Introduction to and overview of ebIX® Business Requirement Specifications (BRSs)

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Content

Table of figures

A. References

A.1. Standards and comment models

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

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

[3] The Harmonised Electricity Market Role Model by ebIX®, ENTSO-E, and EFET (www.ebix.org).

A.2. ebIX® Documents

[4] Introduction to ebIX® Business Requirements and Business Information Models (www.ebix.org).

[5] Recommended Identification Schemes for the European Energy Market (www.ebix.org).

[6] ebIX® code lists (www.ebix.org).

[7] ebIX® BRSs (www.ebix.org).

B. Main changes since last version

Old	New	Clarification	Date
		Version 1	
	1.0.A	First published document.	20231017

1 Introduction to BRSs

This document explains the structure of ebIX® Business Requirement Specifications (BRS), the benefits of using it, and provides a step-by-step guide on how to read and understand an ebIX® BRS. Thereafter an overview of the ebIX® BRSs is presented. Finally, there are two appendixes. In Appendix A there is a brief introduction to UML and in Appendix B the UN/CEFACT rules for message diagrams are shown.

ebIX® Business Requirement Specifications describes business processes between organisations in the energy market using a framework developed by ebIX®, to help organisations in the energy industry implementing effective and standardised data-exchange processes. The framework is designed to improve communication between stakeholders, reduce development time, and minimise errors. As an intended side-effect, this will harmonise the downstream market processes in the EU energy markets.

An ebIX® BRS is a comprehensive framework that covers all aspects of a business requirement specification for a specific data-exchange process and purpose, including functional requirements, partly non-functional requirements, UseCases, and process flows.

1.1 The UN/CEFACT Modelling Methodology (UMM)

The UN/CEFACT Modelling Methodology (UMM) is a UML (Unified Modelling Language, see Appendix A) modelling approach to design the business services that a business partner must provide to collaborate with other business partners. It provides the business justification for the services to be implemented in a service-oriented collaboration architecture. Thus, a primary vision of UN/CEFACT is to capture the business knowledge that enables the development of low-cost software, helping the small and medium size companies (SMEs), and emerging economies to engage in e-Business practices. UMM focuses on developing a global choreography of inter-organisational 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 need to be realised in a service-oriented architecture, implementing the business collaboration. This approach provides insurance against technical obsolescence.

UMM consist of three views; the Business Requirements View, the Business Choreography View and the Business Information View.

An ebIX® BRS describes a specific business process seen from the first of these three UMM main views, i.e. the Business Requirements View. The Business Requirements View consist of three sub views, i.e. the Business Domain View, the Business Partner View, and the Business Entity View.

The Business Domain View is used to discover and describe business processes that are of relevance in a project. A business domain is a framework for identification and understanding of business processes as well as for categorising them according to a classification schema. The Business Domain View is a container capturing the categorisation scheme and categorised business processes (manifested as a hierarchical structure of UseCases).

The Business Partner View captures a list of business partners and stakeholders in the business process under consideration.

The Business Entity View is a container to describe the business data having business significance in the modelled process.

Since the ebIX® model is open for national customisation, some attributes are added as optional for usage for regional/national customisation. If used, these attributes must be specified nationally.

1.2 The content of an ebIX® BRS

As mentioned above, the methodology behind the ebIX® BRSs is the Business Requirements View from the UMM, which consist of the three sub views: Business Domain View, the Business Partner View and the Business Entity View. Hence, an ebIX® BRS will consist of these three main chapters. In addition, some of the BRSs have an introduction chapter where you can find a brief description of the intended processes and basic principles, definitions of terms etc. used in this BRS.

1.2.1 Business Domain View

The Business Domain View chapter contains a hierarchy of UseCases, as shown in Figure 1 below, where the top level UseCase represents a top view of the business process in question. Thereafter the top level UseCase is expanded into a set of sub-UseCases (sub-processes), as many UseCases and levels as is needed to describe the process up to the detailed data exchange. On the lower level UseCases, also the business partners participating in the UseCase are shown.

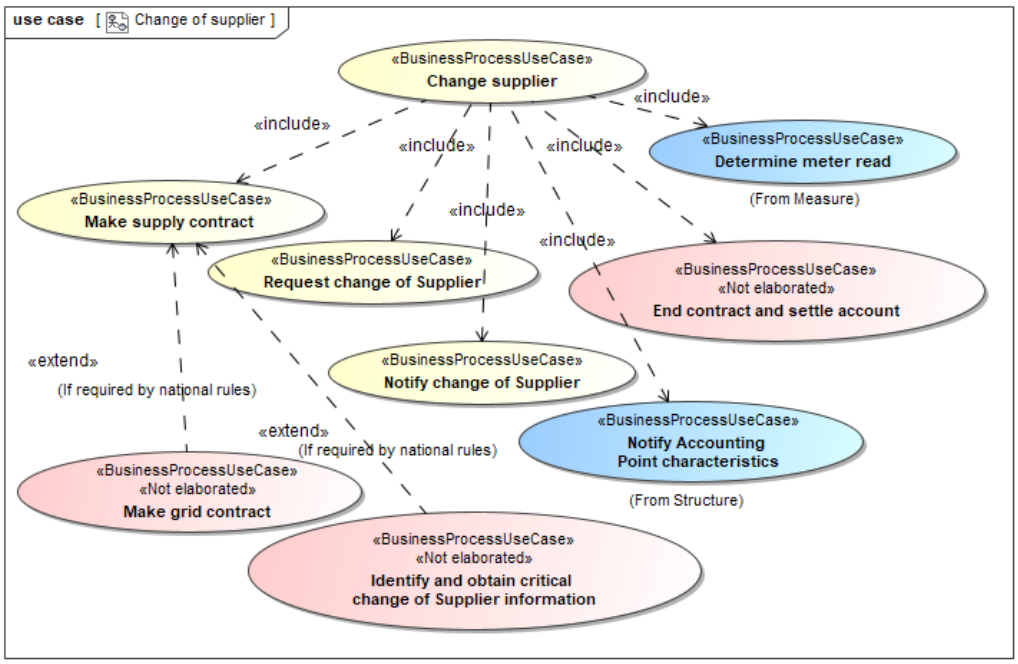


Figure 1 Example of Business Domain View top level UseCase diagram

For each UseCase there is a UseCase description table that describes the UseCase in readable text, the aim of the UseCase, under what conditions and when it starts and ends and what the end position is after execution of the UseCase and if there are exceptions to the UseCase. The effect of the Use Case is bringing the situation as described in the pre-condition into the post-condition.
The table therefore has the following content (rows): definition, beginsWhen, preCondition, endsWhen, postCondition, exceptions and actions. The actions, if applicable for the UseCase, refers to the paragraph describing the activity diagram.

UseCase description: **Request change of Supplier**	
definition	In this process, the new Energy Supplier, on behalf of the Customer, requests to become the Energy Supplier for the Accounting Point and the Metering Point Administrator confirms it. The Metering Point Administrator must check the consent the Customer has given to the new Energy Supplier. Because of the confirmed request, the Metering Point administration will be updated with the new Energy Supplier in due time.

beginsWhen	When the new Energy Supplier decides to send a request for change of Supplier to the Metering Point Administrator, to achieve the intended start of supply date for the new supply contract.
preCondition	A supply contract between the new Energy Supplier and the Customer at the Accounting Point is in place, and therefore the new Energy Supplier is consented for the Change of Supplier. A start of supply date has been agreed with the Customer.
endsWhen	When the Request change of Supplier is confirmed.
postCondition	The new Energy Supplier is confirmed to supply the Accounting Point from the requested start date onwards.
exceptions	The Metering Point Administrator rejects the request change of Supplier.
actions	See related activity diagram.

Figure 2 Example of Business Domain View UseCase description

Thereafter, if applicable (for more detailed UseCases), the UseCase is further described using an UML activity diagram. The activity diagram normally shows the business partners (actors) and their actions in chronological order. In addition, exchanged documents between in the business partners are shown.

