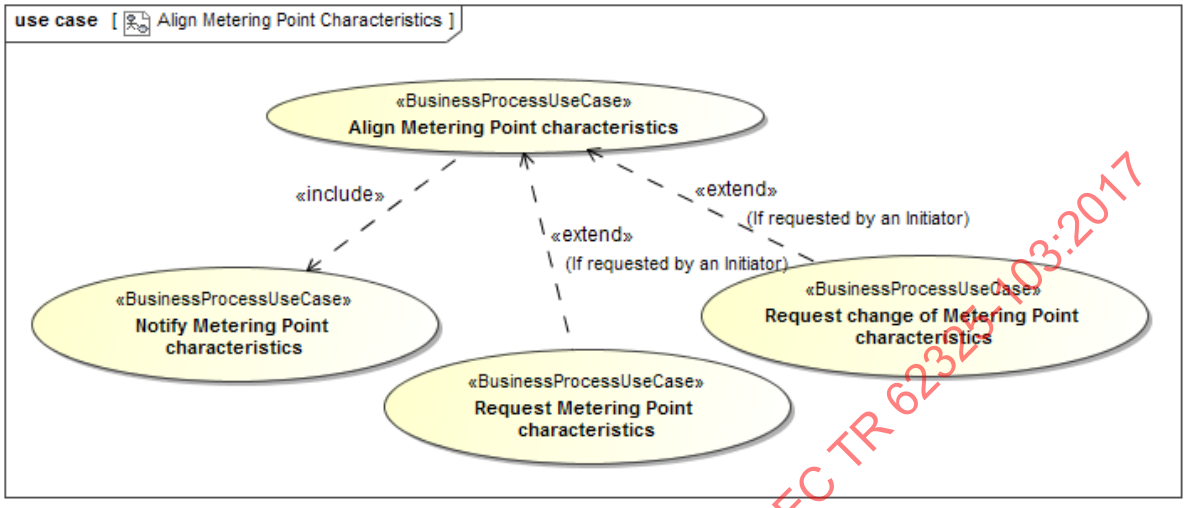


Figure 83 – Business process use case for Align Metering Point Characteristics

In 5.12.2, the use case Notify Metering Point characteristics is described.

5.12.2 Notify Metering Point (MP) characteristics

In this process the Metering Point Administrator distributes Metering Point Characteristics to Linked parties, such as:

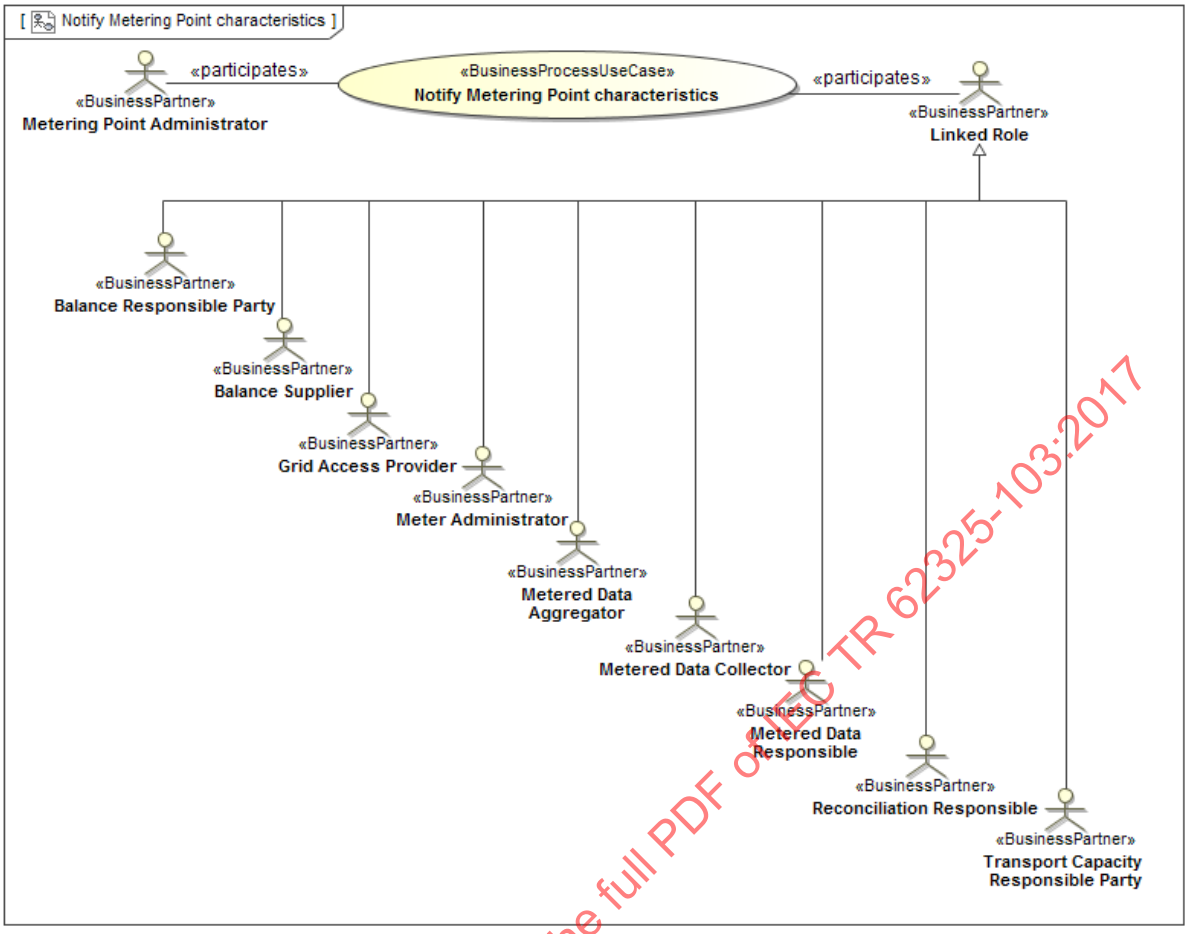
- Balance Responsible Party
- Balance Supplier
- Grid Access Provider
- Metered Data Aggregator
- Metered Data Responsible
- Reconciliation Responsible
- Transport Capacity Responsible Party

The information is sent after updating one or more metering point characteristics. See further [14].

5.12.3 Use case for the Notify Metering Point (MP) characteristics

Figure 84 shows the business process use case Notify Metering Point characteristics from the use cases shown in Figure 83.

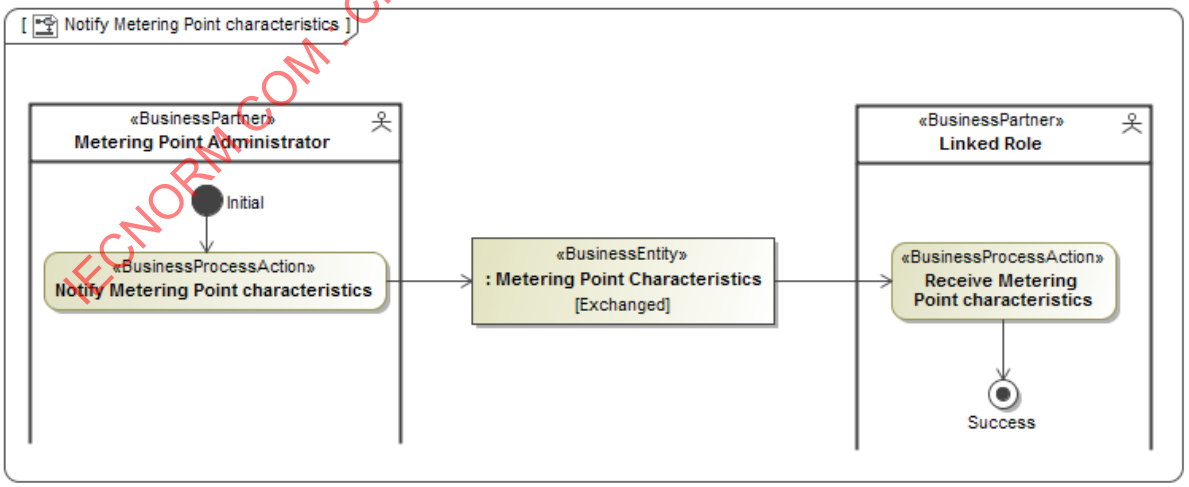
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Figure 84 – Use case for the business process Notify MP characteristics

Figure 85 shows the activity diagram for the use case Notify Metering Point characteristics shown in Figure 84.

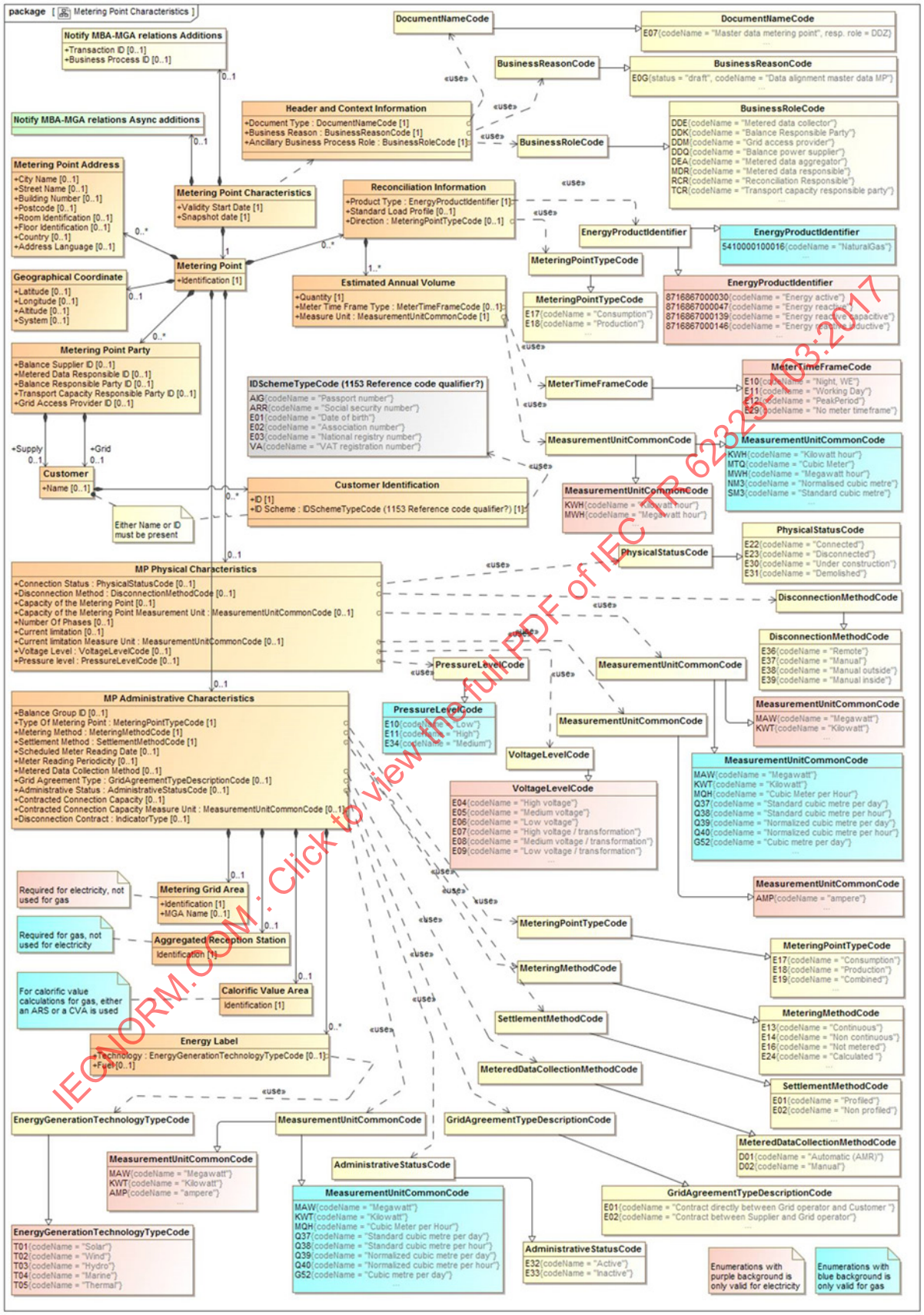


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Figure 85 – Activity diagram for the business process Notify MP characteristics

Figure 86 shows the Class diagram for the exchange of Metering Point Characteristics shown in Figure 85.

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Figure 86 – Class diagram for Notify MP characteristics

5.13 Alignment of Metering Configuration Characteristics

5.13.1 General

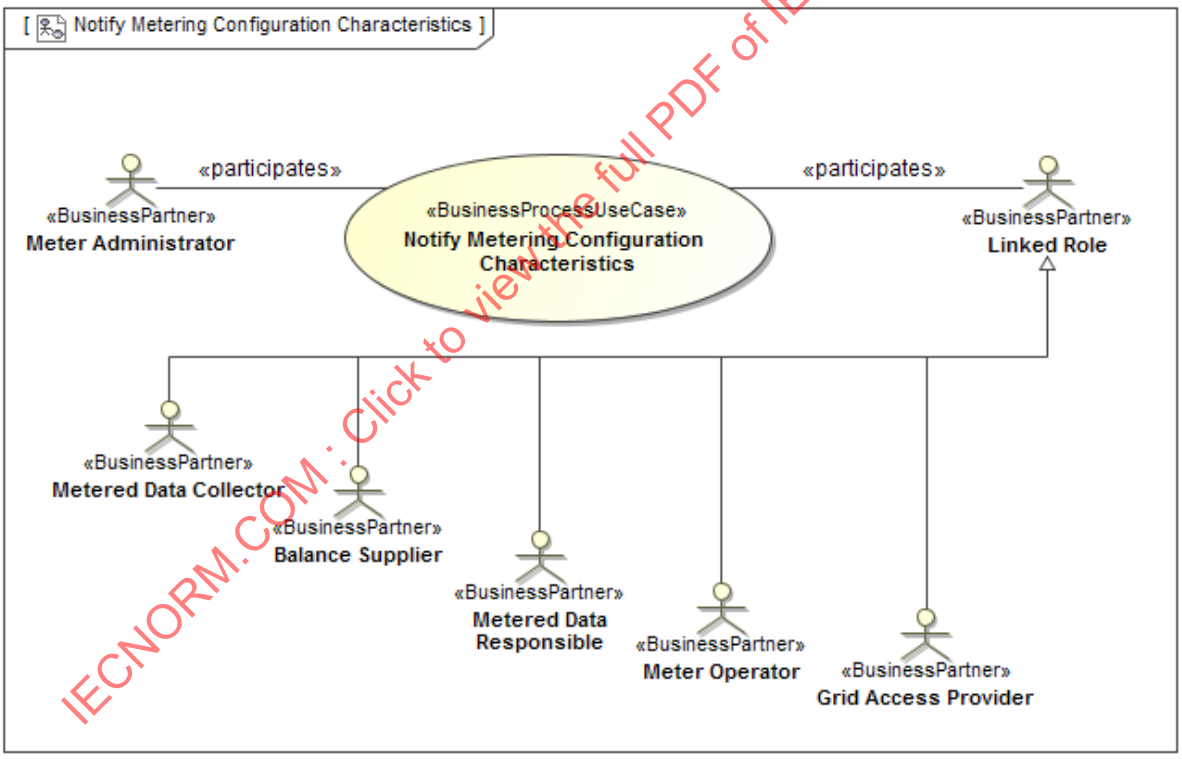
This is the process where a party can notify changes to metering configuration characteristics or requests such configuration characteristics. The metering configuration characteristics is always related to a Metering Point. It is a prerequisite that the requesting party is authorised to receive metering configuration characteristics, i.e. that the requesting party has a formal responsibility for the Meter, such as Balance Supplier or Grid Access Provider. The Request metering configuration characteristics process may return all metering configuration characteristics elements the requesting party may need to fulfil its obligations in the energy market.

Only the use case Notify metering configuration characteristics is further described in this subclause, not the use case Request metering configuration characteristics.

See further [15].

5.13.2 The business process use case Notify Metering Configuration Characteristics

Figure 87 shows the business process use case for Notify Metering Configuration Characteristics from the business area Metering Configuration Characteristics Administration in Figure 4.



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Figure 87 – Use case for the business process Notify Metering Configuration Characteristics

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Description

UseCase description: Notify metering configuration characteristics	
definition	In this process the *Meter Administrator* distributes metering configuration characteristics to *Linked parties*[a,b]: – Balance Supplier[c] – Grid Access Provider – Meter Operator – Metered Data Collector[d] – Metered Data Responsible after update of one or more of these metering configuration characteristics of one or more *Meters* in a *Metering Point*.
beginsWhen	When there have been changes to the metering configuration characteristics of one of more *Meters* in a *Metering Point*. Time constraints are based on national rules.
preCondition	– One or more parties linked to the *Meter* and known by the *Meter Administrator* are entitled to receive metering configuration characteristics; – One or more of the intended metering configuration characteristics have been changed.
endsWhen	When the *Linked parties* have received the notification.
postCondition	The metering configuration characteristics have been notified by the *Meter Administrator* to the *Linked parties*.
exceptions	Note that master data should not be cancelled, but updated.

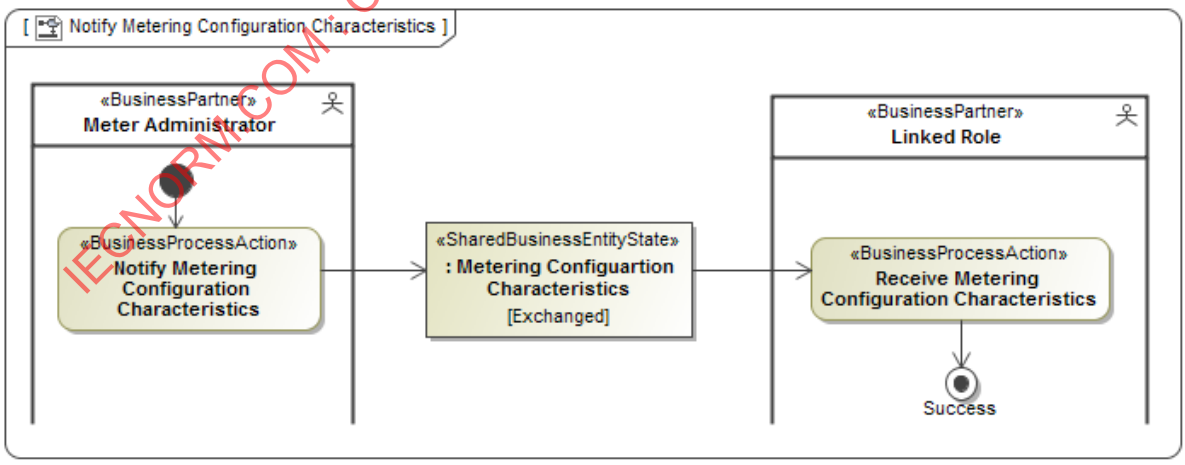
[a]The number of *Linked parties* may vary between countries.

[b]A party is linked to the *Meter* at a given time, i.e. the old supplier should not receive *Metering configuration characteristics* after a change.

[c]The *Balance Supplier* is a *Linked Party* because of his role towards the *Customer* in a supplier centric market model.

[d]he *Metered Data Collector* is linked to the Meter for practical purposes and may need the *Metering configuration characteristics*, but is according to the Harmonised role model [3], linked to the *Register*.

Figure 88 shows the activity diagram for the use case Notify Metering Configuration Characteristics shown in Figure 87.