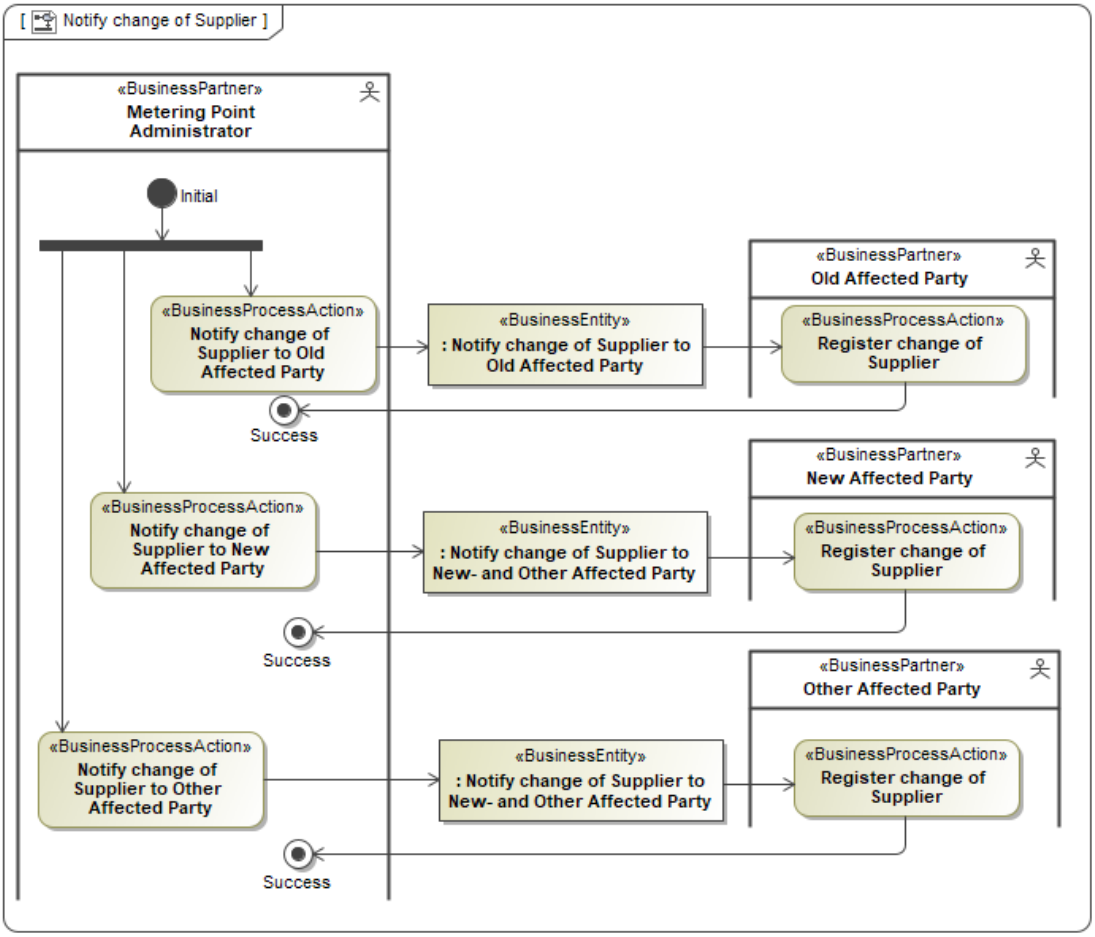


Figure 3 Example of Business Domain View activity diagram

1.2.2 Business Partner View

The Business Partner View shows an overview of the business partners that participate in the various UseCases in the Business Domain View, with the related definitions of the business partners.

If applicable, the business partners are mapped to the appropriate role in the Harmonised Electricity Market Role Model (HEMRM), see [3].

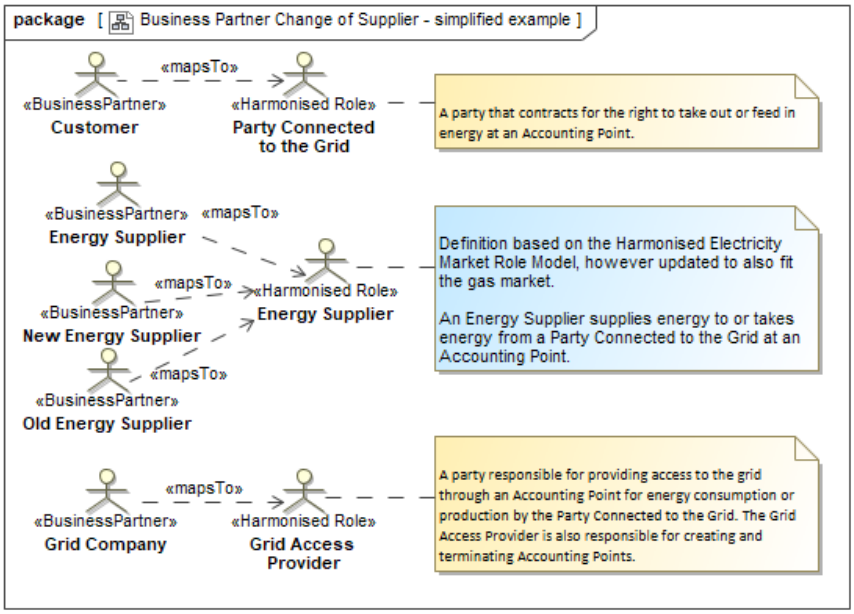


Figure 4 Example of Business Partner View

1.2.3 Business Entity View

The business Entity View describes the information exchange in the various Uses Cases of the business process describes in the Business Domain view.

A business entity is a set of data elements in the real-world having business significance for the business process under consideration that is shared between two or more business partners in a collaborative business process. A business entity will in principle become a business document in later steps of the UMM.

In the ebIX® BRSs all data exchanges shown in the activity diagrams in the Business Domain View, are expanded into class diagrams, showing the attributes needed fo fulfil the requirements from the business process in question and if relevant the codes to use for coded attributes.

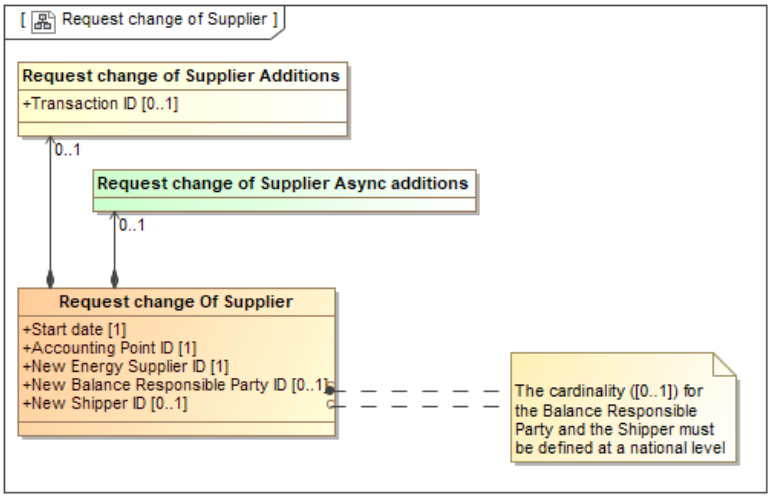


Figure 5 Example of Business Entity View class diagram

In addition, the definitions of all attributes, which are grouped into classes, are listed.

«Business entity» Request change of Supplier	The information set to be sent by an Energy Supplier to the Metering Point Administrator when requesting a change of Supplier.
Start date	The date requested by the new Energy Supplier to take over the energy supply for this Accounting Point.
Accounting Point ID	The unique identification of the Accounting Point this Request change of Supplier is aimed for.
New Energy Supplier ID	The unique identification of the requesting Energy Supplier.
.....	.....

Figure 6 Example of definitions of clases and attributes

1.3 Benefits of using ebIX® BRS

There are several benefits using the ebIX® BRS framework. The framework provides a standardised approach when introducing a new process with (or without) data exchange, which ensures that all stakeholders have a clear understanding of the business requirements. The framework also provides a set of guidelines and templates to help the creation of a consistent and comprehensive business process.

An ebIX® BRS of a certain business process describes that business process in a harmonised way: it is a synthesis of how the process is conducted in several participating countries. This guarantees best practices and implementable processes. It also allows for national expansions and additions.

The ebIX® BRSs improves communication between stakeholders by providing a common language and understanding of the business requirements. The framework also reduces development time by providing clear and concise requirements that guides the development team in creating a successful process. Finally, the framework minimises errors by providing a comprehensive business process that is easy to understand and follow.

2 Overview of business processes covered by BRSs

2.1 ebIX® UML model for the European energy market

The ebIX® Domain model splits the European energy market into the following top level process areas: structure, trade, plan, operate (produce, consume and transport), measure, settle (physical and financial) and bill. The ebIX® UML model for the European energy market describes two of these process areas, namely Structure and Measure, which are the main process areas for the downstream energy market.

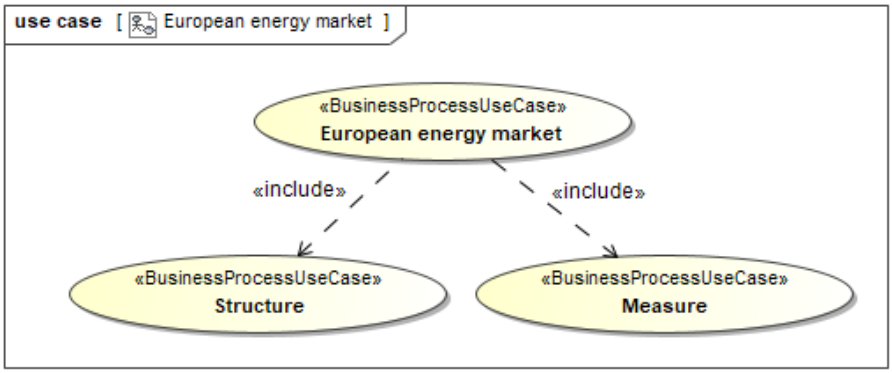


Figure 7 Business process UseCase: European energy market

The UseCases Structure and Measure are furter expanded into a set of business processes, which in turn are furter expanded to a set of lower level UseCases where ebIX® has made the BRS.
This hierarchical structure is shown in the next chapters.

2.1.1 Business area Structure

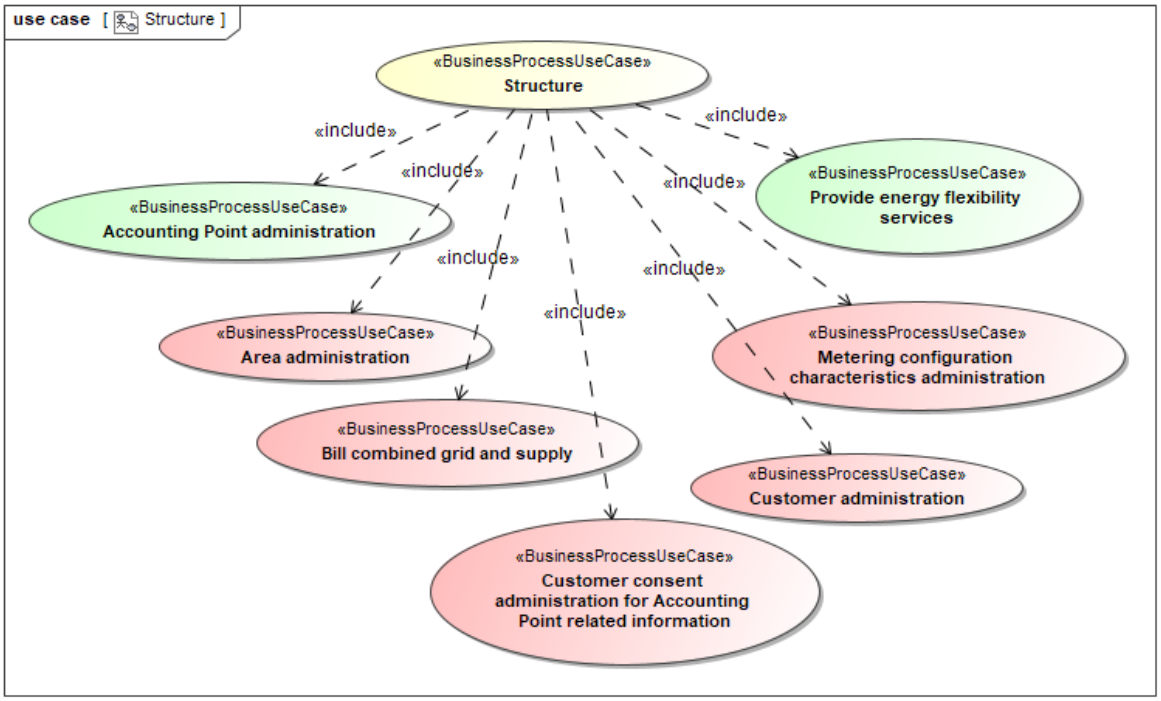


Figure 8 Business process UseCase: Structure

The structuring phase of the business processes in the energy sector consists of a whole range of use cases as shown in Figure 8. For each of the red business process UseCases ebIX® has made one BRS, while for each of the two green business process UseCases, ebIX® has expanded the UseCases into a set of sub-UseCases, which represents the top level UseCase in a BRS, leading to several BRSs.