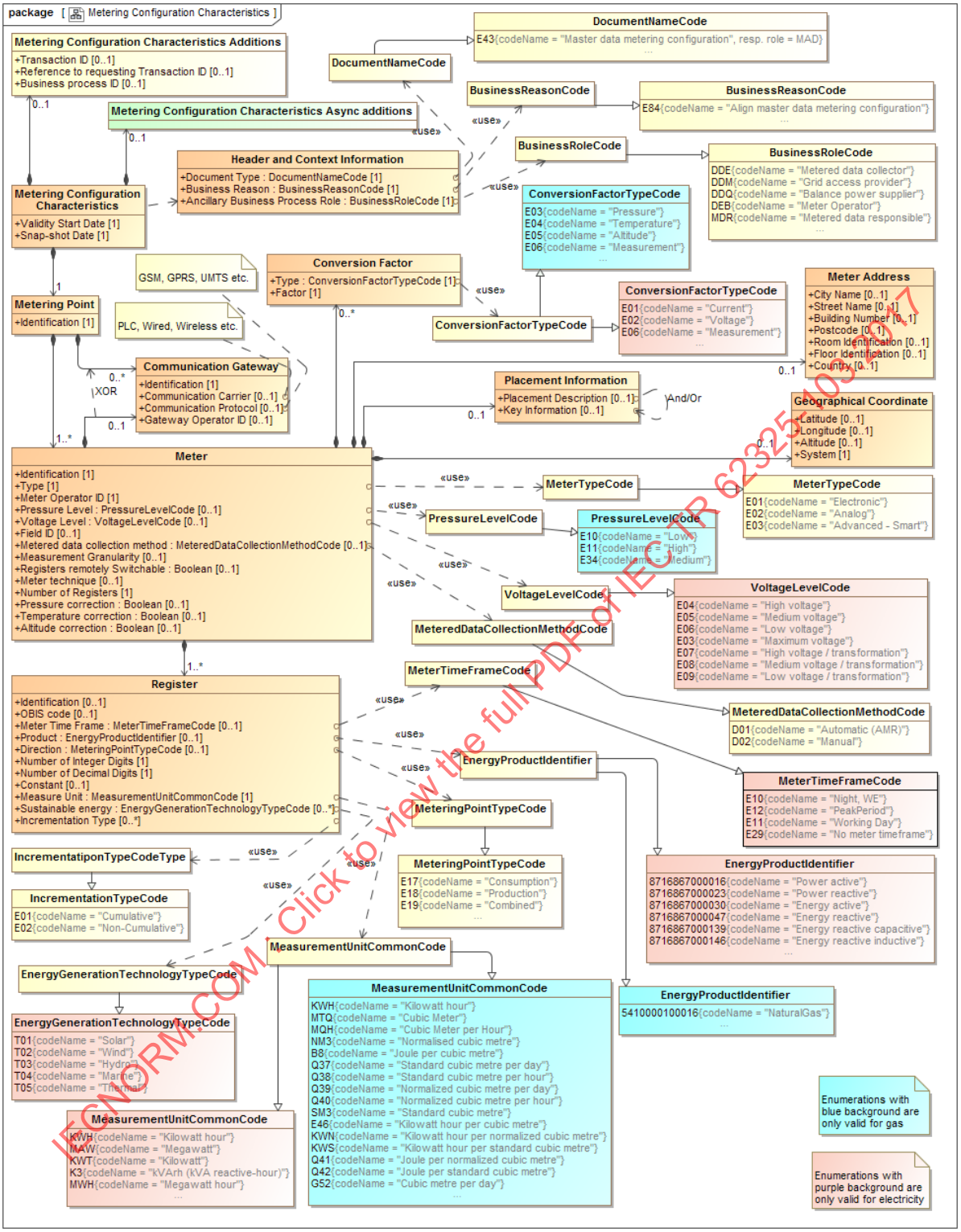


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Figure 88 – Activity diagram for the business process Notify metering configuration characteristics

Figure 89 shows the class diagram for the exchange of Metering Configuration Characteristics shown in Figure 88.

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Figure 89 – Class diagram for Metering Configuration Characteristics

6 Methodology used for the mapping

6.1 Methodology overview

The BRS (Business Requirement Specification) describes, in the semantics of the business people, the information to be exchanged. This is modelled in UML as classes, attributes and associations (see previous class diagrams).

These requirements must now be expressed in standard semantics as defined by CIM. The goal of the mapping is to find the CIM artefacts that have the same meaning.

The methodology has different steps:

1) Look at the definition of BRS class artefacts
2) Find in CIM class artefacts that have the same kind of definition:
   a) If yes make a relation between the two classes in CIM and BRS
   b) If no, a new class must be created in CIM that is related to the BRS one
3) Then look at the BRS association definition in the selected BRS class
4) Find, in corresponding CIM class, associations that match the BRS class associations' definition (these CIM associations could belong to a CIM super class)
   a) If yes make a relation between the two artefacts (BRS associations and CIM class associations)
   b) If no, a new association must be created in CIM
5) Then look at the BRS attribute definition in the selected BRS class
6) Find, in corresponding CIM class, attributes that match the BRS class attributes definition (these CIM attributes could belong to a CIM super class)
   a) If yes make a relation between the two artefacts (BRS attributes and CIM class attributes)
   b) If no, a new attribute must be created in CIM

Basically, the mapping is done in a UML tool (MagicDraw). In the UML tool, the two models BRS and CIM have been imported. So the two kinds of artefacts could be related by a dependency association expressing the mapping.

6.2 CIM extension

When an artefact is missing in CIM, the CIM model has been extended and all added artefacts are stereotyped <<ebIX>> to highlight these extensions. The definitions of the attributes in the CIM extensions can be found in the ebIX® BRSs, see also 8.11.

The mappings from a BRS to CIM are typically stereotyped <<CIM mapping>>.

6.3 Methodology mapping example:

Let us take an example and follow the methodology steps. This example is taken from an excerpt of Figure 114, as shown in Figure 90.

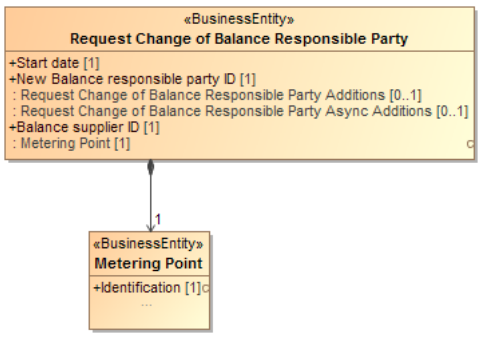


Figure 90 – Extract from class diagram Exchange Request Change of Balance Responsible Party

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Step 1:

In the BRS, there is the process “Request Change of Balance Responsible Party”. This is a sort of event related to Master Data.

Step 2:

In CIM there is the class ActivityRecord: "Records activity for an entity at a point in time; activity may be for an event that has already occurred or for a planned activity" and a subclass "MktActivityRecord", used for market exchanges. Thus “Request Change of Balance Responsible Party” as shown in Figure 91, is mapped to the CIM class MktActivityRecord.

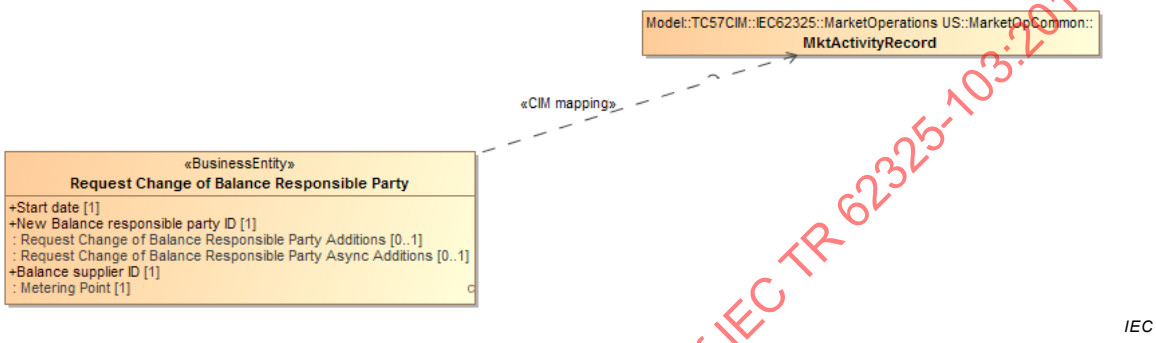


Figure 91 – Mapping of Request Change of Balance Responsible Party

Step 1:

Another class in the BRS is the “Metering Point”, with the definition: "An entity where energy products are measured or computed."

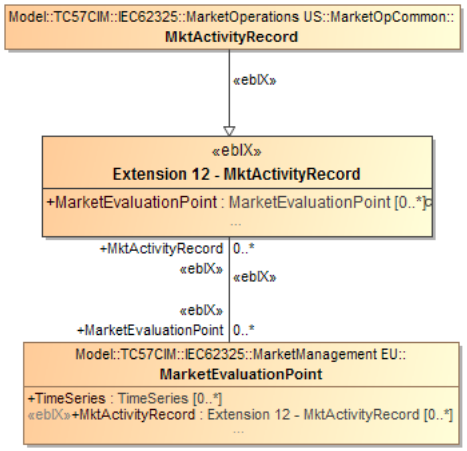
Step 2:

In CIM, there is a MarketEvaluationPoint class with the definition: "The identification of an entity where energy products are measured or computed."

Steps 3 to 4:

The two definitions match, but before mapping, the class MarketEvaluationPoint needs to be associated with MktActivityRecord (as “Metering Point” is associated with “Request Change of Balance Responsible Party” in the BRS). Since that association does not exist in CIM, MktActivityRecord is extended with the association to MarketEvaluationPoint, as shown in Figure 92.

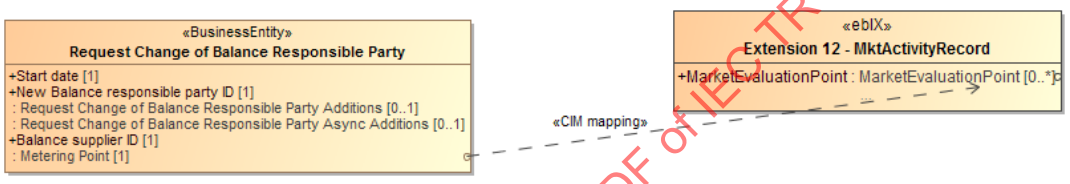
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Figure 92 – Extending MktActivityRecord

Now the two artefacts can be mapped, as shown in Figure 93:



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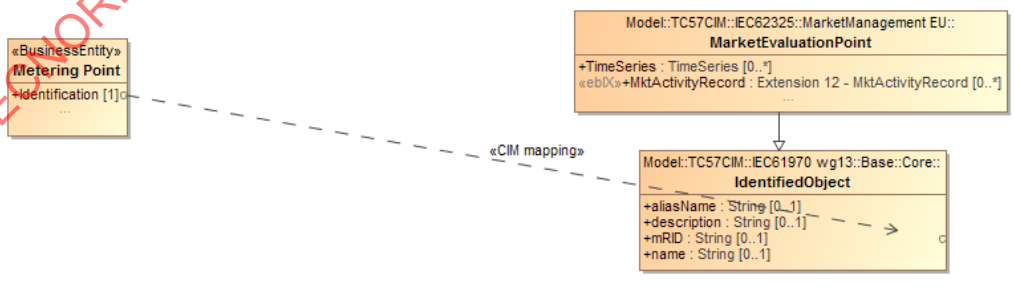
Figure 93 – Mapping of Metering Point, part 1

Steps 5 to 6:

Within the "MeteringPoint class" in the BRS an "identification" attribute with the definition: "An unique identification of the Metering Point" is found.

The CIM MarketEvaluationPoint class get an identifier "mRID" through the inheritance of IdentifiedObject. The definition of the "mRID" attribute in IdentifiedObject class is: "Master resource identifier issued by a model authority. The mRID is unique within an exchange context."

The two definitions match, so the two artefacts can be mapped, as shown in Figure 94:



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Figure 94 – Mapping of Metering Point, part 2

The final mapping result is the one shown in Figure 95:

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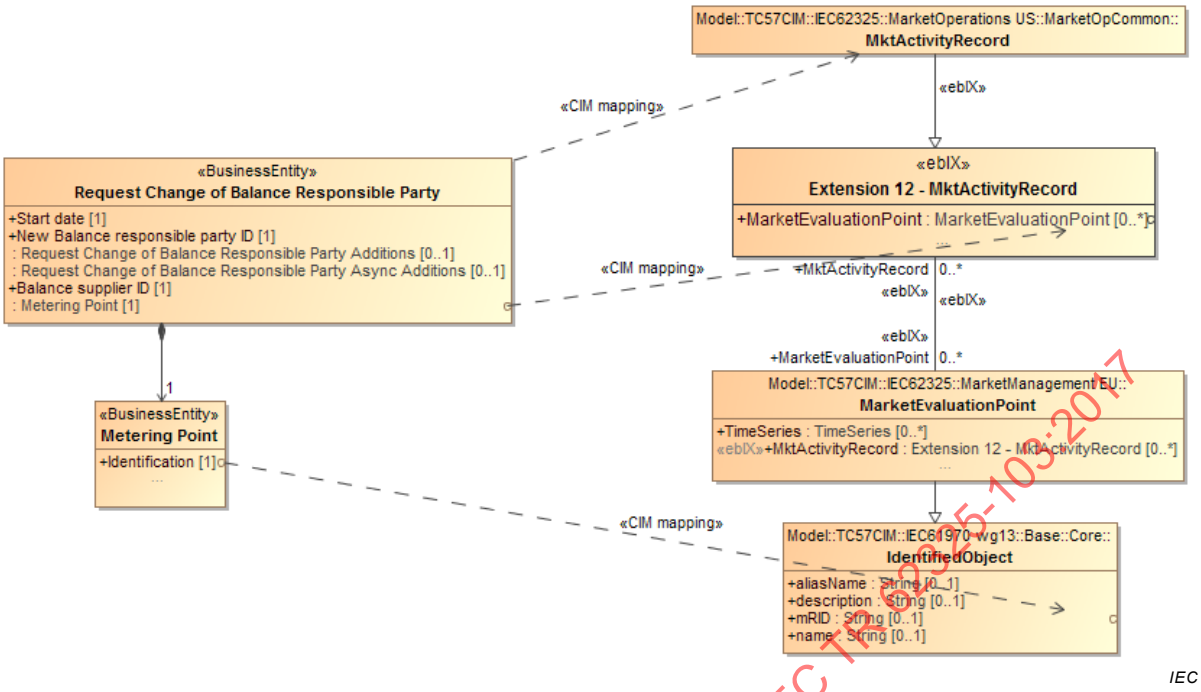


Figure 95 – Result of the mapping of Metering Point within Request Change of Balance Responsible Party

7 Mapping of class diagrams

7.1 Overview

The mapping is done from the 2014-A version of the ebIX® model, see [1], and to the CIM-model version iec61970cim17v04_iec61968cim12v09_iec62325cim03v09.

Tables 1 to 3 and the corresponding figures in this clause show a suggested mapping between the attributes and classes in the BRSs studied in this document and the attributes and classes within CIM.

In the figures a blue colour is used for showing the existing classes within CIM, and a brownish orange colour is used for showing the suggested extensions to CIM. The numbers in the grey rows of the tables are the sum of mappings for the package/class/property in this row to the class/property of the value's column.

In the BRSs the "Header and Context-information", including sender, recipient, date+time of exchange and business process, is not regarded as a business requirement when defining the core data sets. The "Header and Context-information" is seen as a requirement for technical implementation or to be used when mapping to specific syntax. Therefore such information is, with some exceptions, not included or mapped in this technical report.

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7.2 Measure Collected Data

7.2.1 Overview

The rows in Tables 1 to 3 show the classes and attributes from the BRS, see [4].

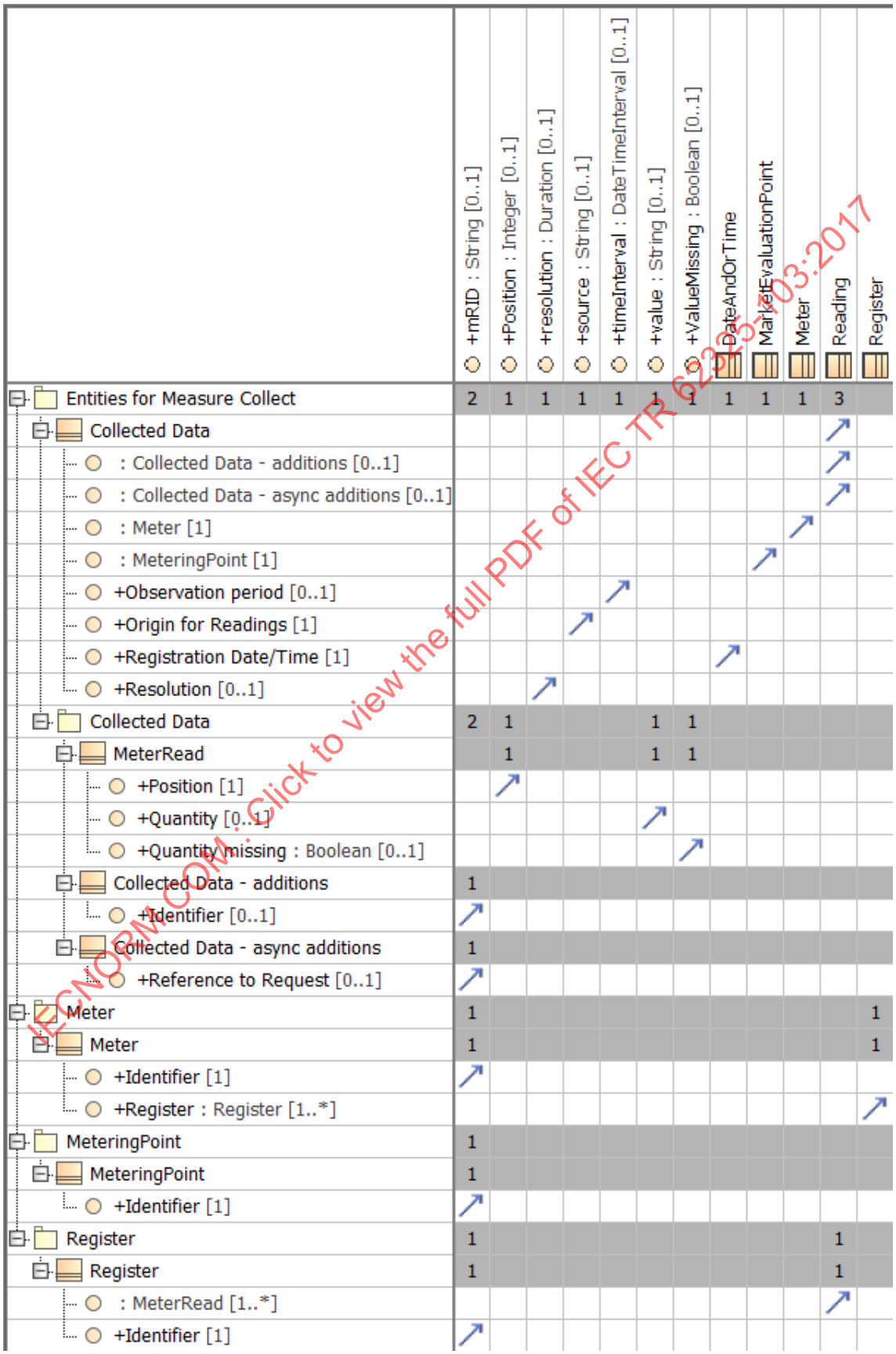
The columns in the tables show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, shown in the tables with ↗, is visually displayed in the figure below the corresponding table.

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7.2.2 Exchange Collected Data

Table 1 – Mapping of Exchange Collected data



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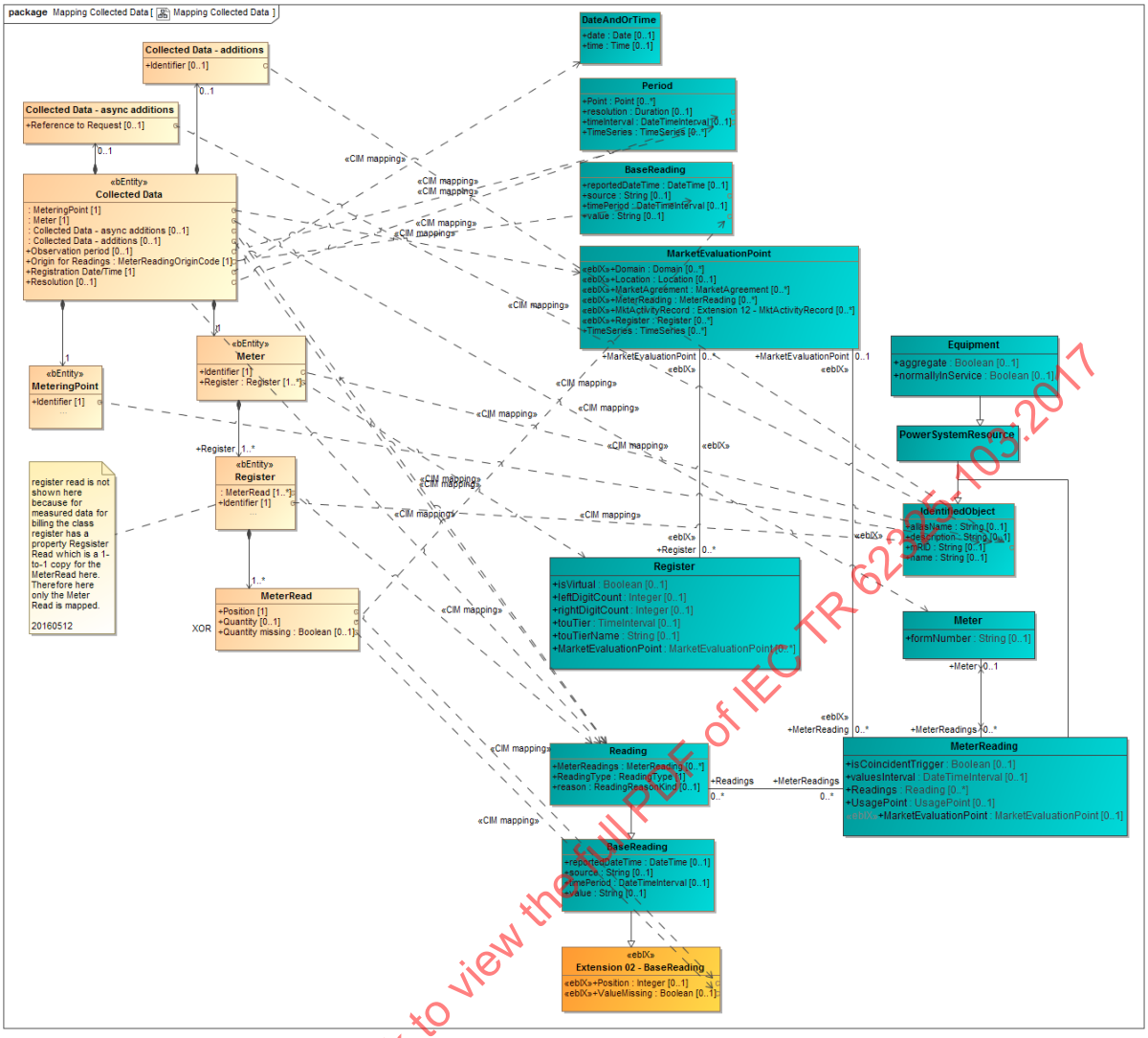


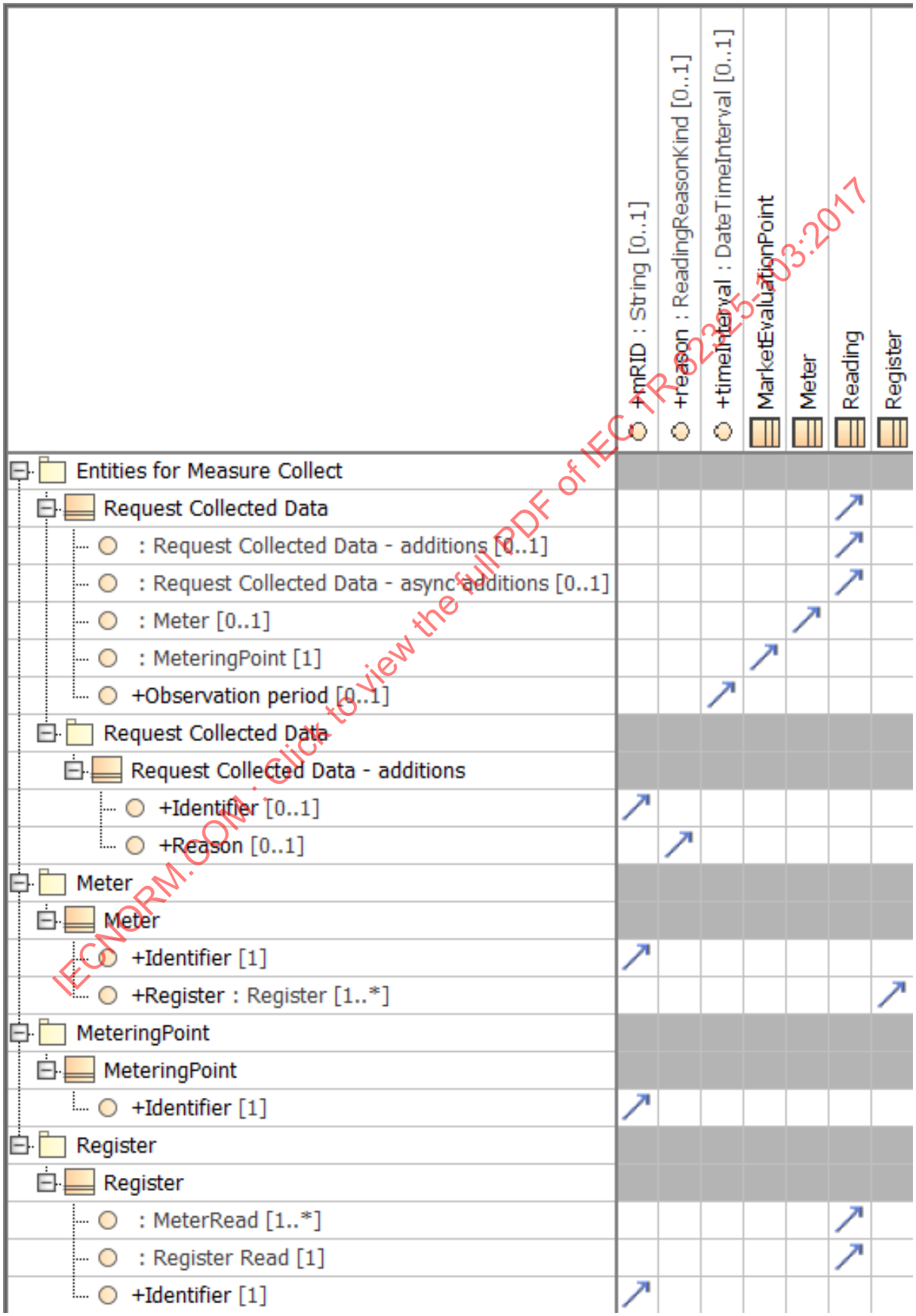
Figure 96 – Mapping of Exchange Collected data

The left hand side of the class diagram shown in Figure 96 corresponds with Figure 9. For the extensions to CIM, see Clause 8.

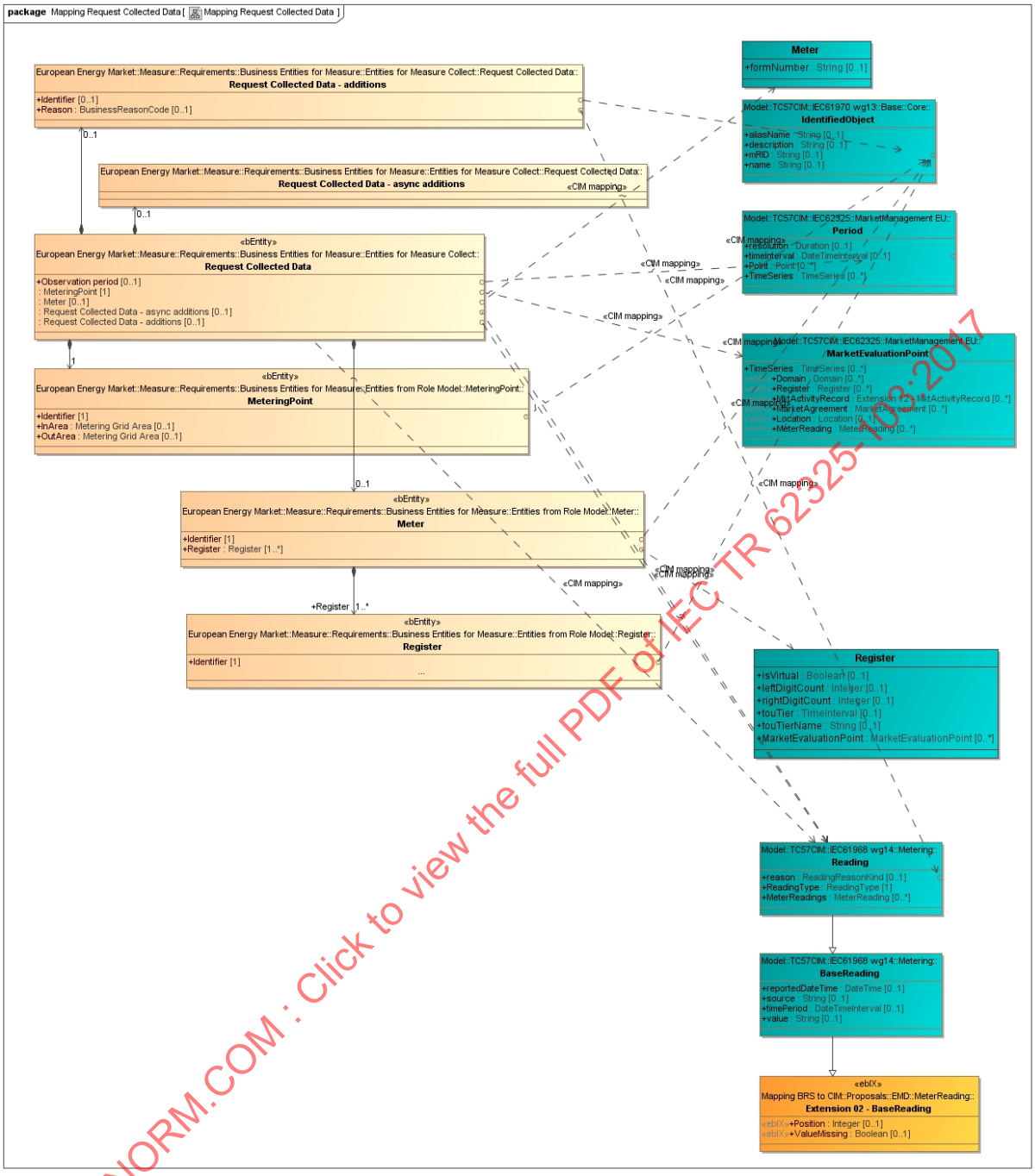
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7.2.3 Exchange Request Collected Data

Table 2 – Mapping of Request Collected data



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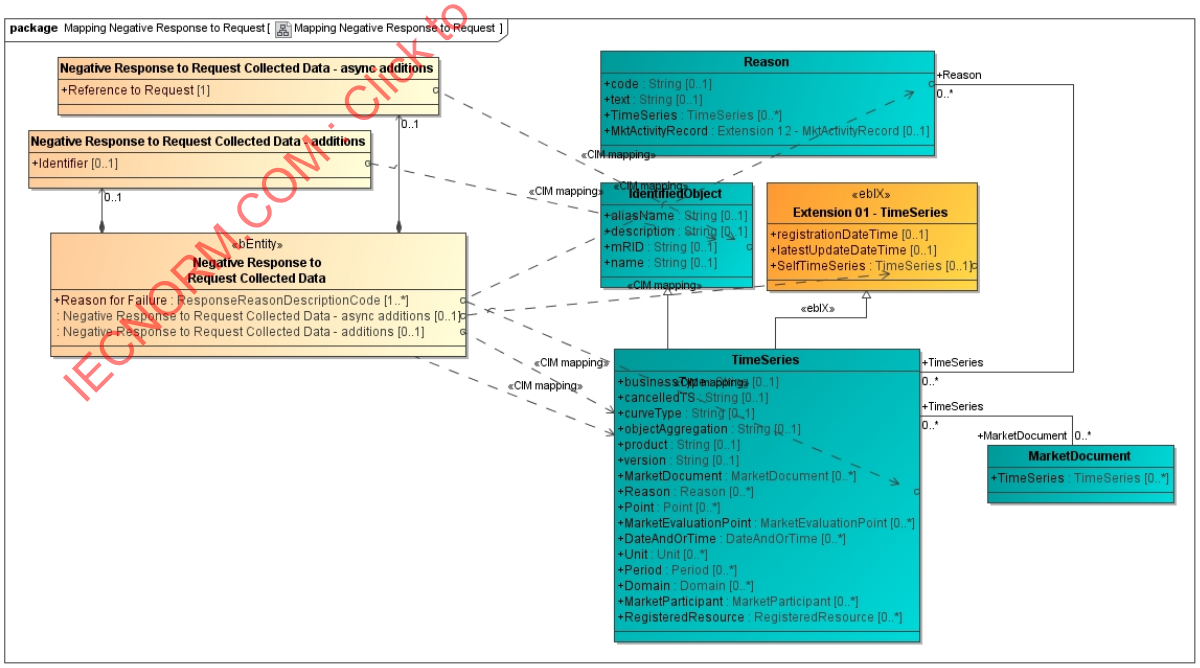
Figure 97 – Mapping of Request Collected data

The left hand side of the class diagram shown in Figure 97 corresponds with Figure 12. For the extensions to CIM, see Clause 8.

7.2.4 Exchange Negative Response to Request Collected Data

Table 3 – Mapping of Negative Response to Request Collected data

	+code : String [0..1]	+mRID : String [0..1]	+Reason : Reason [0..*]	+SelfTimeSeries : TimeSeries [0..1]	TimeSeries
Entities for Measure Collect	1	5	1	1	2
Negative Response to Request		2			
Negative Response to Request Collected Data - additions		1			
+Identifier [0..1]		↗			
Negative Response to Request Collected Data - async additions		1			
+Reference to Request [1]		↗			
Negative Response to Request Collected Data					↗
: Negative Response to Request Collected Data - additions [0..1]					↗
: Negative Response to Request Collected Data - async additions [0..1]				↗	
+Reason for Failure [1..*]	↗		↗		



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Figure 98 – Mapping of Negative Response to Request Collected data

The left hand side of the class diagram shown in Figure 98 corresponds with Figure 13. For the extensions to CIM, see Clause 8.

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7.3 Measure for Reconciliation

7.3.1 Overview

The rows in Table 4 show the classes and attributes from the BRS, see [5].

The columns in the table show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the table shown with ↗, is visually displayed in Figure 99.

7.3.2 Exchange Validated Data for Reconciliation

Table 4 – Mapping of Exchange Validated Data for Reconciliation

	MarketEvaluationPoint	+mRID : String [0..1]	TimeSeries	+product : String [0..1]	+Point : Point [0..*]	+Unit : Unit [0..*]	+name : String [0..1]	+registrationDateTime [0..1]	+SelfTimeSeries : TimeSeries [0..1]	+Period : Period [0..*]	+resolution : Duration [0..1]	+timeInterval : DateTimeInterval [0..1]	Point	+position : Integer [0..1]	+Quantity : Quantity [0..*]	+meterTimeFrame [0..1]	+Quantity : Quantity [0..*]	+quantity : Decimal [0..1]
Entities for Measure for Reconciliation																		
Validated Data for Reconciliation			↗															
: Observation [1..*]					↗													
: Validated Data for Reconciliation - additions [0..1]			↗															
: Validated Data for Reconciliation - async additions [0..1]									↗									
: MeteringPoint [1]	↗																	
+Observation period [1]										↗		↗						
+Product Identifier [1]				↗														
+Product Measure Unit [0..1]						↗	↗											
+Registration Date/Time [0..1]								↗										
+Resolution [0..1]											↗							
Validated Data for Reconciliation																		
Observation																		
: Observation detail [1..*]													↗		↗			
+Position [1]														↗				
Observation detail																		
+Meter Time Frame Type [0..1]																↗		
+Quantity [1]																	↗	↗
Validated Data for Reconciliation - additions																		
+Identifier [0..1]		↗																
Validated Data for Reconciliation - async additions																		
+Reference to Request [0..1]		↗																
MeteringPoint																		
MeteringPoint																		
+Identifier [1]		↗																

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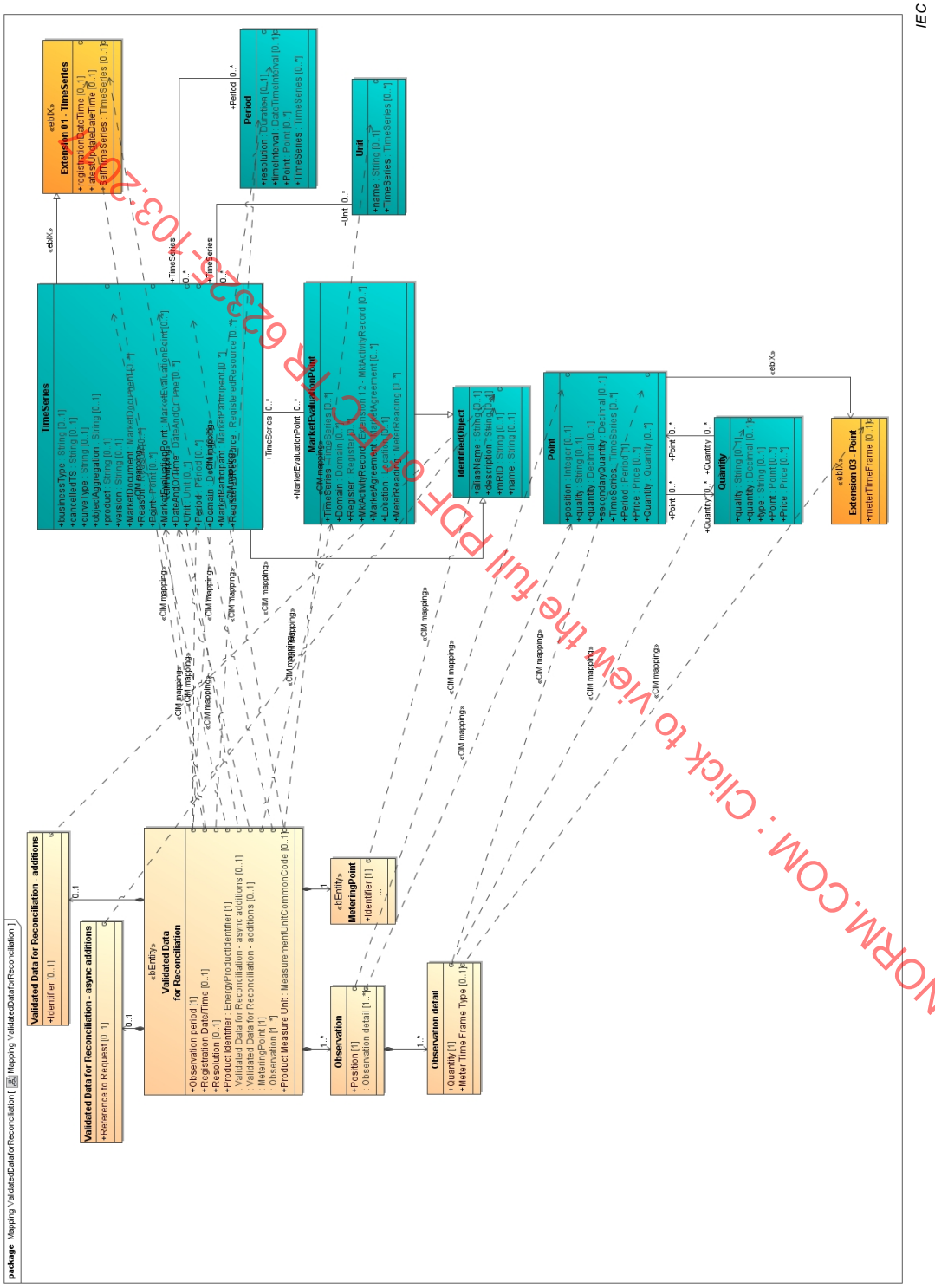


Figure 99 – Mapping of Exchange Validated Data for Reconciliation

The left hand side of the class diagram shown in Figure 99 corresponds with Figure 17. For the extensions to CIM, see Clause 8.

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7.4 Aggregated Data for Imbalance Settlement

7.4.1 Overview

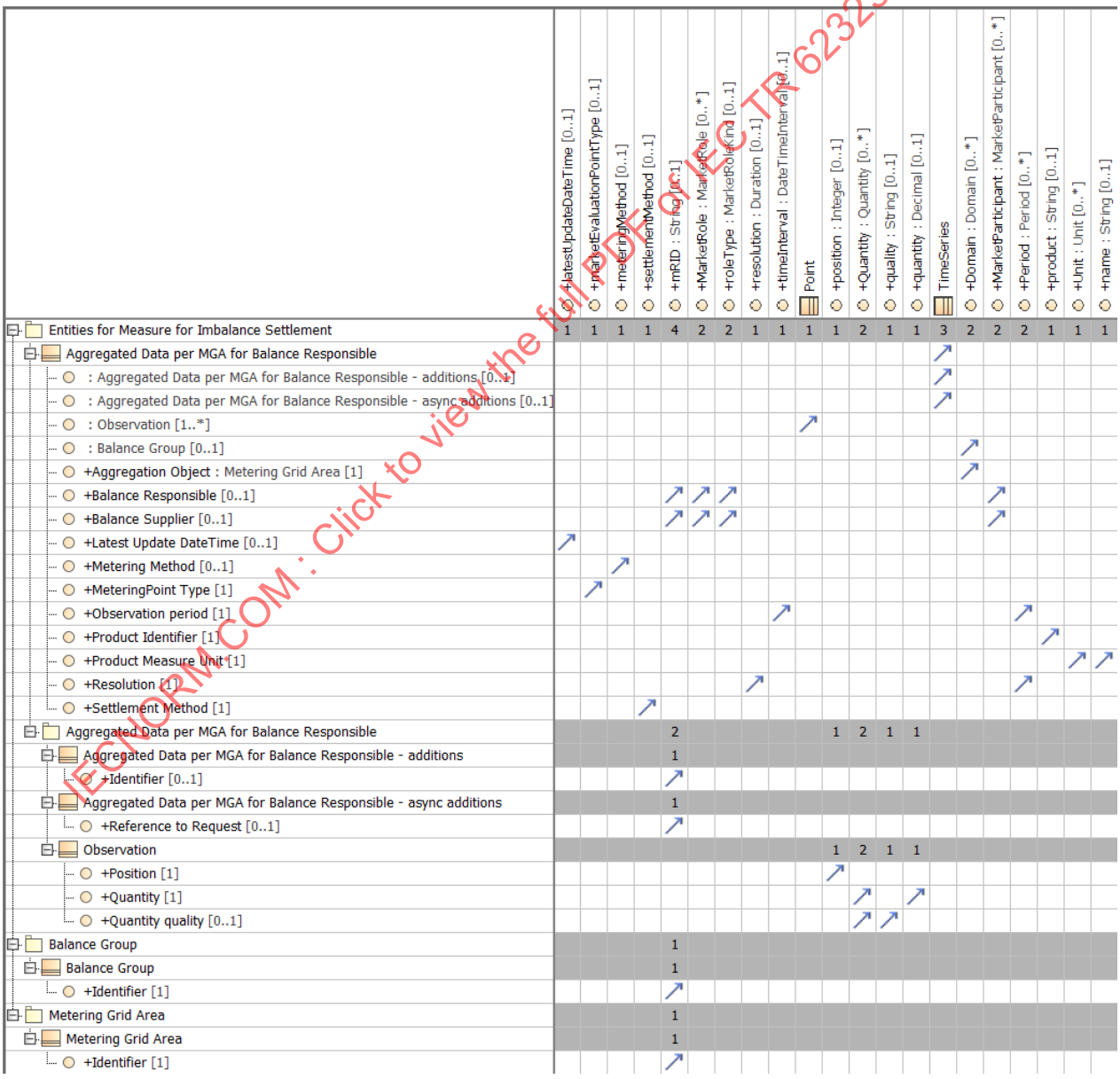
The rows in Tables 5 to 7 show the classes and attributes from the BRS, see [6].