2.1.1.1 Business area Accounting Point administration

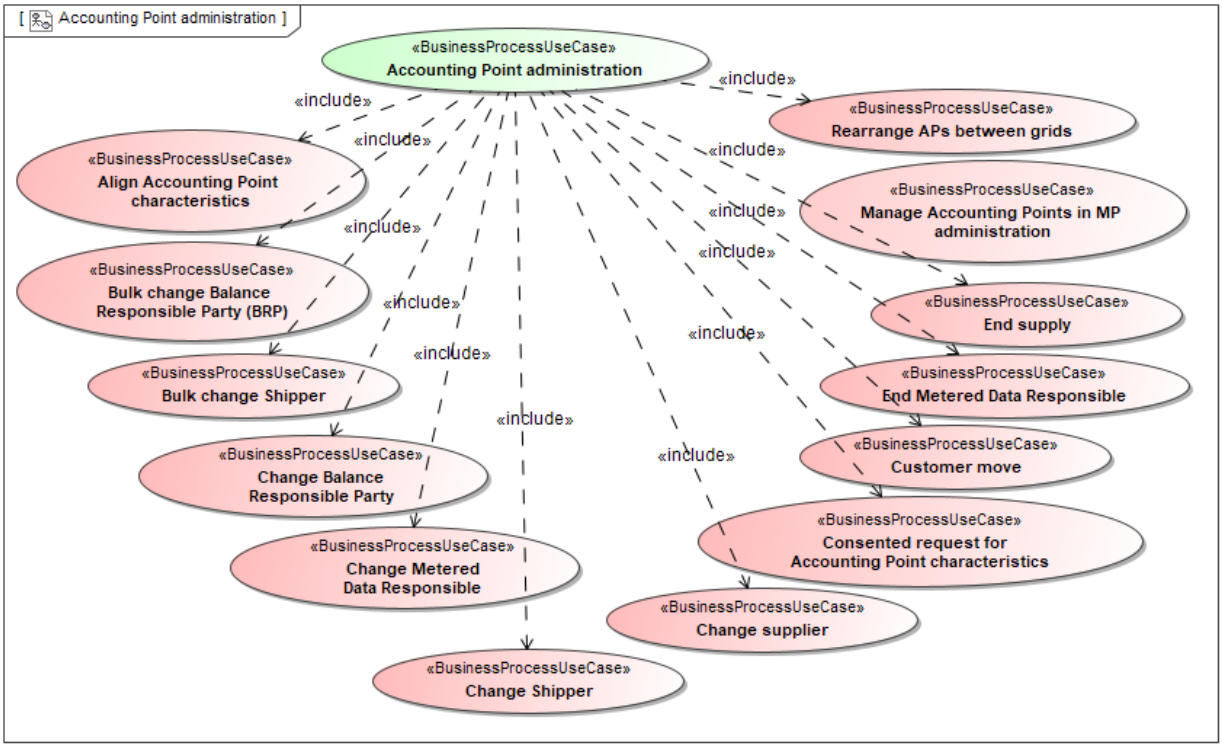


Figure 9 Business area: Accounting Point Administration

2.1.1.2 Business area Provide energy flexibility services

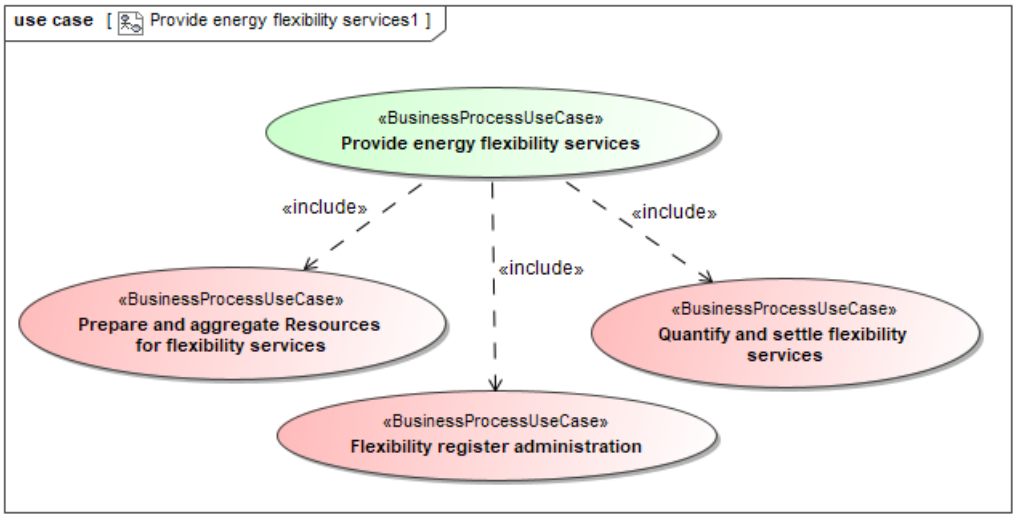


Figure 10 Business area: Provide energy flexibility services

2.1.2 Business area Measure

The Measure phase consists of several different processes for measuring power and energy, as shown in the diagram below. For each of the red business process UseCases ebIX® has made one BRS.

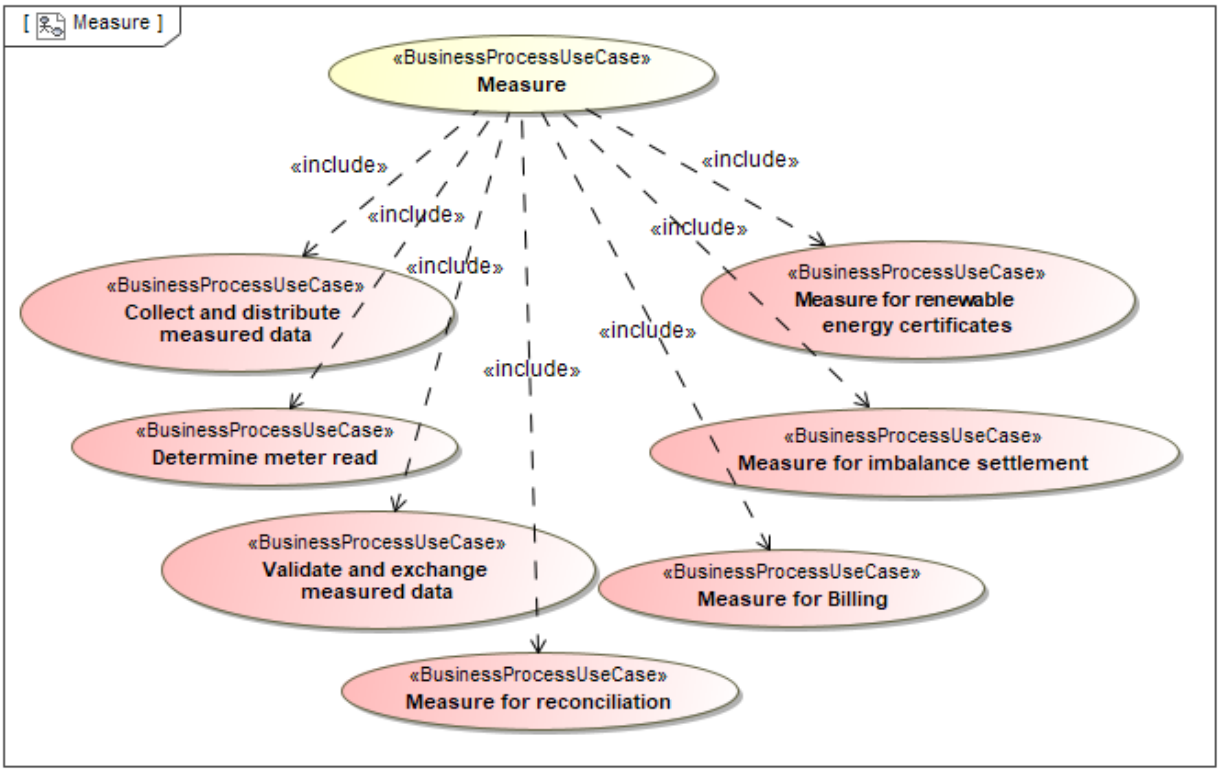


Figure 11 Business area: Measure

3 Overview of ebIX® BRSs

This chapter gives a brief (one-page) introduction to each of the BRSs published by ebIX®.

3.1 BRSs related to structuring processes

3.1.1 ebIX® BRS for administration of consent

The ebIX® BRS for administration of consent is intended for use in the context of data exchange in the energy sector. The purpose of this ebIX® BRS is to provide a common framework for organisations to manage and exchange consent-related information in a consistent and interoperable manner for third party access to energy related data and measured data, within the European energy market. This is particularly important in today's data-driven economy, where organisations need to obtain consent from individuals to use their personal data in compliance with privacy regulations.

The ebIX® BRS covers topics, such as the management of consent requests and revocations, the handling of consent exceptions, and the integration with other systems and processes. It provides a comprehensive and flexible approach to consent management, which can be adapted to different UseCases and regulatory contexts.

The administration of Customer consent related to Accounting Point information is a process where the Customer can give, withdraw, and maintain access to information of his Accounting Point for third parties, such as Energy Service Companies (ESCO) or Flexibility Service Providers (FSP), but also to other Energy Suppliers in a prospecting phase. The privacy regulation GDPR enforces explicit Customer consent before exchanging privacy related data from the Customer to parties that do not have access to data by other legal reasons.

Overall, this ebIX® BRS is a valuable tool for organisations that need to manage consent-related information in a secure, transparent, and compliant way. By adopting these processes described in the BRS, organisations can reduce the complexity and cost of consent administration, while improving the trust and confidence of their customers and business partners.

Currently, the document deals with administration of consents in the energy sector only. However, we see similarities with other sectors and expect that a harmonisation with other sectors may be inevitable.

The main UseCase covered by this BRS is limited to data related to an Accounting Point.