The columns in the tables show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the tables shown with ↗, is visually displayed in the figure below the corresponding table.

7.4.2 Exchange Aggregated Data for Imbalance Settlement

Table 5 – Mapping of Exchange Aggregated Data for Imbalance Settlement



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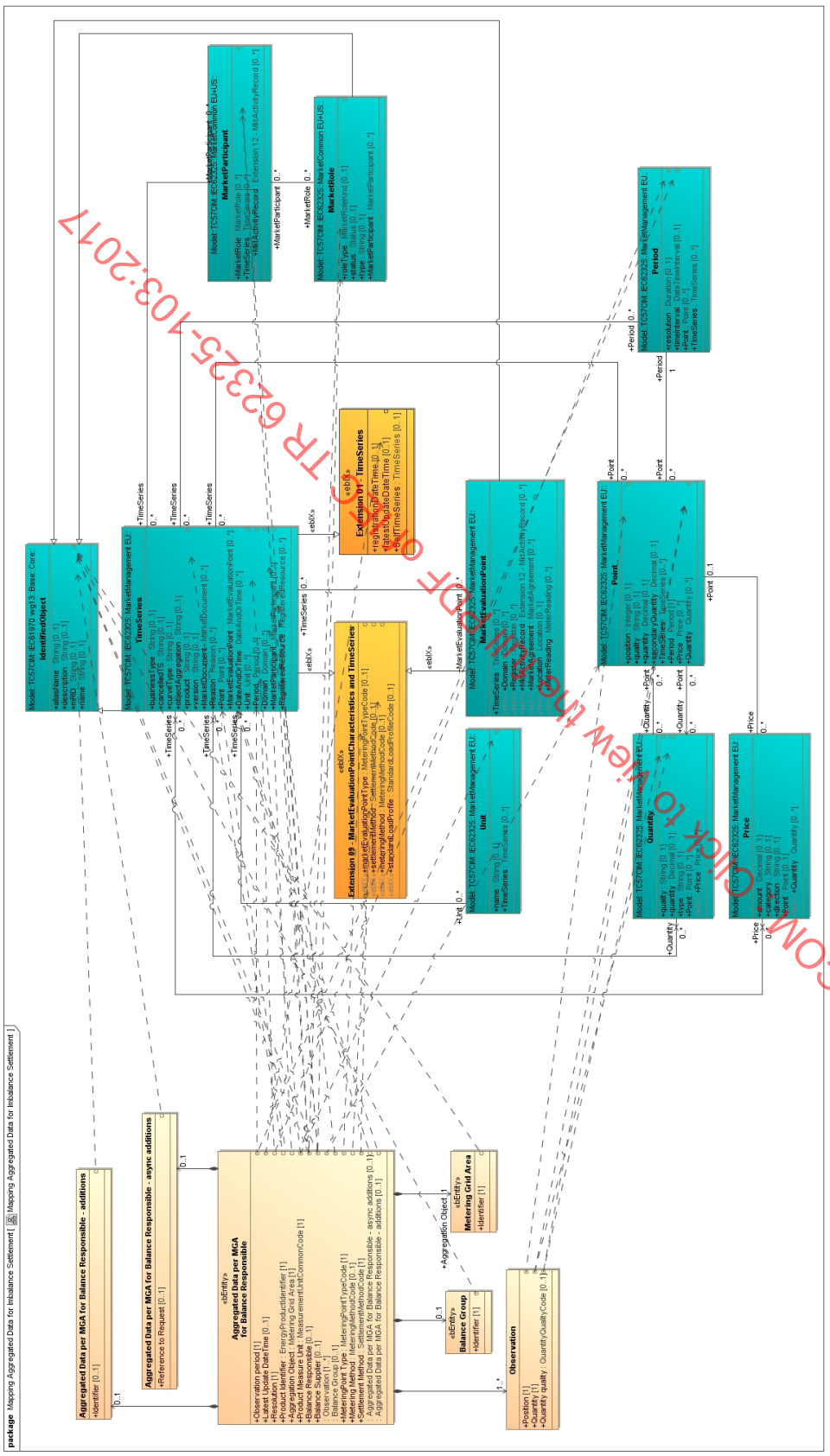


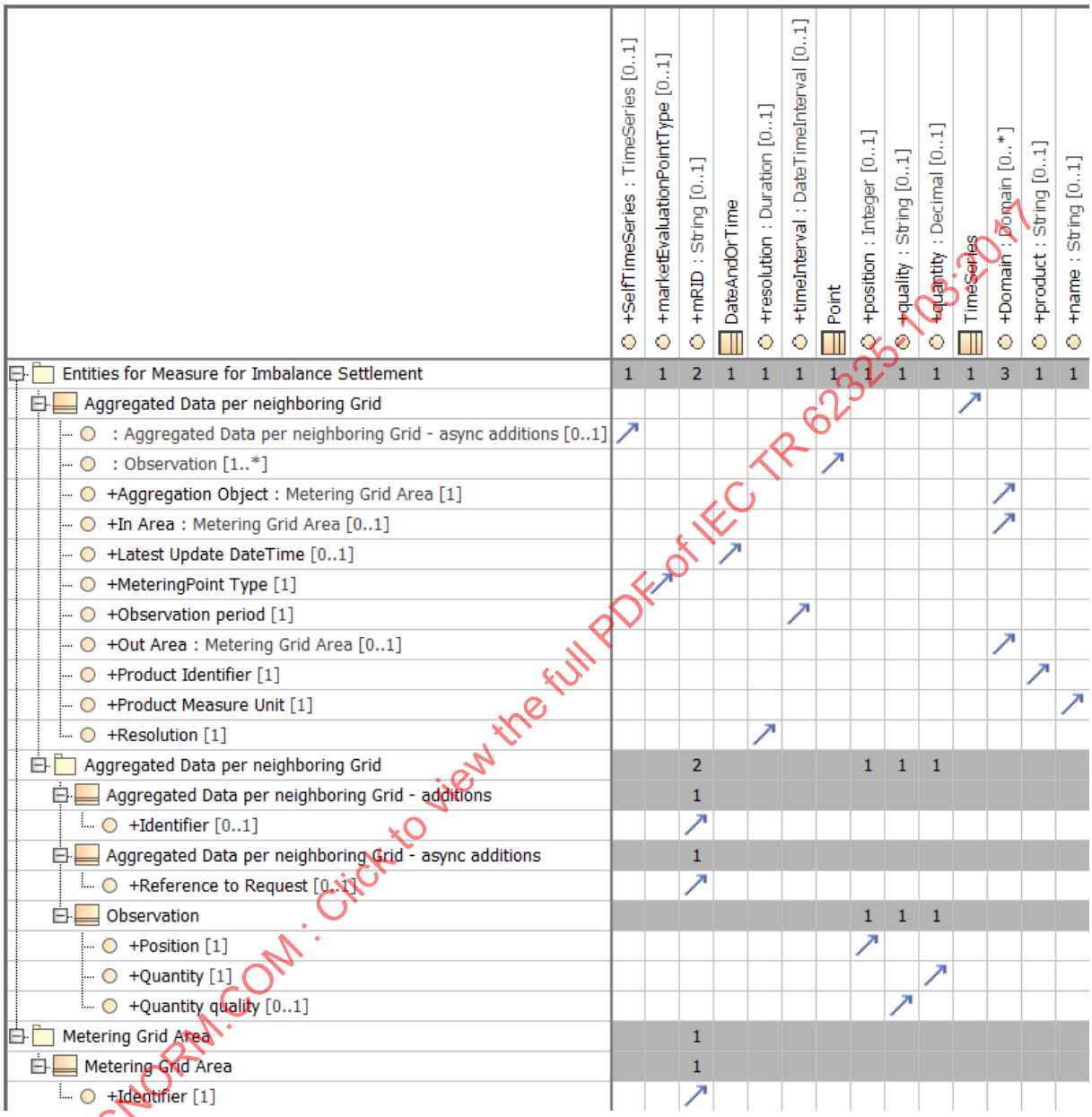
Figure 100 – Mapping of Exchange Aggregated Data for Imbalance Settlement

The left hand side of the class diagram shown in Figure 100 corresponds with Figure 25. For the extensions to CIM, see Clause 8.

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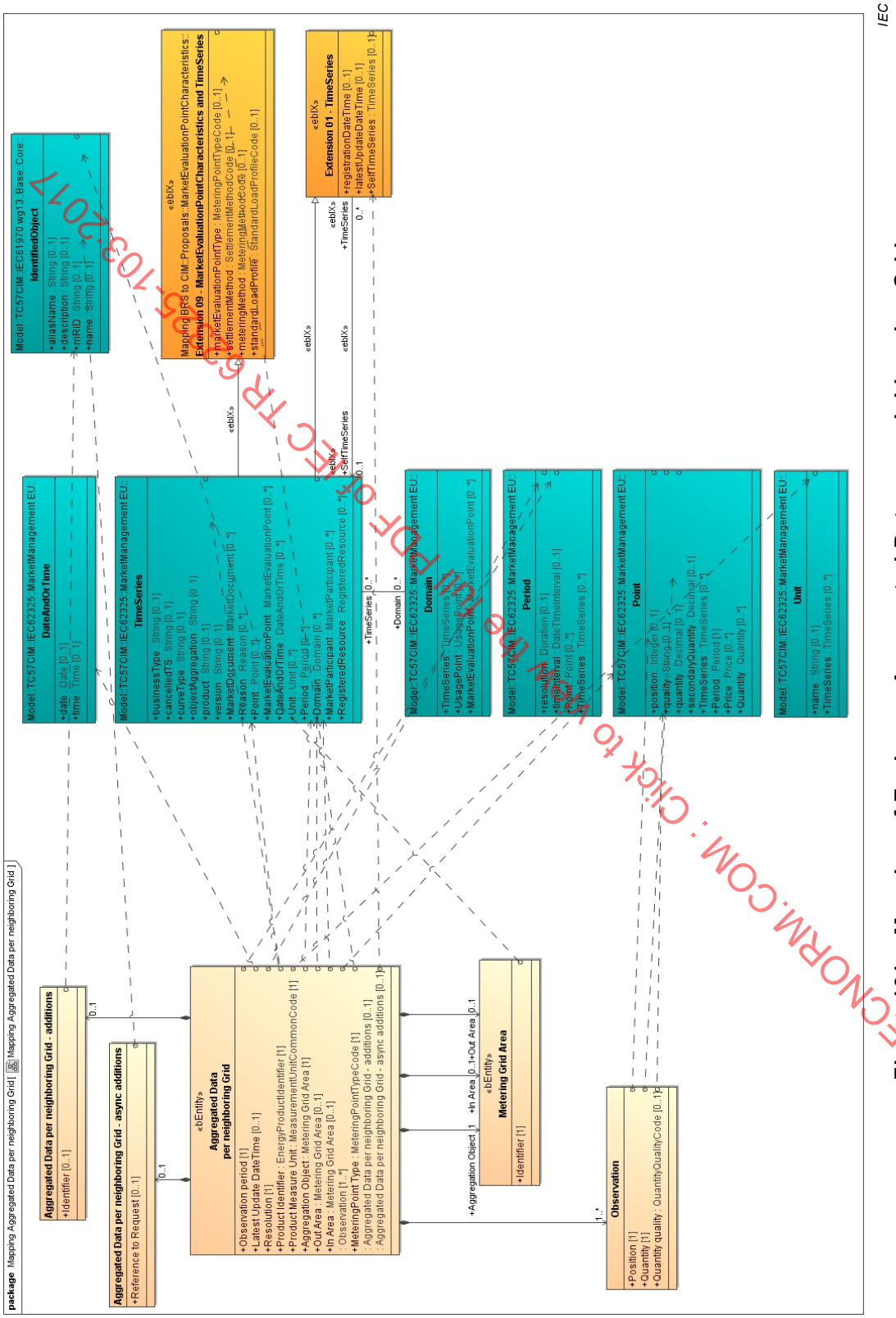
7.4.3 Exchange Aggregated Data per neighbouring Grid

Table 6 – Mapping of Exchange Aggregated Data per neighbouring Grid



	+SelfTimeSeries : TimeSeries [0..1]	+marketEvaluationPointType [0..1]	+mRID : String [0..1]	DateAndOrTime	+resolution : Duration [0..1]	+timeInterval : DateTimeInterval [0..1]	Point	+position : Integer [0..1]	+quality : String [0..1]	+quantity : Decimal [0..1]	TimeSeries	+Domain : Domain [0..*]	+product : String [0..1]	+name : String [0..1]
Entities for Measure for Imbalance Settlement	1	1	2	1	1	1	1	1	1	1	1	3	1	1
Aggregated Data per neighboring Grid											↗			
: Aggregated Data per neighboring Grid - async additions [0..1]	↗													
: Observation [1..*]							↗							
+Aggregation Object : Metering Grid Area [1]												↗		
+In Area : Metering Grid Area [0..1]												↗		
+Latest Update DateTime [0..1]				↗										
+MeteringPoint Type [1]		↗												
+Observation period [1]						↗								
+Out Area : Metering Grid Area [0..1]												↗		
+Product Identifier [1]													↗	
+Product Measure Unit [1]														↗
+Resolution [1]					↗									
Aggregated Data per neighboring Grid			2					1	1	1				
Aggregated Data per neighboring Grid - additions			1											
+Identifier [0..1]			↗											
Aggregated Data per neighboring Grid - async additions			1											
+Reference to Request [0..1]			↗											
Observation								1	1	1				
+Position [1]								↗						
+Quantity [1]										↗				
+Quantity quality [0..1]									↗					
Metering Grid Area			1											
Metering Grid Area			1											
+Identifier [1]			↗											

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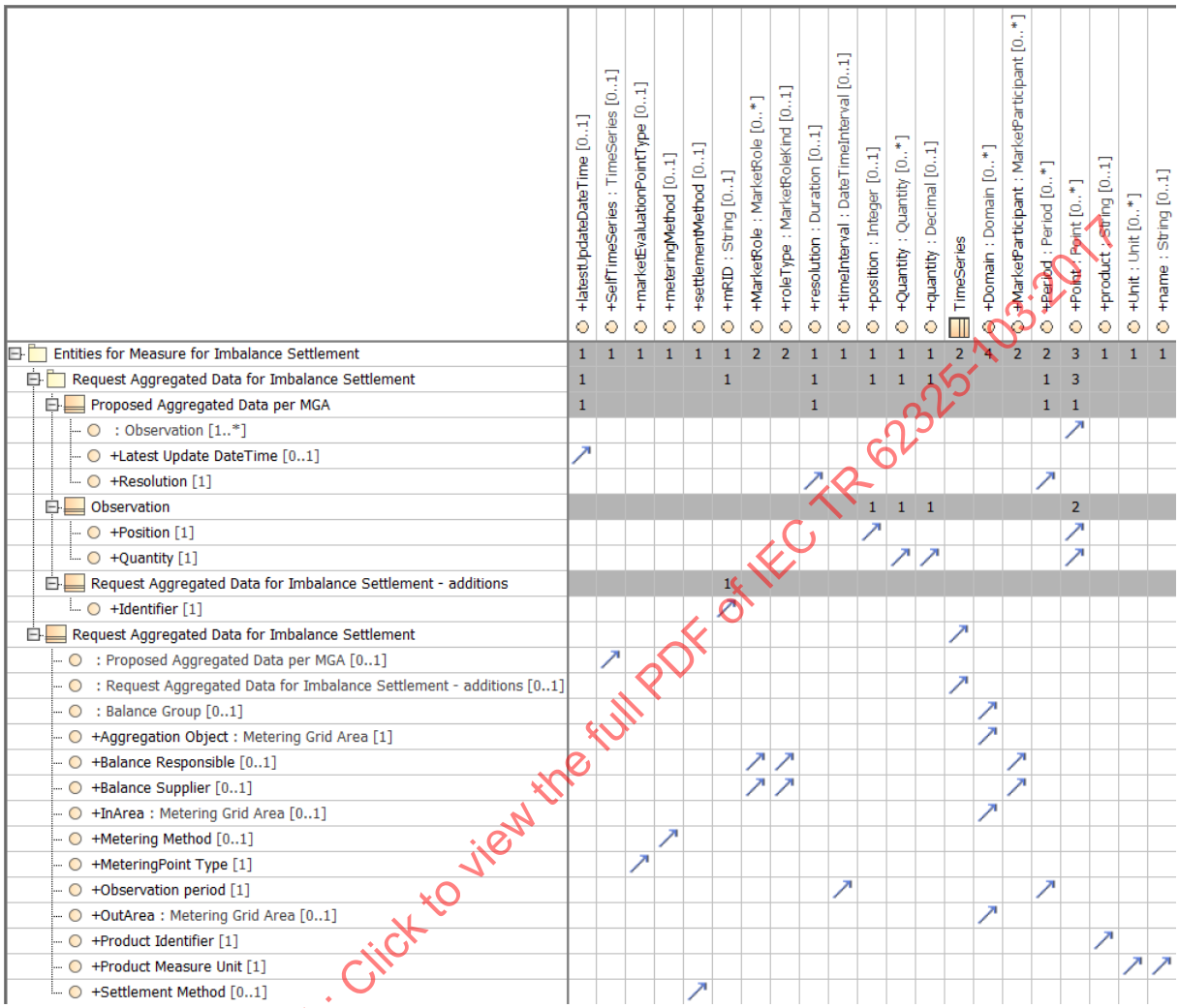
Figure 101 – Mapping of Exchange Aggregated Data per neighbouring Grid

The left hand side of the class diagram shown in Figure 101 corresponds with Figure 27. For the extensions to CIM, see Clause 8.

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7.4.4 Exchange Request Aggregated Data for Imbalance Settlement

Table 7 – Mapping of Exchange Request Aggregated Data for Imbalance Settlement



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Figure 102 – Mapping of Exchange Request Aggregated Data for Imbalance Settlement

The left hand side of the class diagram shown in Figure 102 corresponds with Figure 28. For the extensions to CIM, see Clause 8.

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7.5 Measure for Billing

7.5.1 Overview

The rows in Table 8 show the classes and attributes from the BRS, see [7].

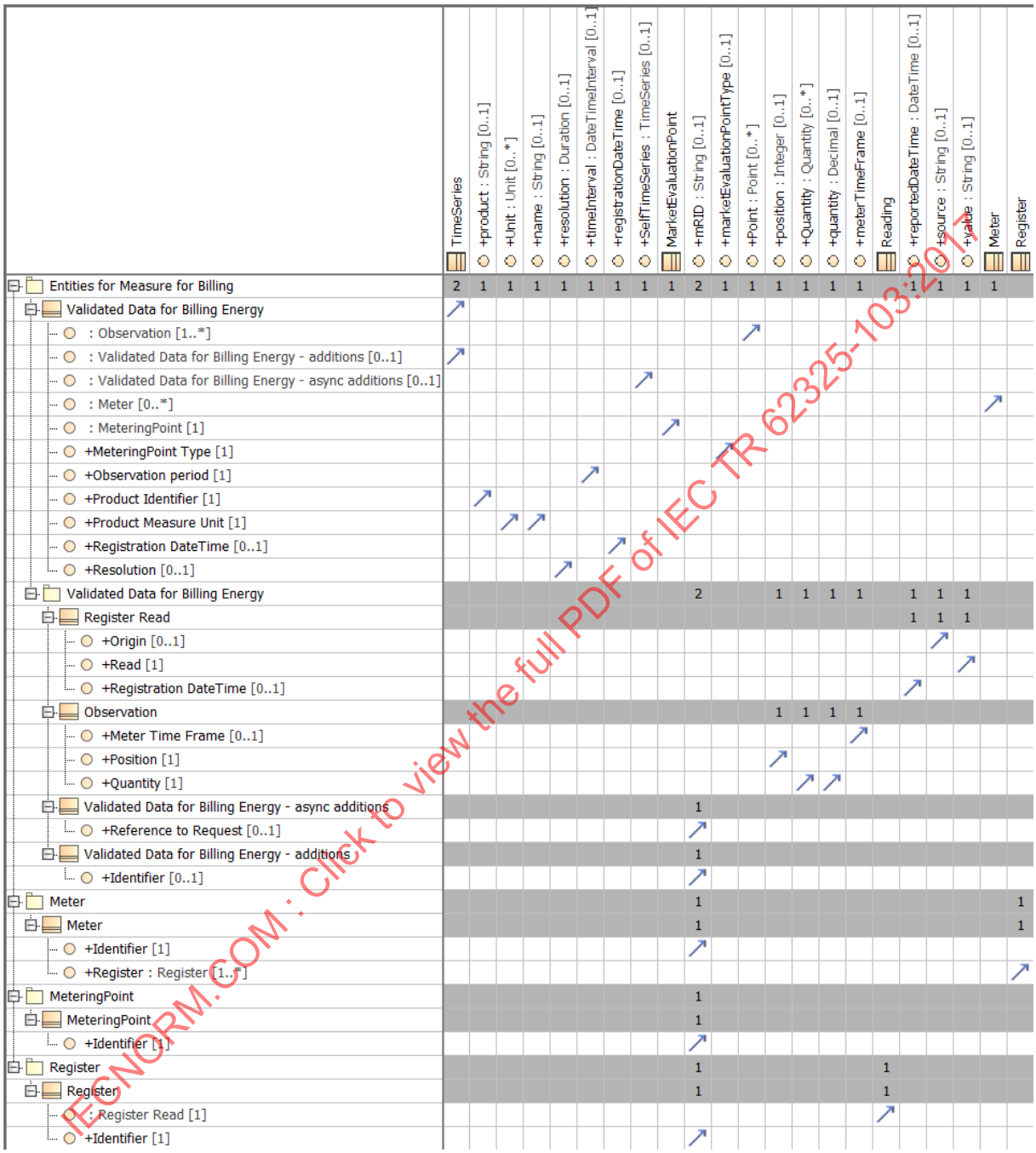
The columns in the table show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the table shown with ↗, is visually displayed in Figure 103.

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7.5.2 Exchange Validated Data for Billing Energy

Table 8 – Mapping of Exchange Validated Data for Billing Energy



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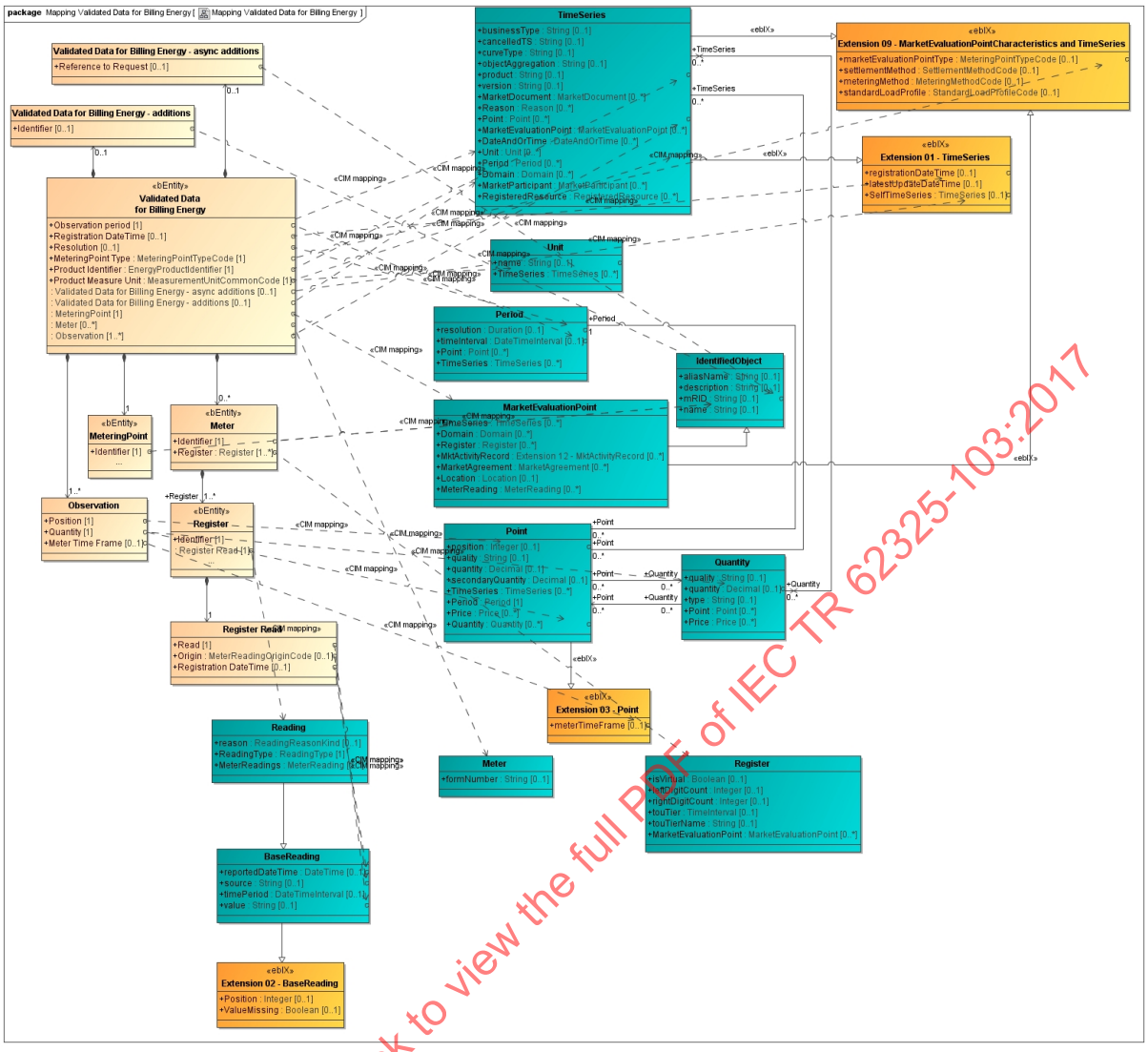


Figure 103 – Mapping of Exchange Validated Data for Billing Energy

The left hand side of the class diagram shown in Figure 103 corresponds with Figure 32. For the extensions to CIM, see Clause 8.

7.6 Measure for Labeling

7.6.1 Overview

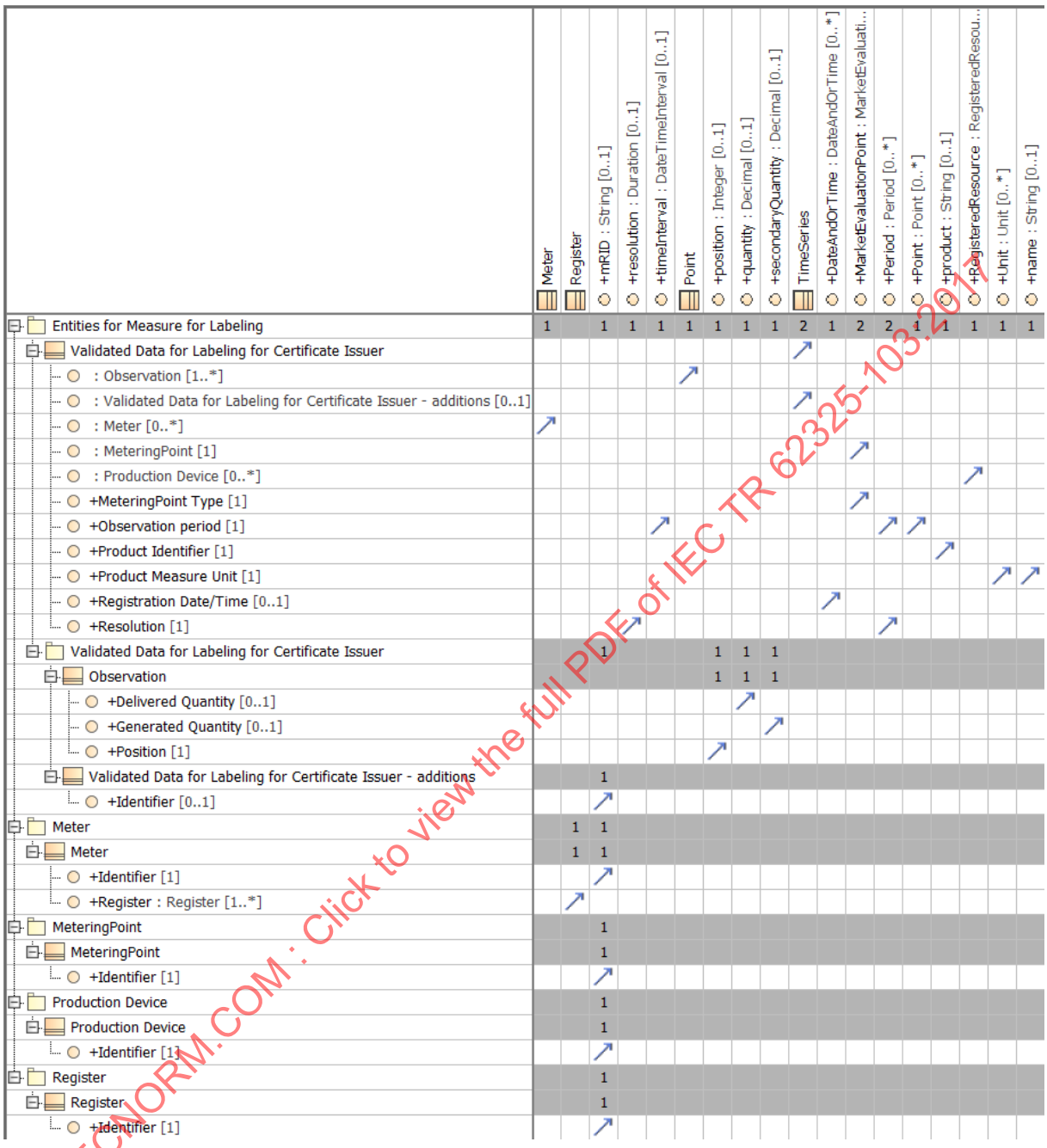
The rows in Table 9 show the classes and attributes from the BRS, see [8].

The columns in the table show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the table shown with ↗, is visually displayed in Figure 104.

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Table 9 – Mapping of Exchange Validated Data for Labeling for Certificate Issuer



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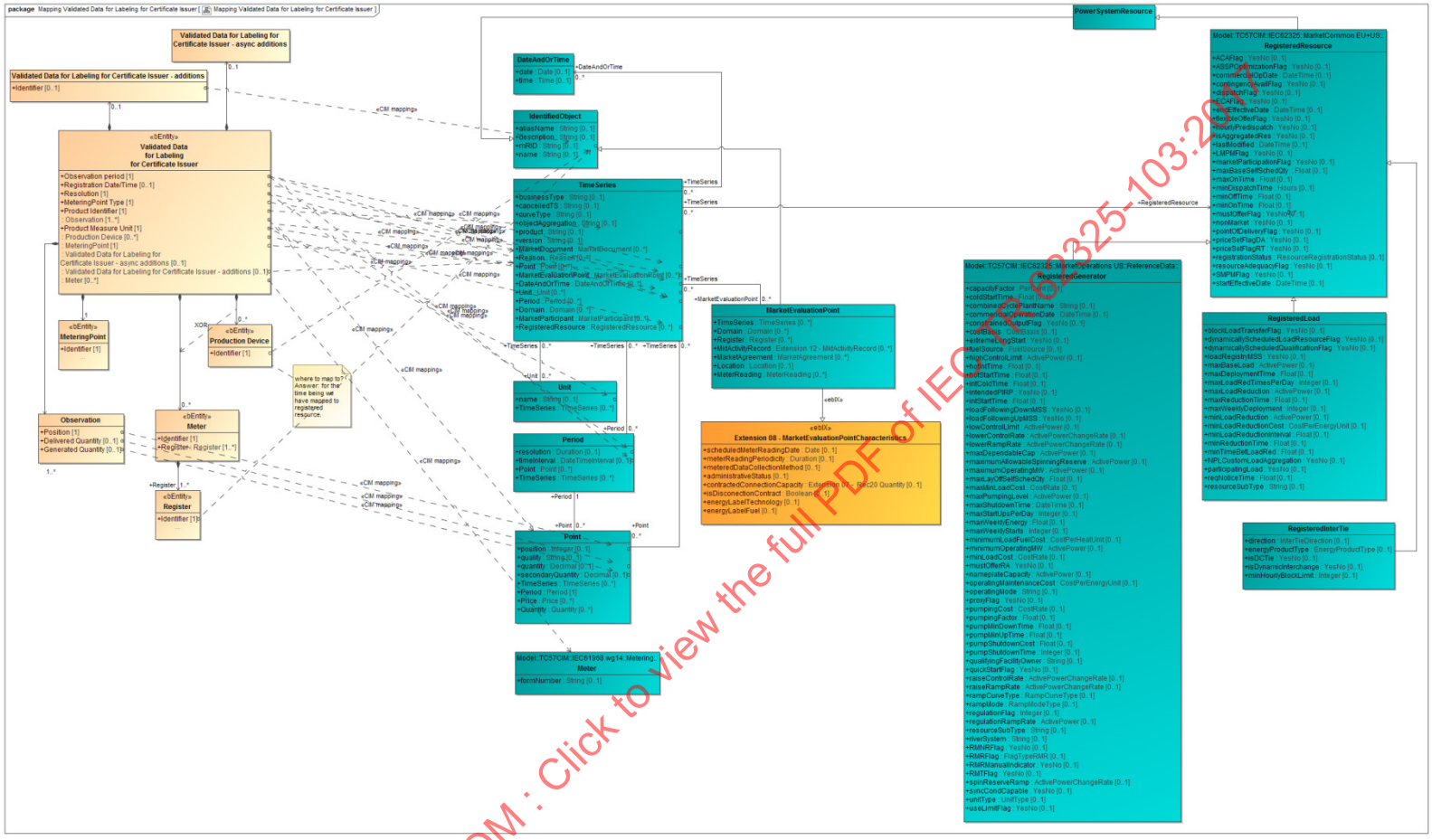


Figure 104 – Mapping of Exchange Validated Data for Labeling for Certificate Issuer

In the work it was discussed if the attribute Production Device should be mapped to e.g. RegisteredResource or to MktGeneratingUnit. The suggestion is to map it to RegisteredResource. However, note that MktGeneratingUnit is used (together with RegisteredResource) in IEC 62325-451-6 (Publication of information on market, contextual and assembly models for European style market).

The left hand side of the class diagram shown in Figure 104 corresponds with Figure 36. For the extensions to CIM, see Clause 8.

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7.7 Measure Calorific Value

7.7.1 Overview

The rows in Table 10 show the classes and attributes from the BRS, see [9].

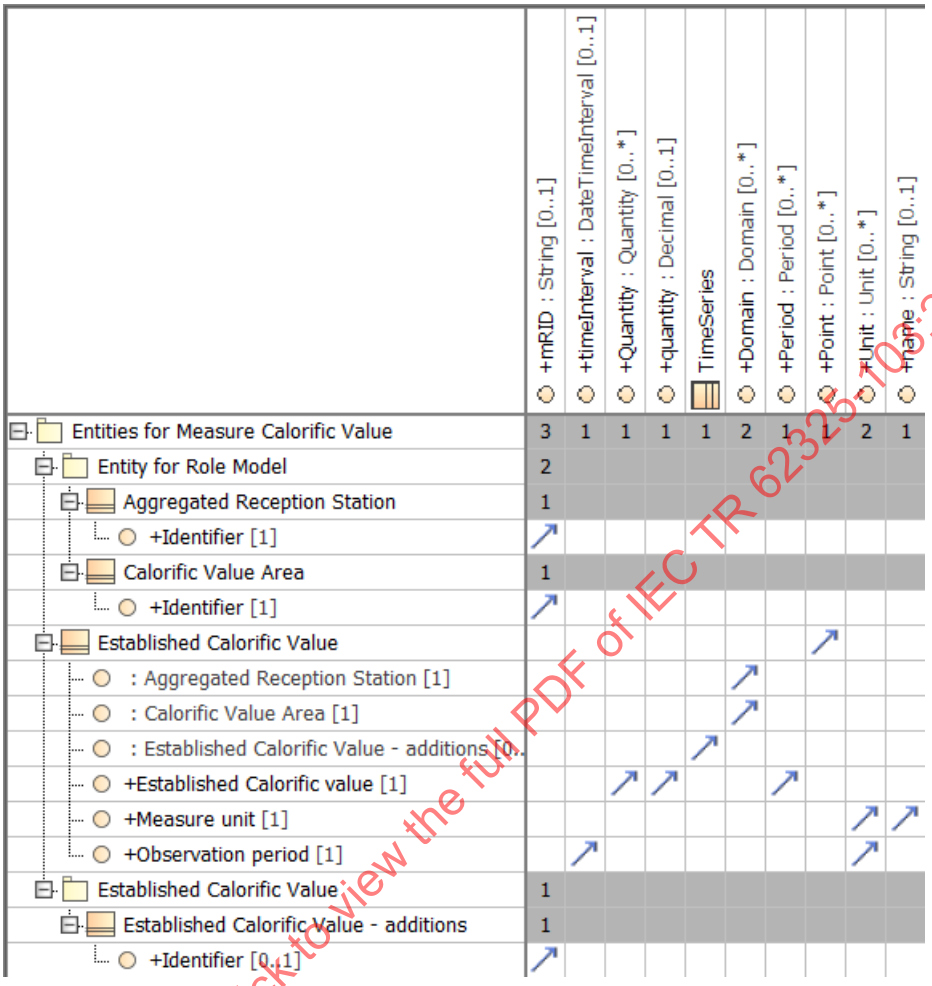
The columns in the table show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the table shown with ↗, is visually displayed in Figure 105.

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7.7.2 Exchange Established Calorific Value

Table 10 – Mapping of Exchange Established Calorific Value



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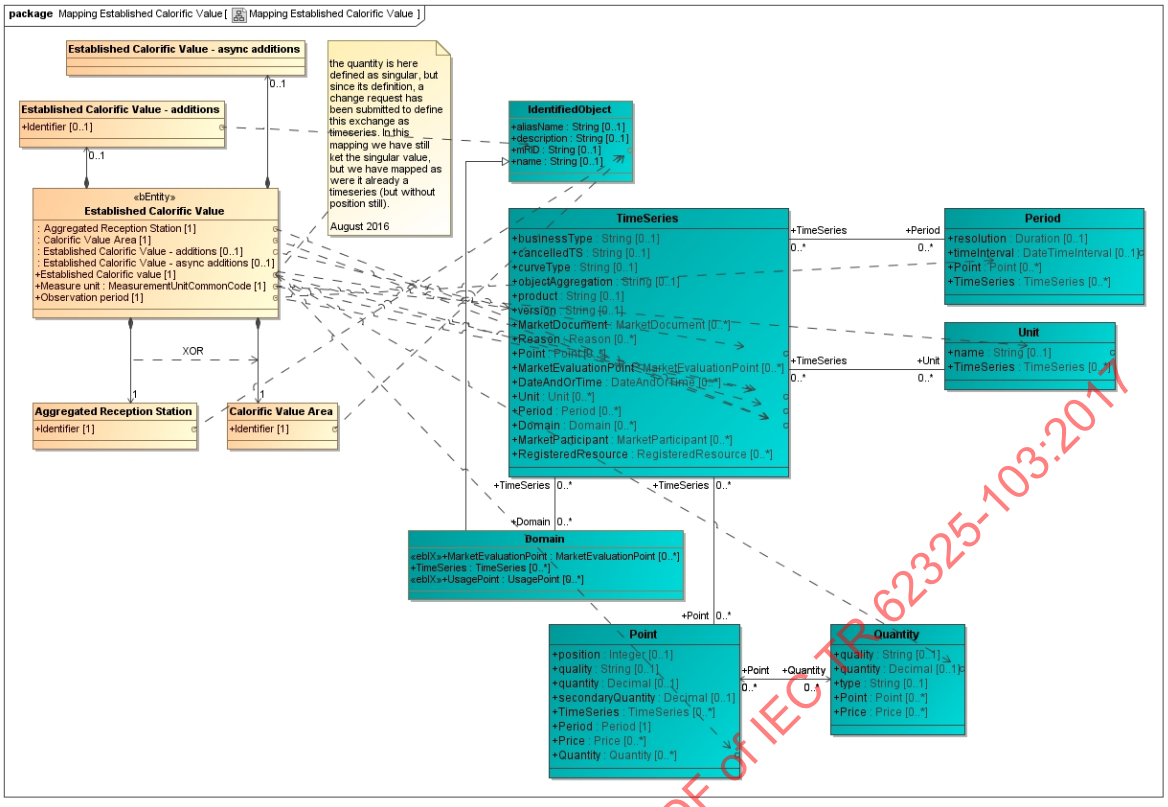


Figure 105 – Mapping of Exchange Established Calorific Value

The left hand side of the class diagram shown in Figure 105 corresponds with Figure 40.