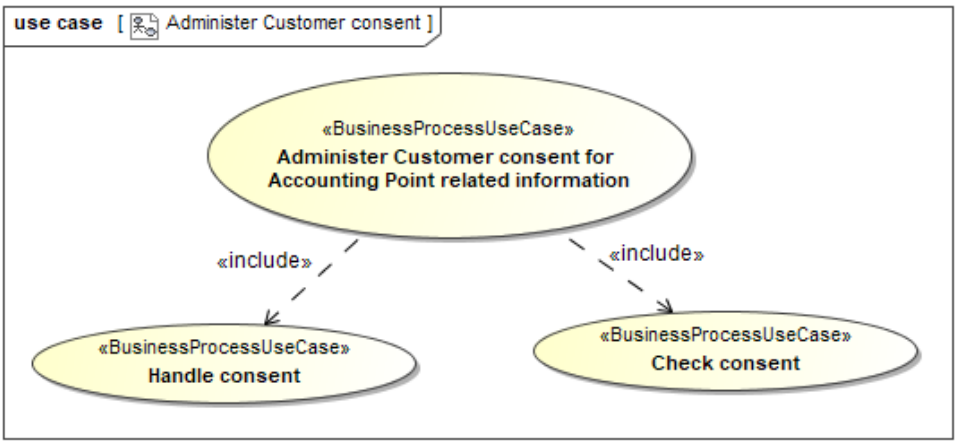


Figure 12 Administer Customer consent for Accounting Point related information

3.1.2 ebIX® BRS for Alignment of Accounting Point characteristics

The ebIX® BRS for alignment of Accounting Point (AP) characteristics is a Business Requirements Specification (BRS) for Alignment of Accounting Point (AP) characteristics between entitled parties within the structuring process of the European energy market. In the BRS we use business terms for the actors, and we map them to the terms used in the Harmonised Electricity Market Role Model from ENTSO-E, ebIX® and EFET [3]. A party acts in the capacity of a certain role.

According to the Harmonised Electricity Market Role Model [3], a Metering Point may be specialised as an Accounting Point or an Exchange Point. This BRS is limited to the alignment of Accounting Point characteristics. The alignment of Exchange Points characteristics will be specified in a separate BRS.

The alignment of Accounting Point characteristics consists of several sub processes:

- After a change of the characteristics of the Accounting Point, the Metering Point Administrator will notify all Linked Parties, for example the Grid Company, the Energy Supplier, the Balance Responsible Party of the change. In addition the Consented Parties to the Accounting Point will be notified of the change.
- Linked- or Consented Parties to the Accounting Point can request Accounting Point characteristics. It is a prerequisite that the requesting party is authorised, i.e. is properly consented, to receive Accounting Point characteristics. Contrary to the “Consented request for Accounting Point characteristics”, the request Accounting Point characteristics process described in his BRS may return all Accounting Point characteristics elements the requesting party may need to fulfil its obligations in the energy market.
- The Change Accounting Point characteristics process is a process where a Content Responsible Party requests changes to the characteristics of an Accounting Point. In a supplier centric environment, there are two Content Responsible Parties for each Accounting Point, being responsible for different sets of the Accounting Point characteristics. I.e. the responsibility is split between the Grid Company and the Energy Supplier.
- As most of the characteristics are Grid Company responsibility, some of the characteristics can be requested updated by a third party to the Grid Company.

  Example:

  - The Metered Data Responsible or Energy Supplier can ask the Grid Company to update the Accounting Point address. After the Grid Company has accepted the update, he will request the Metering Point Administrator to change the Accounting Point characteristics.

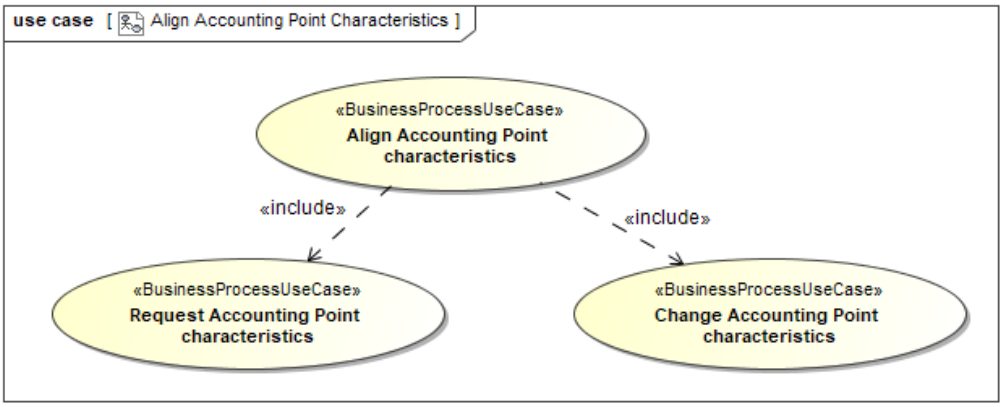


Figure 13 Align Accounting Point characteristics

3.1.3 ebIX® BRS for Alignment of Area characteristics[1]

The ebIX® BRS for Alignment of Area characteristics is a Business Requirements Specification for Alignment of area characteristics, within the structuring process of the European energy market.

The alignment of area characteristics is a process where the "responsible party" (the Area administrator) maintains, publishes and/or distributes characteristics of areas, such as a Metering Grid Area (MGA), a Calorific Value Area, an Aggregated Reception Station, a Temperature Zone, a Bidding Zone or a Scheduling Area, or relations between these areas. The Area administrator maintains, publishes and/or distributes characteristics of areas, on behalf of a Content Responsible Party, such as a Grid Company (normally responsible for a Metering Grid Area) or a Scheduling Area Responsible (normally responsible for a Scheduling Area).

The BRS covers both the electricity sector and the gas sector.

An area is always a collection of Metering Points.

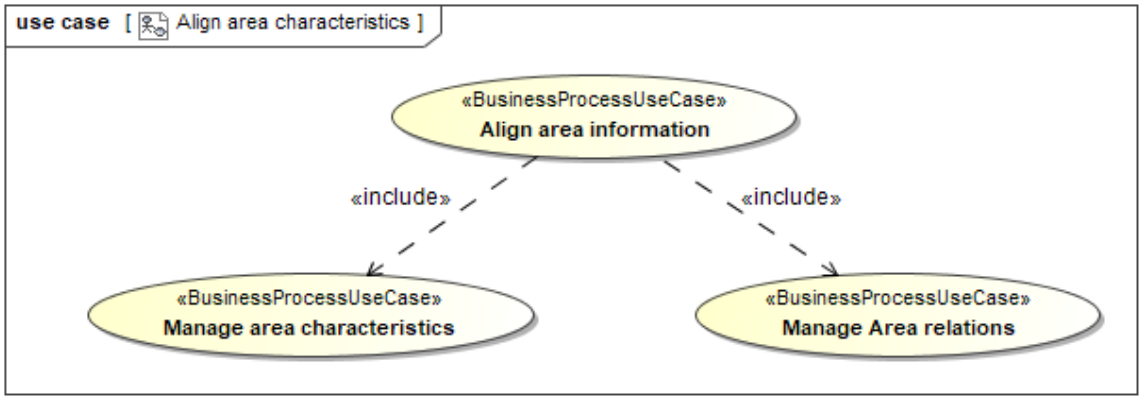


Figure 14 Align area information

[1] There is (situation summer 2023) a suggestion for a new common project for harmonising master data for areas (for instance Metering Grid Areas, Bidding Zones and Scheduling Areas) between the downstream and the upstream European energy market, with the following invited members ebIX®, the EU DSO Entity, ENTSO-E and ENTSOG.

3.1.4 ebIX® BRS for Alignment of characteristics of a Customer at an AP

The ebIX® BRS for Alignment of characteristics of a Customer at an Accounting Point process is based on a "supplier centric model", i.e. where the Energy Supplier is the Content Responsible Party for the Customer information for the regulated roles. The Customer in this process is limited to the Party Connected to Grid, whose characteristics need to be aligned between the Energy Supplier, the Grid Company and other Entitled Parties.