7.8 Settle for Reconciliation

7.8.1 Overview

The rows in Tables 11 to 15 show the classes and attributes from the BRS, see [10].

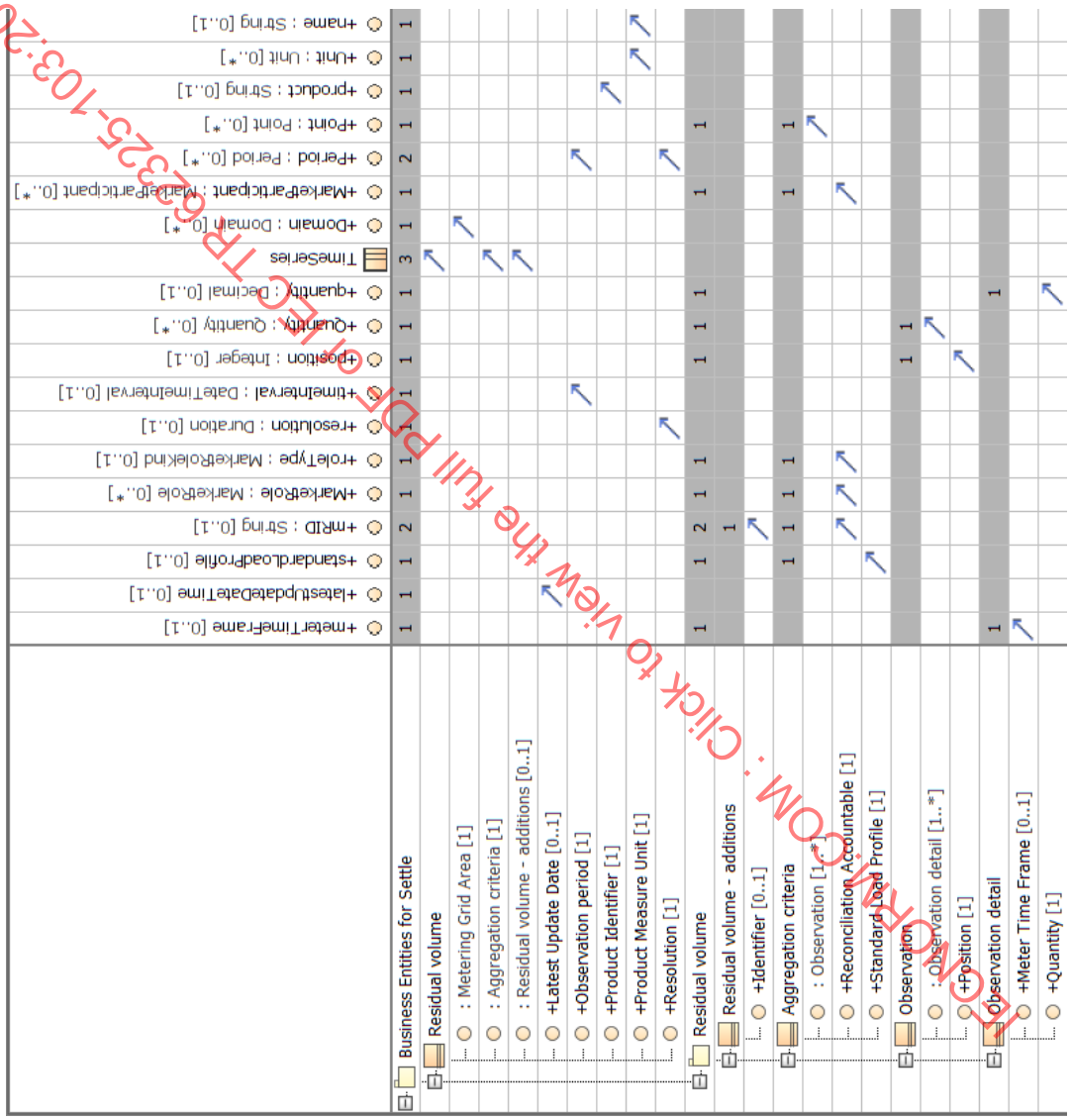
The columns in the tables show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the tables shown with ↗, is visually displayed in the figure below the corresponding table.

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7.8.2 Exchange Residual Volume

Table 11 – Mapping of Exchange Residual Volume



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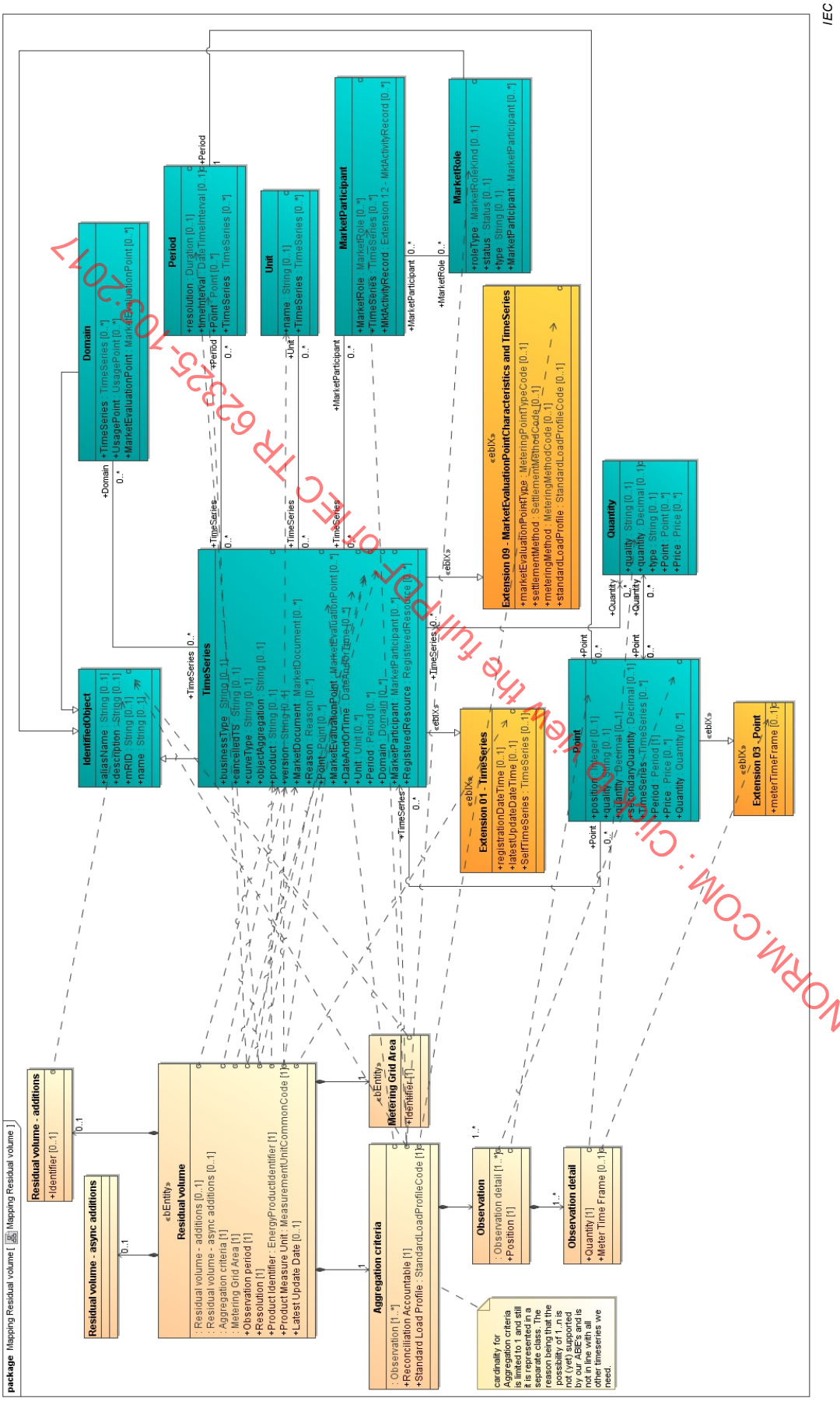
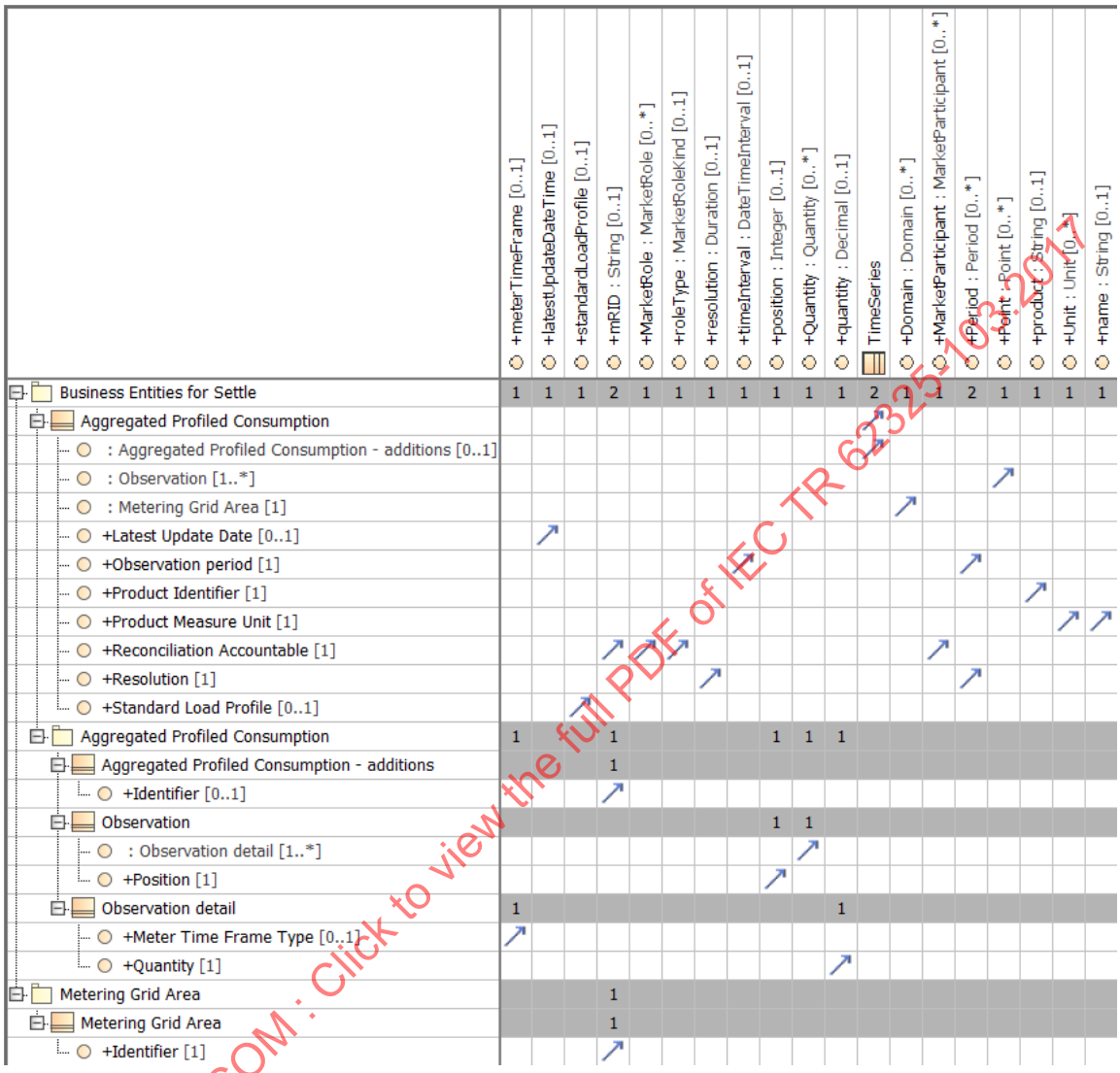


Figure 106 – Mapping of Exchange Residual Volume

The left hand side of the class diagram shown in Figure 106 corresponds with Figure 47. For the extensions to CIM, see Clause 8.

7.8.3 Exchange Aggregated Profiled Consumption

Table 12 – Mapping of Exchange Aggregated Profiled Consumption



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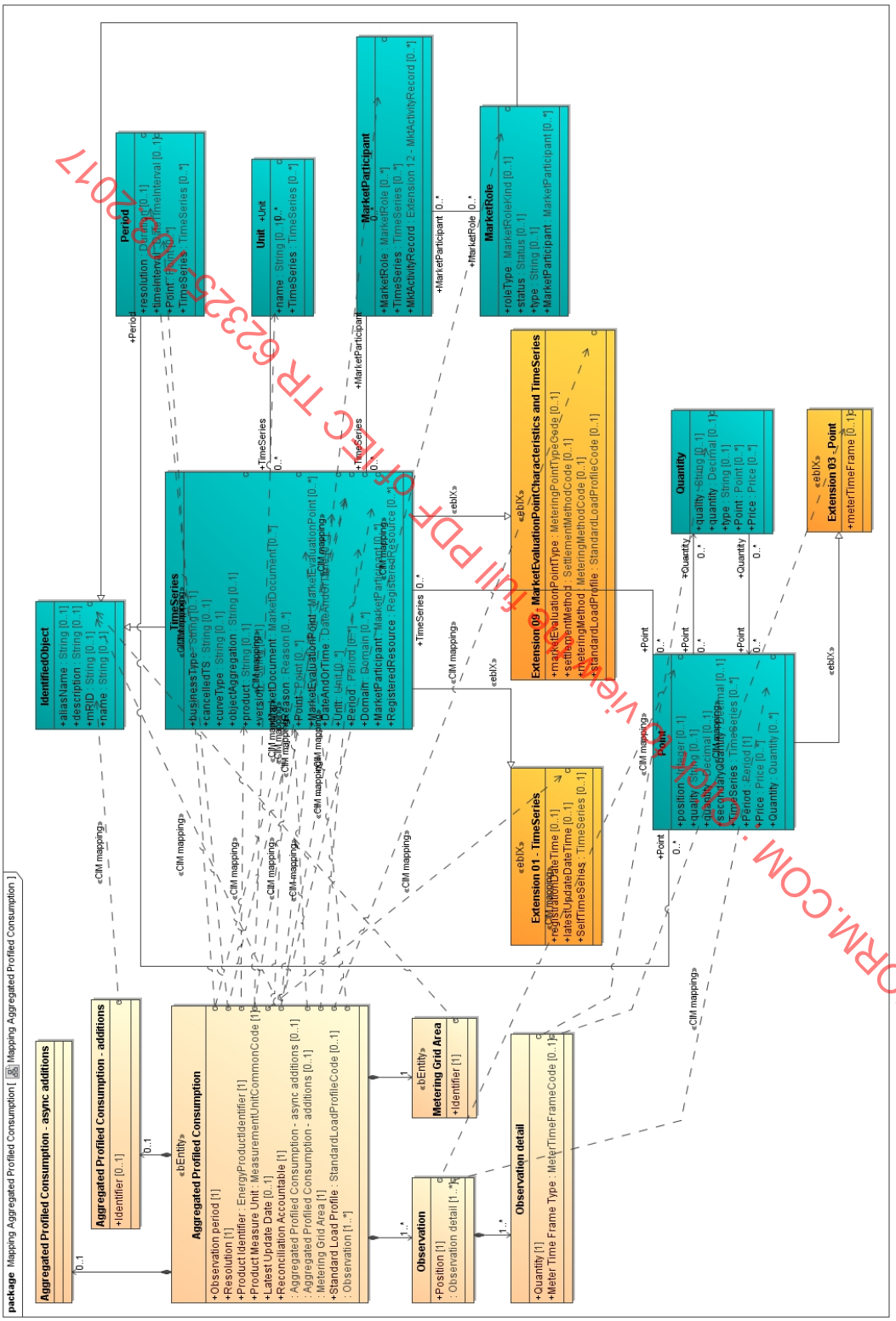


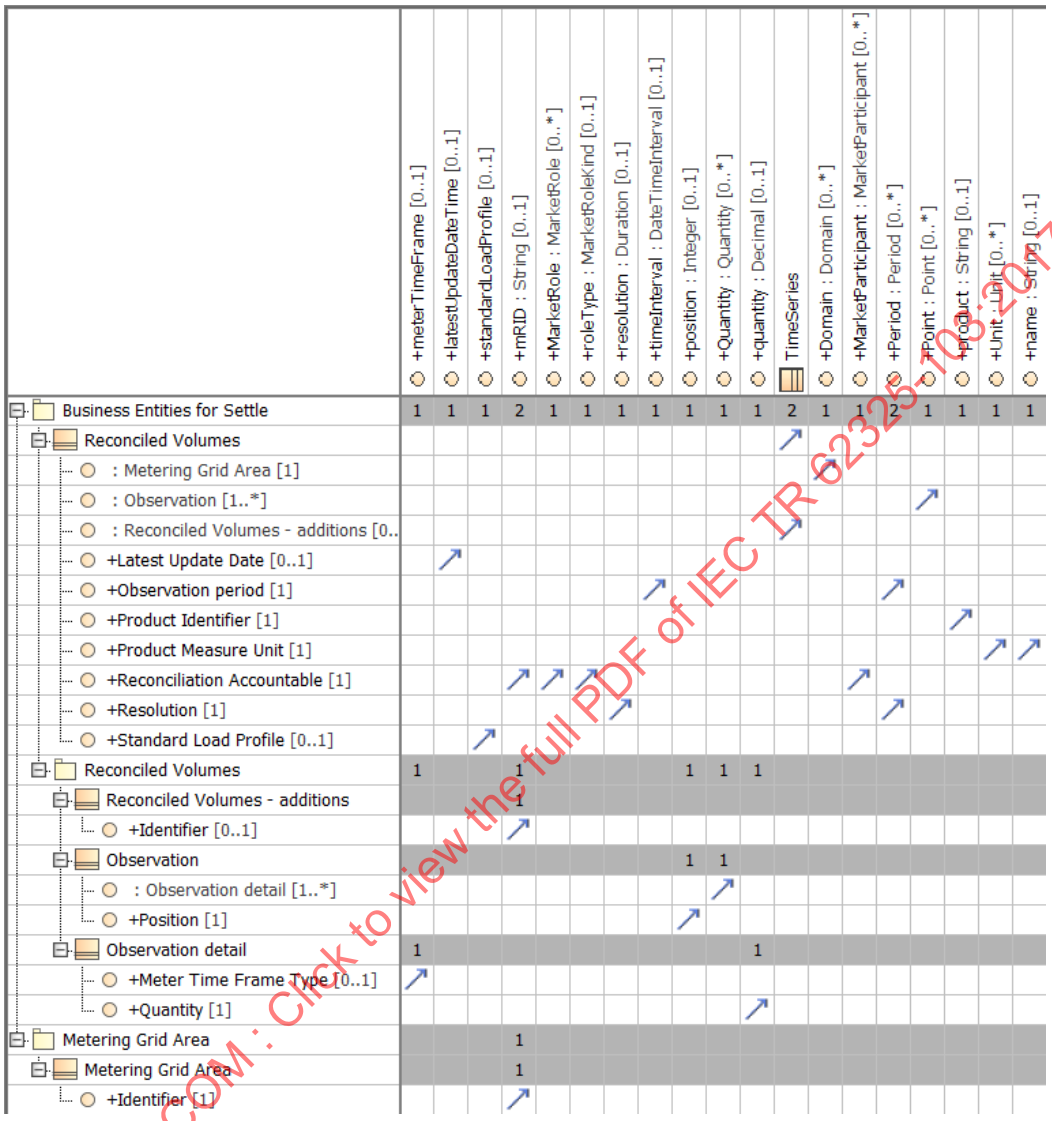
Figure 107 – Mapping of Exchange Aggregated Profiled Consumption

The left hand side of the class diagram shown in Figure 107 corresponds with Figure 49. For the extensions to CIM, see Clause 8.

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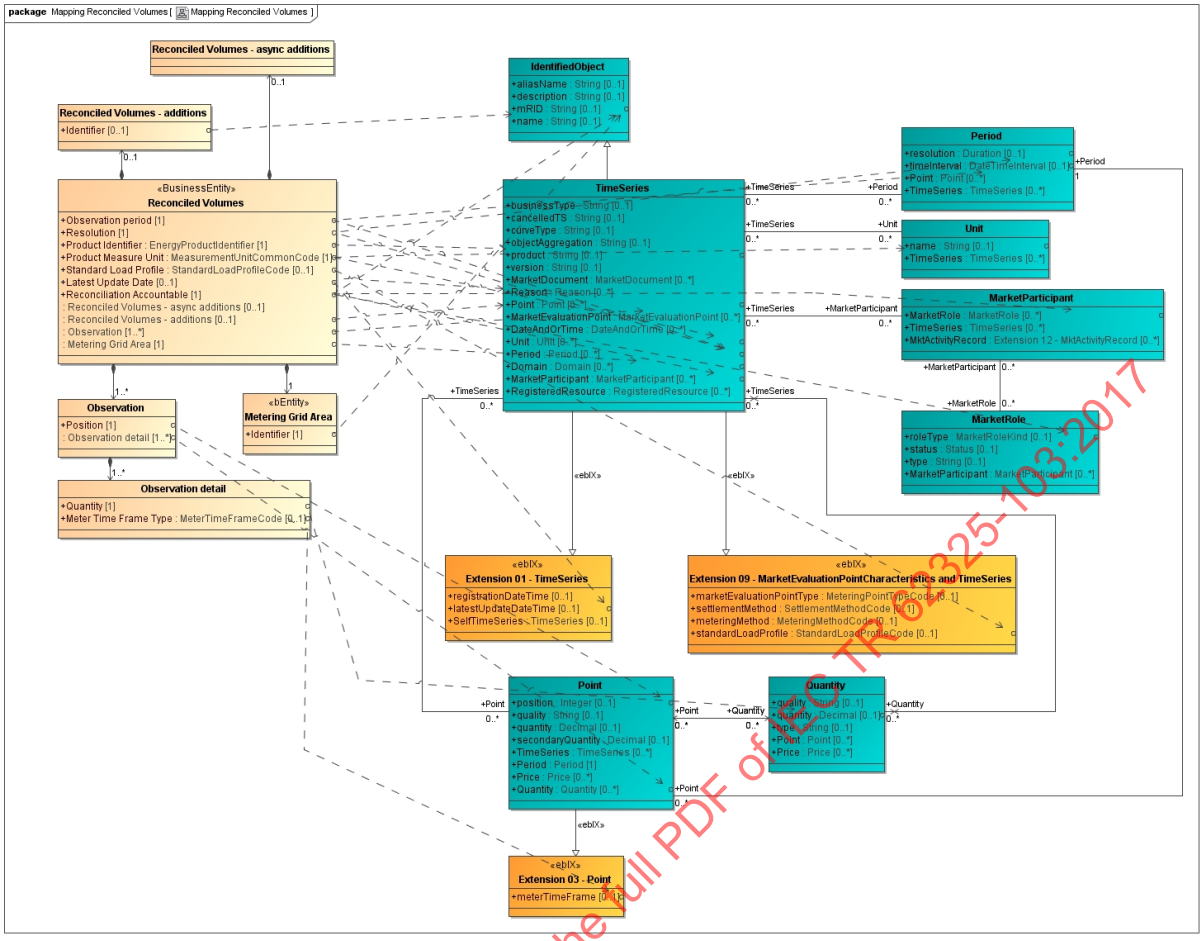
7.8.4 Exchange Reconciled Volumes

Table 13 – Mapping of Exchange Reconciled Volumes



	+meterTimeFrame [0..1]	+latestUpdateDateTime [0..1]	+standardLoadProfile [0..1]	+mRID : String [0..1]	+MarketRole : MarketRole [0..*]	+roleType : MarketRoleKind [0..1]	+resolution : Duration [0..1]	+timeInterval : DateTimeInterval [0..1]	+position : Integer [0..1]	+Quantity : Quantity [0..*]	+quantity : Decimal [0..1]	TimeSeries	+Domain : Domain [0..*]	+MarketParticipant : MarketParticipant [0..*]	+Period : Period [0..*]	+Point : Point [0..*]	+product : String [0..1]	+Unit : Unit [0..*]	+name : String [0..1]
Business Entities for Settle	1	1	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1
Reconciled Volumes												↗							
: Metering Grid Area [1]													↗						
: Observation [1..*]																↗			
: Reconciled Volumes - additions [0..												↗							
+Latest Update Date [0..1]		↗																	
+Observation period [1]								↗							↗				
+Product Identifier [1]																	↗		
+Product Measure Unit [1]																		↗	↗
+Reconciliation Accountable [1]				↗	↗	↗								↗					
+Resolution [1]						↗									↗				
+Standard Load Profile [0..1]			↗																
Reconciled Volumes	1			1					1	1	1								
Reconciled Volumes - additions				1															
+Identifier [0..1]				↗															
Observation									1	1									
: Observation detail [1..*]										↗									
+Position [1]									↗										
Observation detail	1										1								
+Meter Time Frame Type [0..1]	↗																		
+Quantity [1]											↗								
Metering Grid Area				1															
Metering Grid Area				1															
+Identifier [1]				↗															

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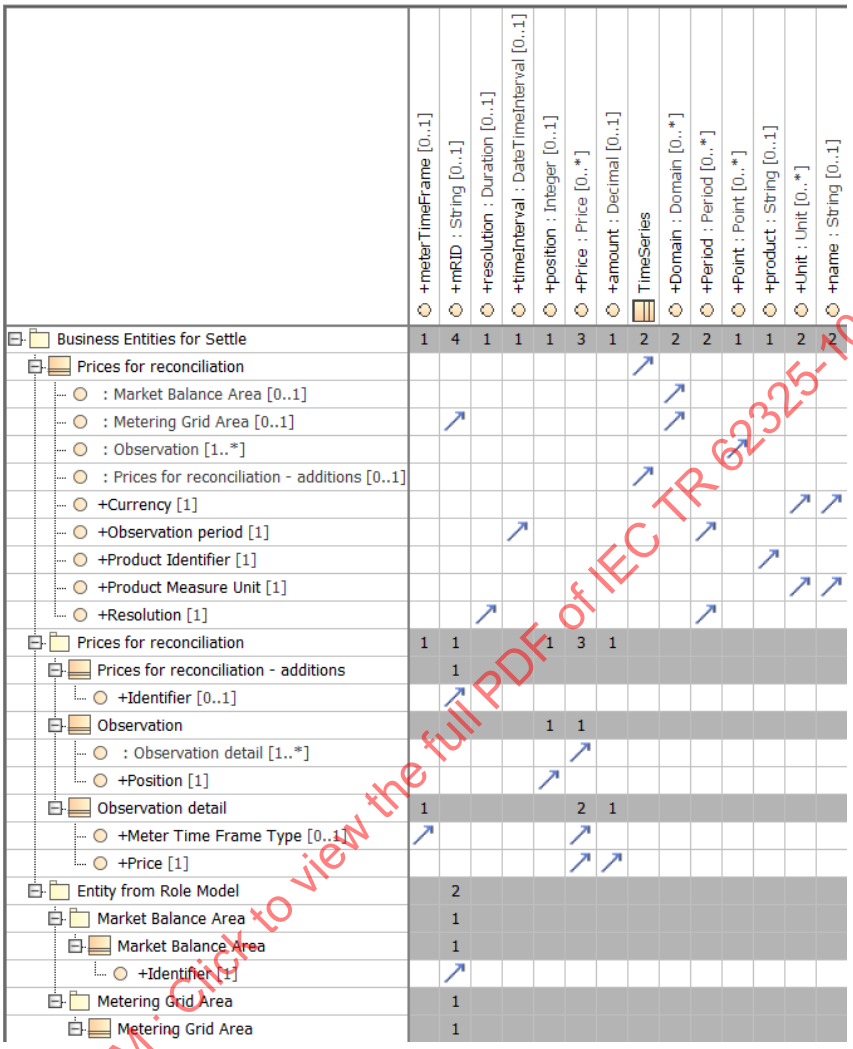
Figure 108 – Mapping of Exchange Reconciled Volumes

The left hand side of the class diagram shown in Figure 108 corresponds with Figure 54. For the extensions to CIM, see Clause 8.

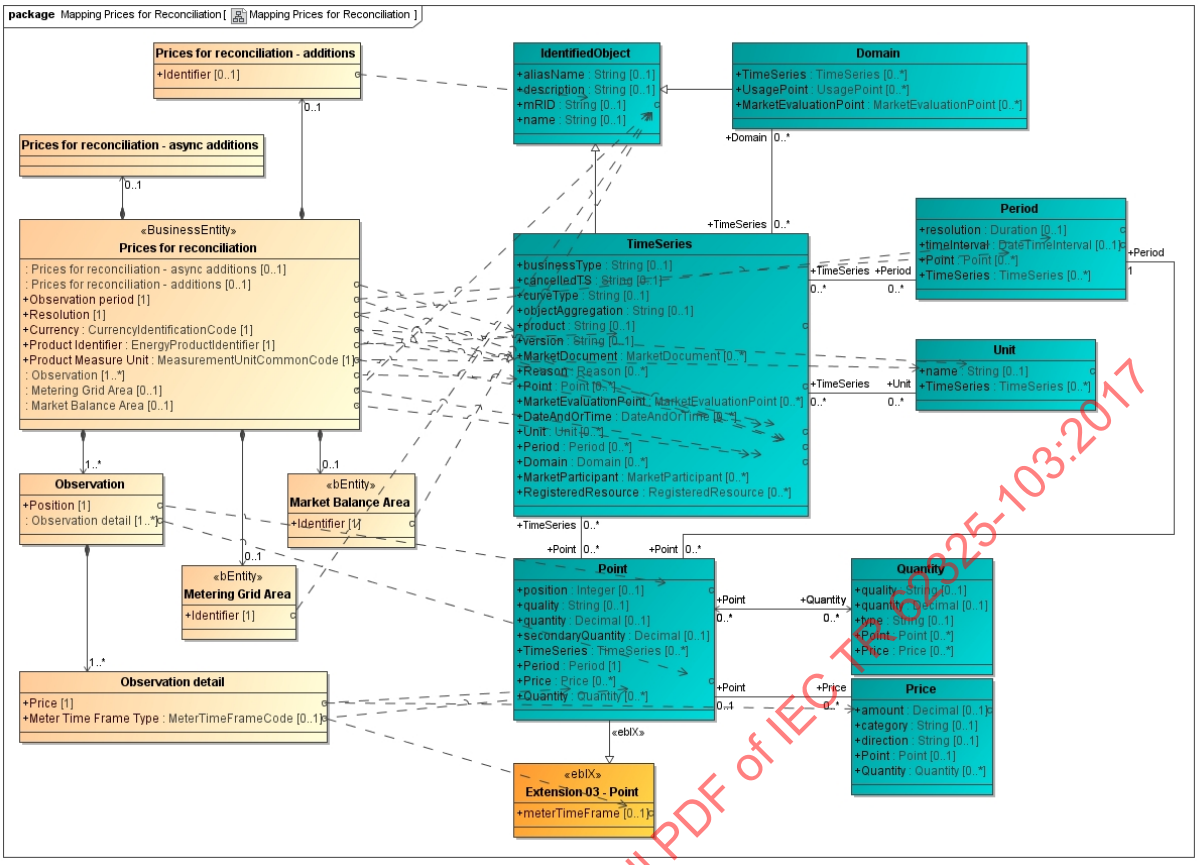
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7.8.5 Exchange Prices for Reconciliation

Table 14 – Mapping of Exchange Prices for Reconciliation



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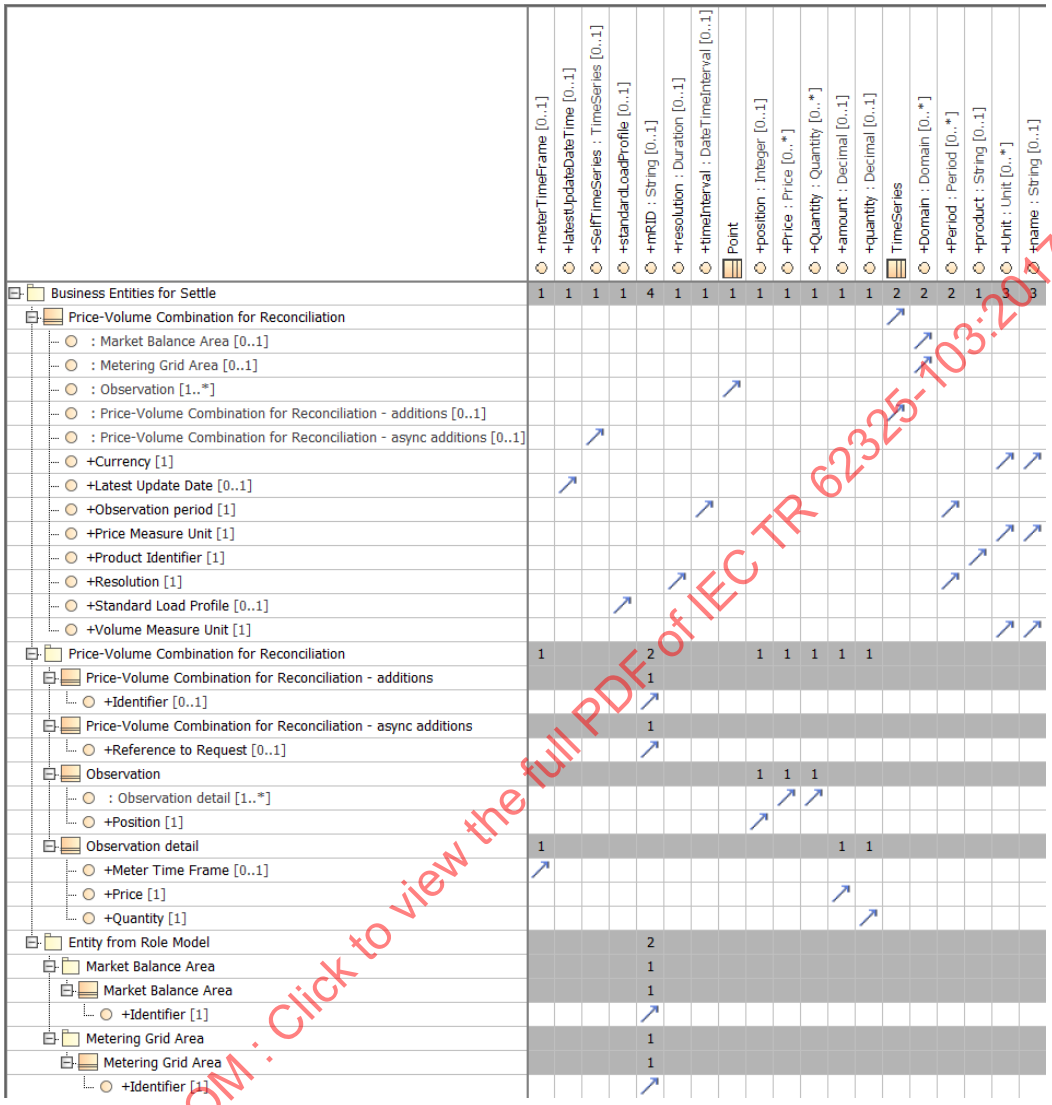
Figure 109 – Mapping of Exchange Prices for Reconciliation

The left hand side of the class diagram shown in Figure 109 corresponds with Figure 58. For the extensions to CIM, see Clause 8.

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7.8.6 Exchange Price-Volume Combination for Reconciliation

Table 15 – Mapping of Exchange Price-Volume Combination for Reconciliation



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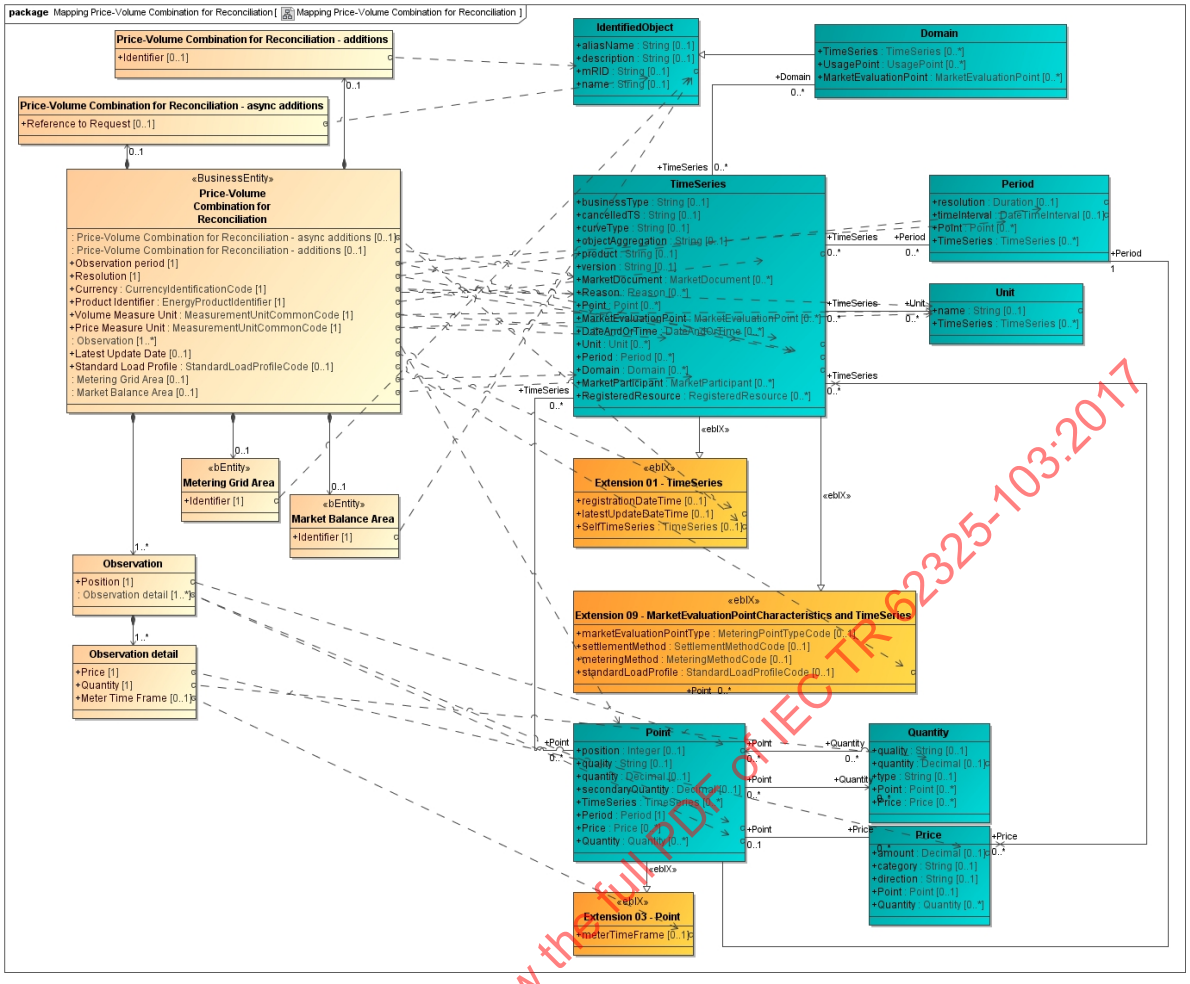


Figure 110 – Mapping of Exchange Price-Volume Combination for Reconciliation

The left hand side of the class diagram shown in Figure 110 corresponds with Figure 62. For the extensions to CIM, see Clause 8.

7.9 Measure for Determine meter read

7.9.1 Overview

The rows in Table 16 show the classes and attributes from the BRS, see [11].

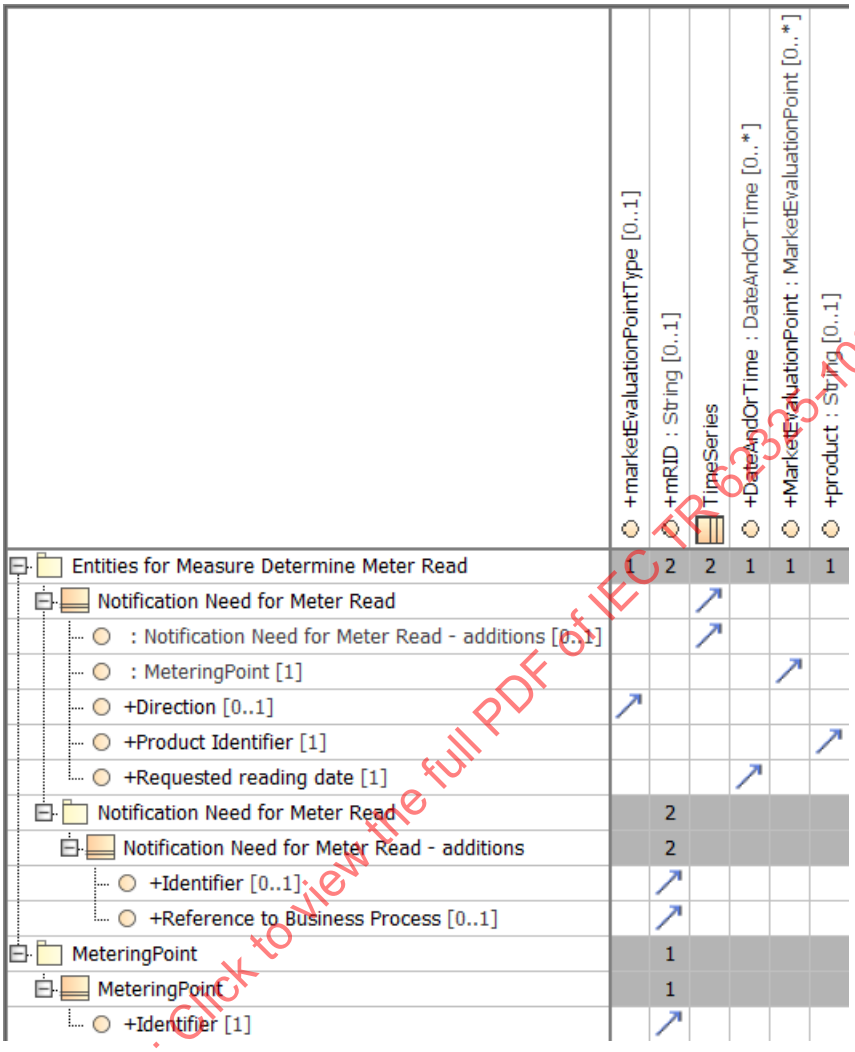
The columns in the table show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the table shown with ↗, is visually displayed in Figure 111.