The characteristics of a Customer at an Accounting Point are always related to an Accounting Point.

The BRS shows three basic processes:

1) A process where the Party Administrator notifies the Entitled Parties with changes to the characteristics of a Customer at an Accounting Point.
2) A process where an Entitled Party, such as a Grid Company, requests characteristics of a Customer from the Party Administrator. The Request characteristics of a Customer at an Accounting Point process will return the characteristics the requesting party needs to fulfil its obligations in the energy market.
3) A process where an Entitled Party, such as a Grid Company requests an update in the characteristics of a Customer at an Accounting point.

This BRS will not include transfer of Customer data directly between Energy Suppliers. A main reason for alignment of Customer characteristic is for billing purposes.

There is a need for additional common Customer information. For Customer identification, a unique ID is needed, preferably from an official administration. A Customer is linked to the Accounting Point, using the ID from the common Customer administration.

We assume that sometime in the future there will be a "Party administration", independent of the Metering Point administration, maintained by a Party Administrator.

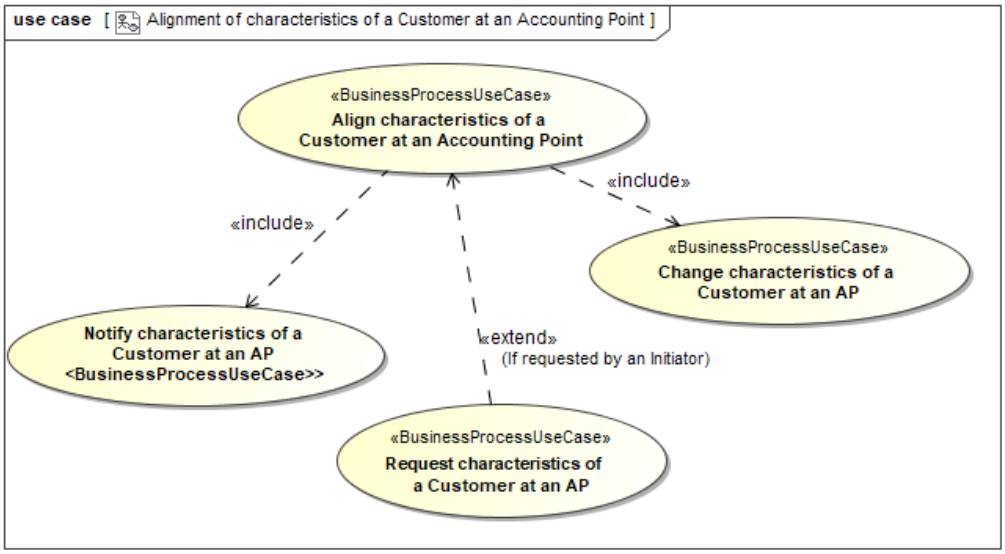


Figure 15 Business Process UseCase: Align characteristics of a Customer at an Accounting Point

3.1.5 ebIX® BRS for Alignment of metering configuration characteristics for a Metering Point

The ebIX® BRS for Alignment of metering configuration characteristics for a Metering Point[2] describes a set of sub processes:

- The Meter Administrator administrates the metering configuration characteristics of Metering Points. The metering configuration characteristics is the set of data elements of the metering configuration that is or might be relevant to parties linked to the Metering Point and/or parties that have a consent to receive metering configuration characteristics to fulfil their obligations. These parties are in the rest of this document called Entitled Parties.
- After a change of the metering configuration characteristics (including a change of meter), the Meter Administrator will notify all Entitled Parties to the Accounting Point, such as the Meter Operator and Metered Data Responsible, of the change.
- Entitled Parties can request metering configuration characteristics. It is a prerequisite that the requesting party is authorised, i.e. that the requesting party has a formal responsibility in using the Meter, such as Metered Data Collector, Metered Data Responsible and other parties dependent on national regulations (e.g. Energy Supplier and Grid Company), or an explicit consent from the Customer at the Metering Point. The Request metering configuration characteristics process will return all metering configuration characteristics elements the requesting party may need to fulfil its obligations in the energy market or is consented for.
- It is the Meter Operator that is responsible for the metering configuration characteristics, i.e. being the Content Responsible Party. Hence, he will request the Meter Administrator to change the metering configuration characteristics in the Meter administration when needed.
- The metering configuration characteristics can be requested updated to the Meter Operator by an Entitled Party. The Meter Operator will thereafter request the Meter Administrator to change these characteristics.

  Example:

  - An Entitled Party can request the Meter Operator to update the address of the Meter. After the Meter Operator has accepted the update, he will request the Meter Administrator to change the metering configuration characteristics.

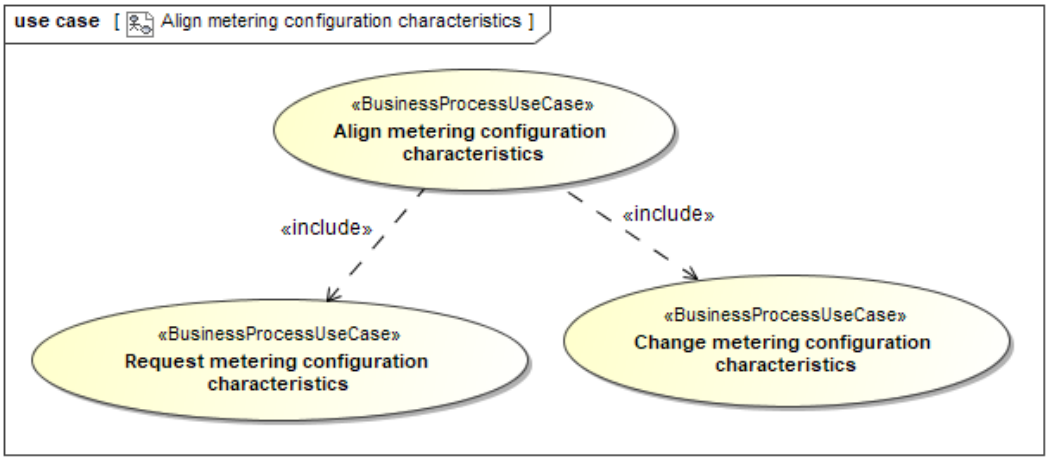


Figure 16 Alignment of metering configuration characteristics

[2] In the Harmonised Electricity Market Role Model [3], a Metering Point may be an Accounting Point or an Exchange Point. Since the Exchange Points are included in the meter administration, we use Metering Points and not Accounting Points in this BRS.

3.1.6 ebIX® BRS for Bulk change of Balance Responsible Party

The ebIX® BRS for Bulk change of Balance Responsible Party (BRP) describes a process where an Energy Supplier can request change of BRP for a bulk of Accounting Points or all Accounting Points in an area, such as a Metering Grid Area (MGA) or Market Balance Area (MBA).

In the process, an Energy Supplier can change the Balance Responsible Party for multiple Accounting Points at one time. The Metering Point Administrator makes all necessary updates for the change, notifies Affected Parties, including distribution of master data for alignment of the business partner administrations.

The process Bulk change of Balance Responsible Party is modelled based on changes to multiple specified Accounting Points or all Accounting Points a Balance Responsible Party is responsible for in an area. When the request is confirmed or rejected, it must be for all Accounting Points in the request. In the rejection, the rejected Accounting Points may be listed for information.

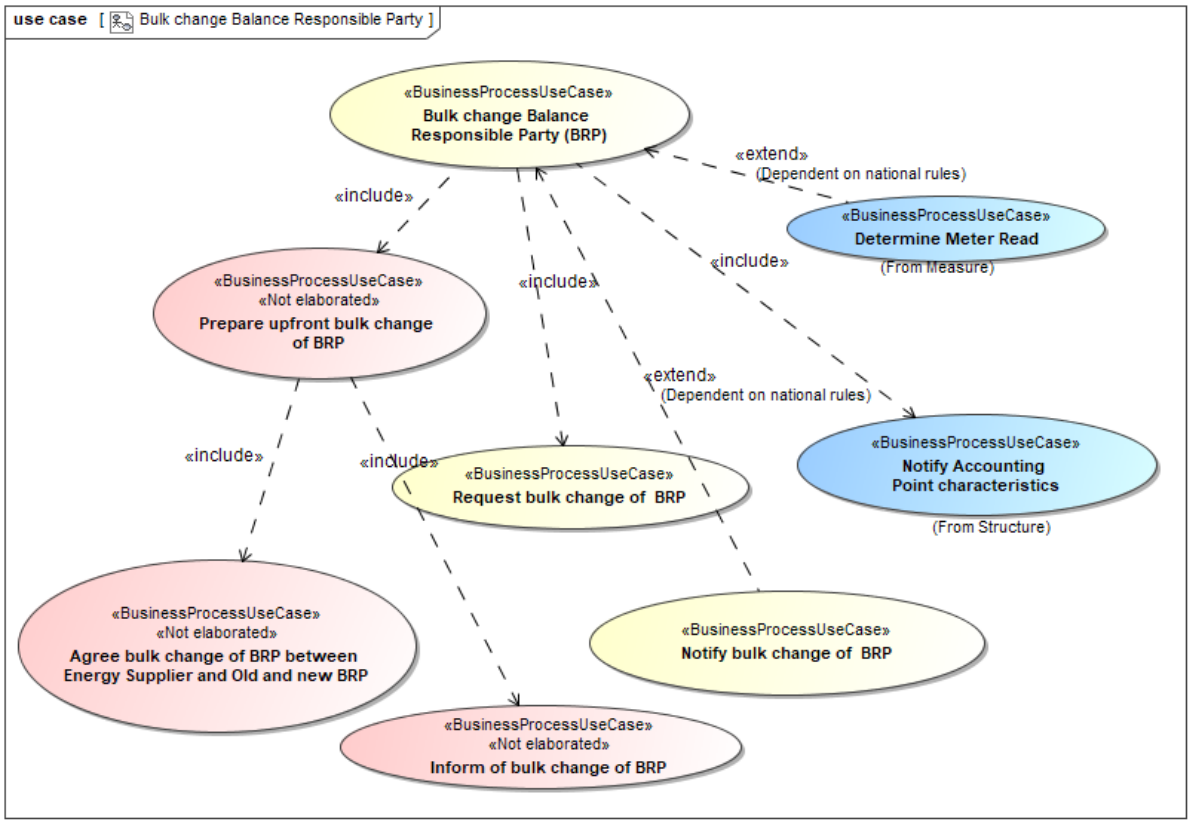


Figure 17 UseCase: Bulk change of Balance Responsible Party

3.1.7 ebIX® BRS for Bulk change of Shipper

The ebIX® BRS for Bulk change of Shipper describes a process where an Energy Supplier can request change of Shipper for a bulk of Accounting Points or all Accounting Points in an area, such as a Metering Grid Area (MGA), a Calorific Value Area or an Aggregated Reception Station.

This is the process where an Energy Supplier can change the Shipper for multiple Accounting Points at one time. The Metering Point Administrator makes all necessary updates for the change, notifies Affected Parties, including distribution of master data for alignment of the business partner administrations.

The process “Bulk change of Shipper” is modelled based on changes to multiple Accounting Points or on all Accounting Points of a Shipper in an area. Which principle to use must be based on national situation or rules. When the request is confirmed or rejected, it must be for all Accounting Points in the request. In the rejection, the rejected Accounting Points may be listed for information.

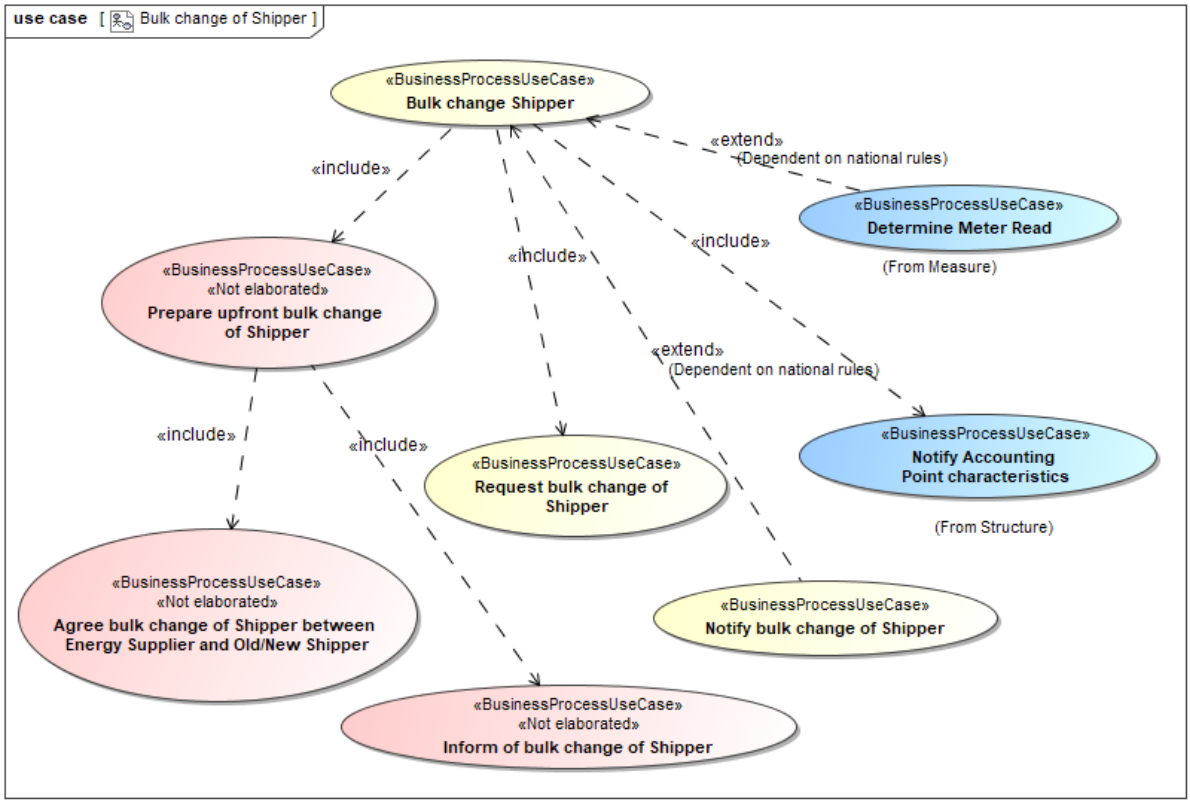


Figure 18 UseCase: Bulk change of Shipper

3.1.8 ebIX® BRS for Change of Balance Responsible Party

The ebIX® BRS for Change of Balance Responsible Party (BRP) describes the process where a new Balance Responsible Party will be registered for an Accounting Point in the Metering Point administration at the request of the Energy Supplier. The Metering Point Administrator confirms the request, makes all necessary updates for the change, informs Affected Parties including distribution of master data for alignment.

The change of BRP may at a national level be handled by other roles than the Energy Supplier, such as the BRP itself or the Party Connected to the Grid.

Depending on national rules or needs of the involved parties, meter reads for the change of Balance Responsible Party may be determined and communicated.