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7.9.2 Exchange Notification Need for Meter Read

Table 16 – Mapping of Notification Need for Meter Read



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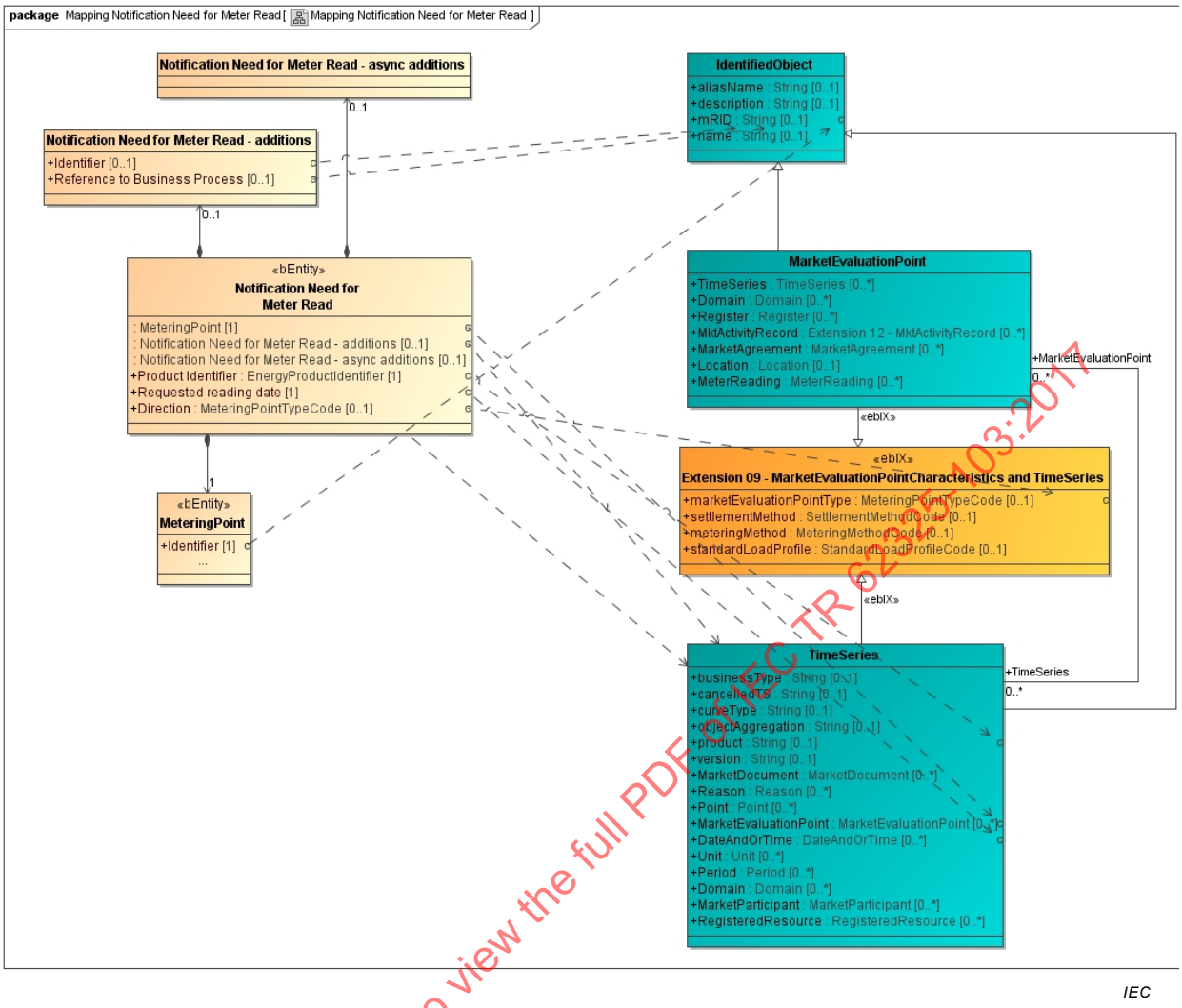


Figure 111 – Mapping of Notification Need for Meter Read

The left hand side of the class diagram shown in Figure 111 corresponds with Figure 66. For the extensions to CIM, see Clause 8.

7.10 Change of Supplier

7.10.1 Overview

The rows in Tables 17 and 18 show the classes and attributes from the BRS, see [12].

The columns in the tables show attributes, and sometimes classes, from CIM see [25], [26], [27].

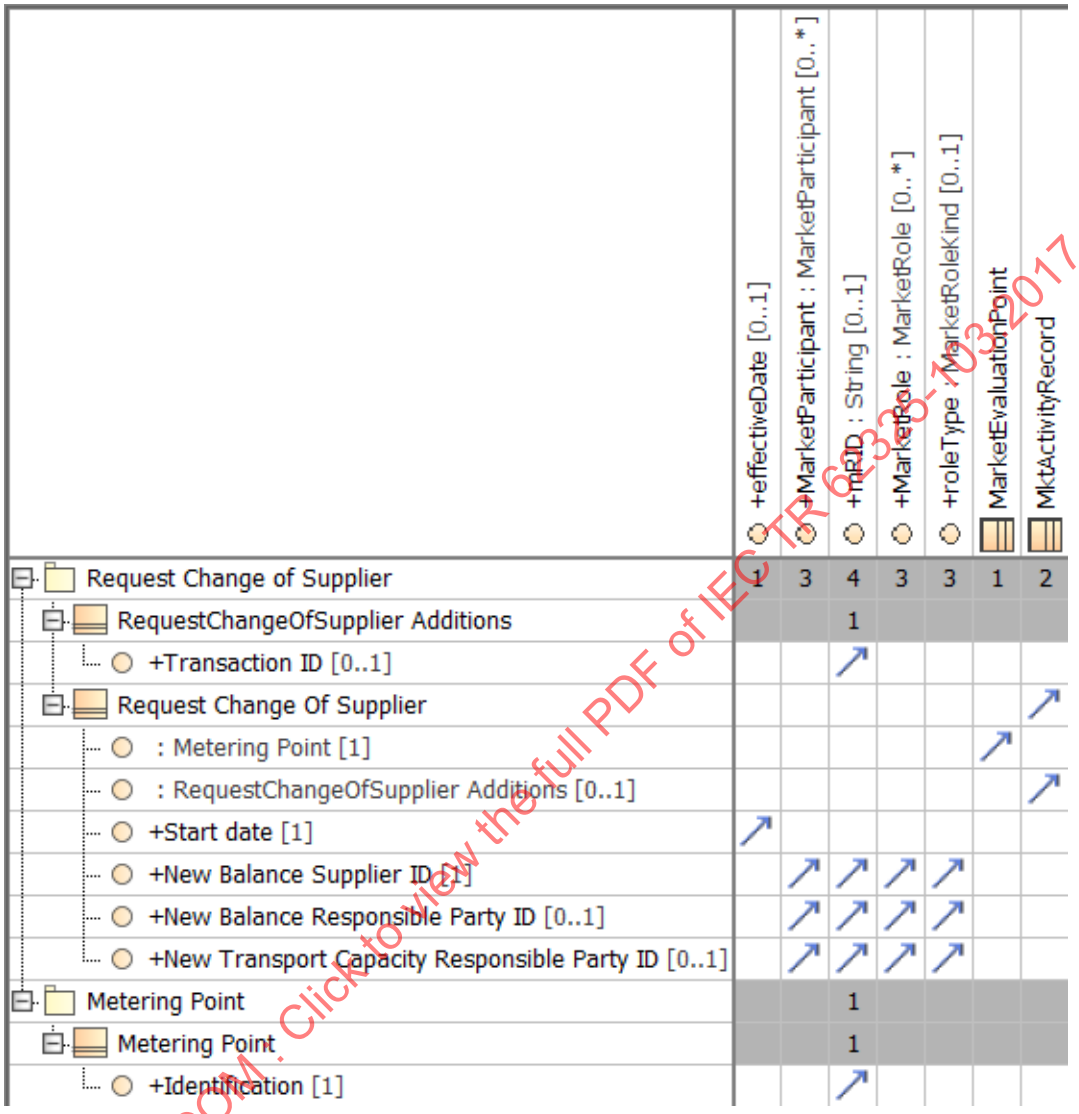
The mapping, in the tables shown with ↗, is visually displayed in the figure below the corresponding table.

Mapping of Reject Change of Supplier and of Confirm Change of Supplier is not included in this clause. It is very similar to the mapping of Reject and Confirm Change of Balance Responsible Party, see Clause 7.11.

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7.10.2 Exchange Request Change of Supplier

Table 17 – Mapping of Exchange Request Change of Supplier



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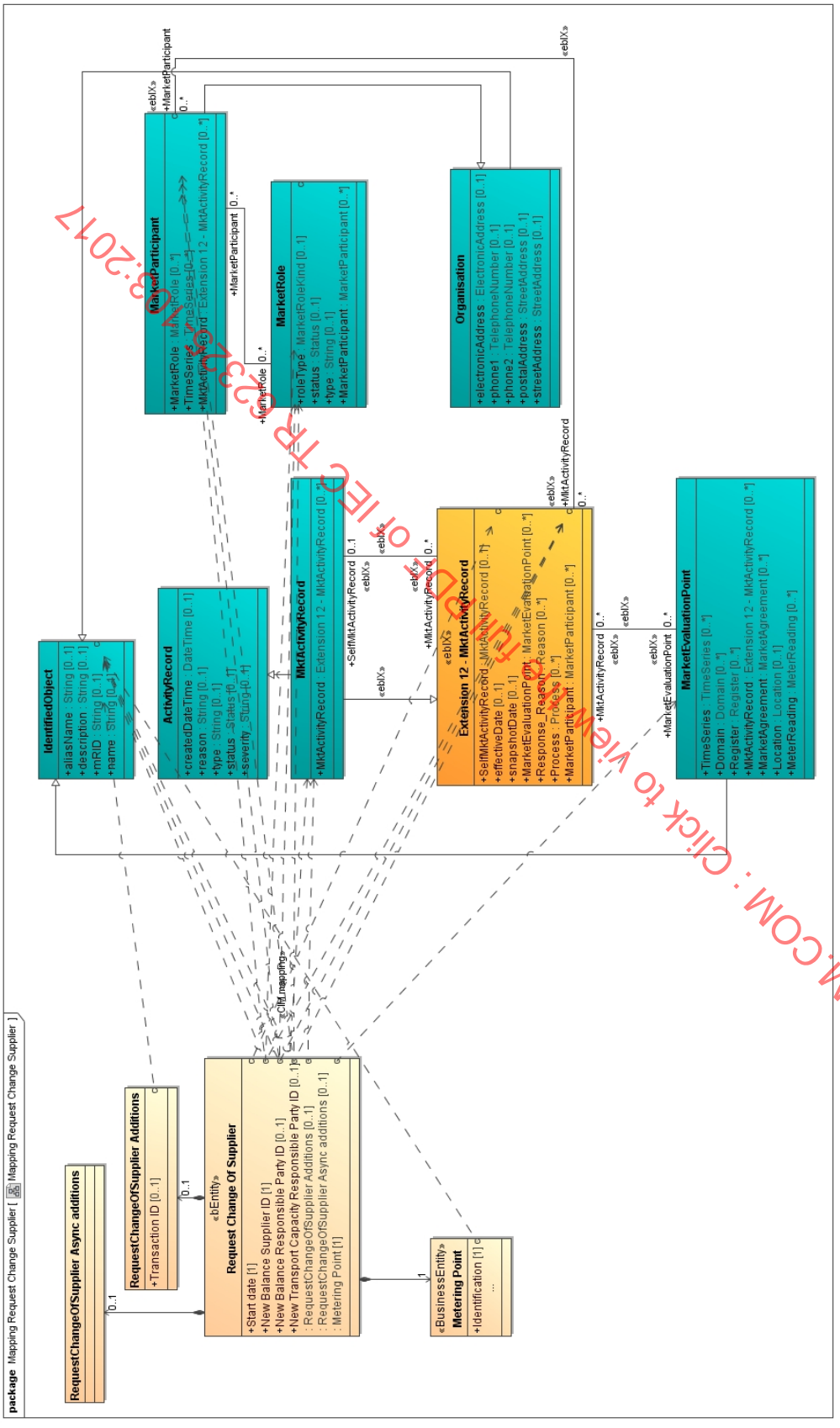


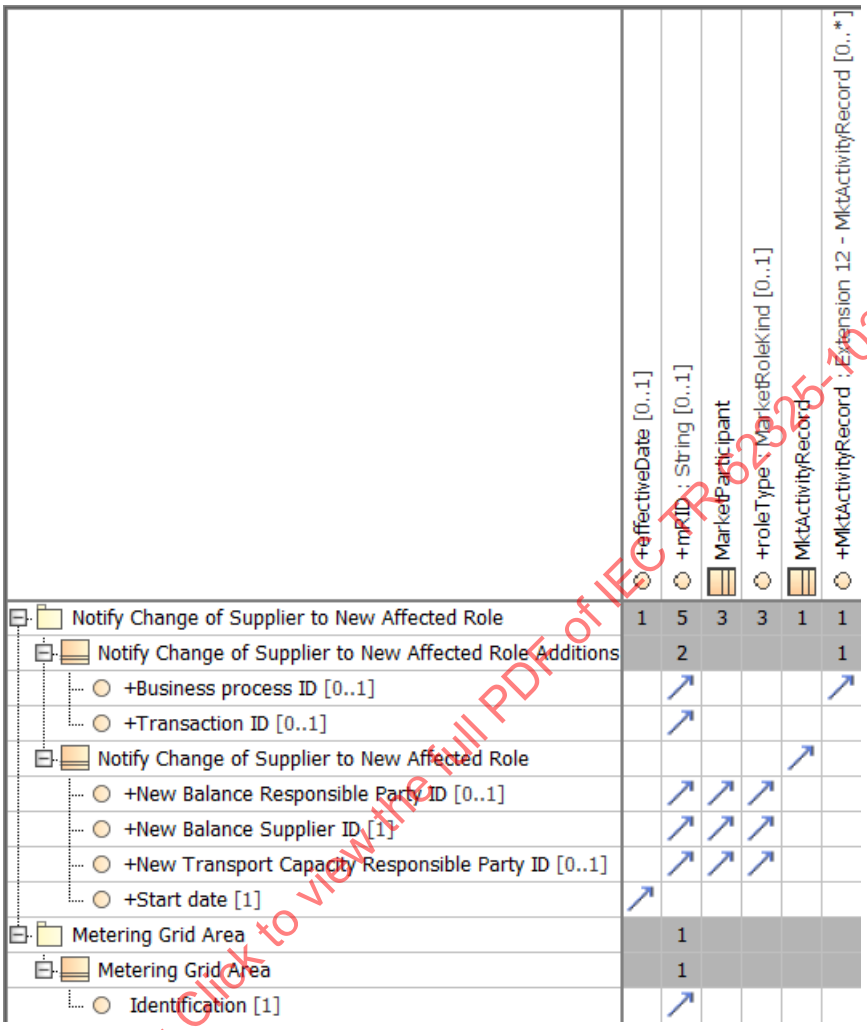
Figure 112 – Exchange Request Change of Supplier

The left hand side of the class diagram shown in Figure 112 corresponds with Figure 71. For the extensions to CIM, see Clause 8.

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7.10.3 Exchange Notify Change of Supplier to New Affected Role

Table 18 – Mapping of Notify Change of Supplier to New Affected Role



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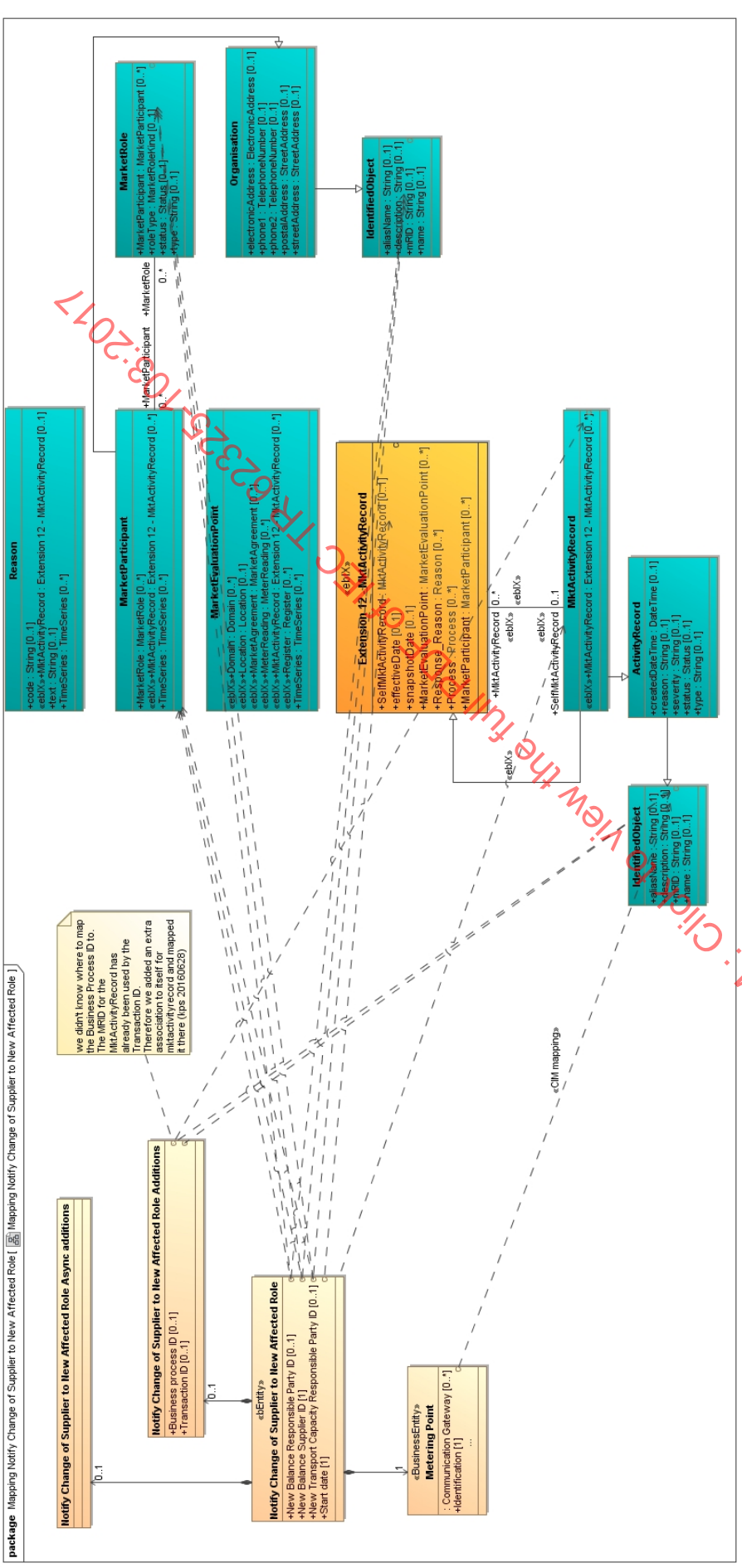


Figure 113 – Exchange Notify Change of Supplier to New Affected Role

The left hand side of the class diagram shown in Figure 113 corresponds with Figure 76. For the extensions to CIM, see Clause 8.

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7.11 Change of balance responsible party

7.11.1 Overview

The rows in Tables 19 and 20 show the classes and attributes from the BRS, see [13].

The columns in the tables show attributes, and sometimes classes, from CIM see [25], [26], [27].

The mapping, in the tables shown with ↗, is visually displayed in the figure below the corresponding table.

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