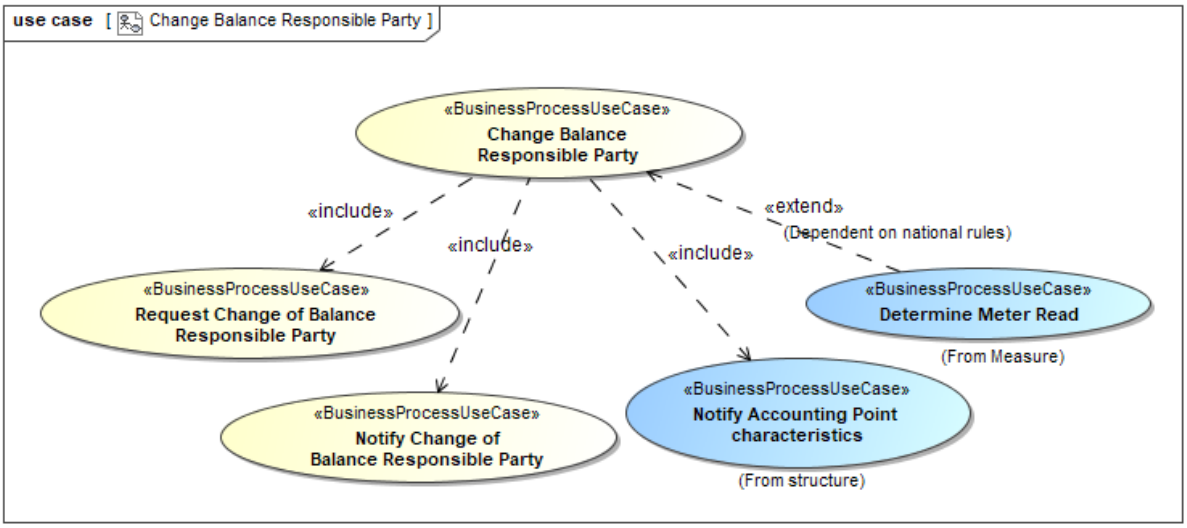


Figure 19 UseCase diagram: Change of Balance Responsible Party

3.1.9 ebIX® BRS for Change of Metered Data Responsible

The ebIX® BRS for Change of Metered Data Responsible describes the process where a new Metered Data Responsible will be registered in the Metering Point administration at the request of the new Metered Data Responsible for an Accounting Point. The Metering Point Administrator makes all necessary updates for the change, including notification to old Metered Data Responsible and distribution of master data for alignment.

A change of meter may be associated with the process of change of the Metered Data Responsible.

The change of the Metered Data Responsible may result in the change of the Metered Data Administrator, as both roles are often within one company.

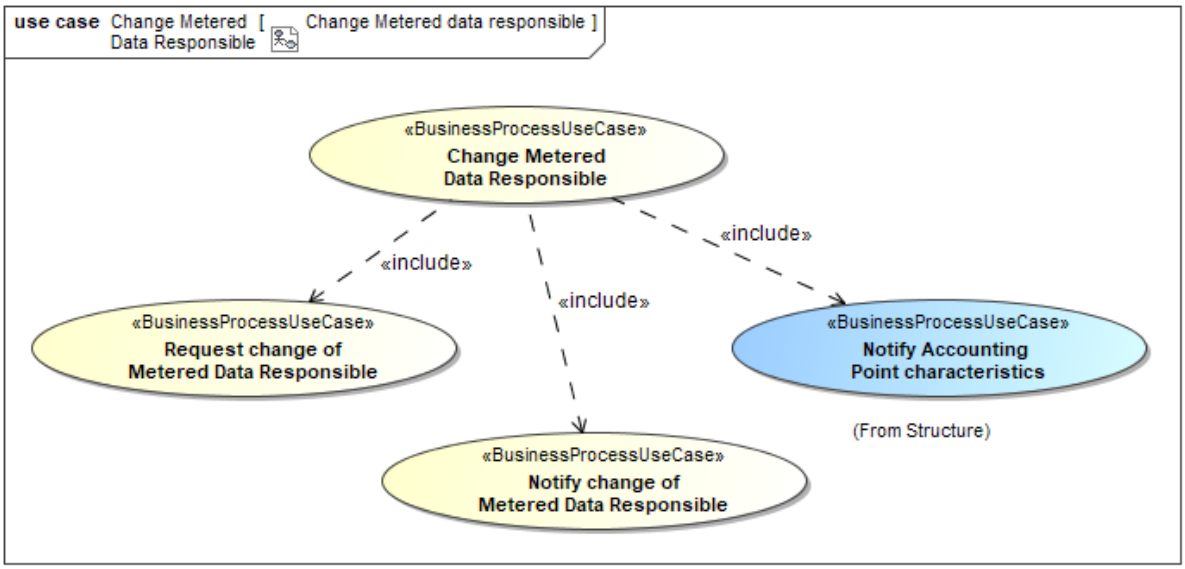


Figure 20 Change of Metered Data Responsible

3.1.10 ebIX® BRS for Change of Shipper

The ebIX® BRS for Change of Shipper describes the process where a new Shipper will be registered in the Metering Point administration at the request of the Energy Supplier for the Accounting Point. The Metering Point Administrator confirms the request, makes all necessary updates for the change and informs Affected Parties, including distribution of master data for alignment. Depending on national rules or needs of the involved parties, meter reads for the change of Shipper may have been determined and communicated.

The change of Shipper may at a national level be handled by other roles than the Energy Supplier, such as the Shipper itself or the Party Connected to the Grid.

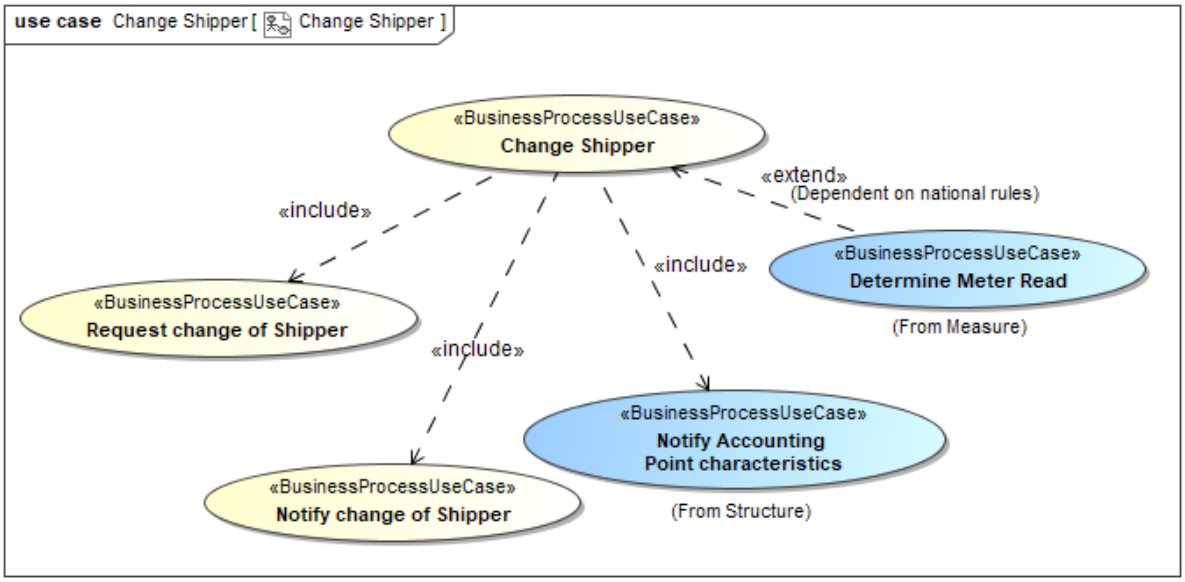


Figure 21 UseCase diagram: Change of Shipper

3.1.11 ebIX® BRS for Change of Supplier

The ebIX® BRS for Change of Supplier is a centrepiece within the Structuring processes. This is the process where an Energy Supplier (together with the Balance Responsible Party or Shipper) will be registered in the Metering Point administration as the new Energy Supplier for the Accounting Point. The Metering Point Administrator makes all necessary updates for the change of Supplier, notifies relevant parties including distribution of Accounting Point characteristics for alignment to the Linked Parties.

The process starts when a Customer and a new Energy Supplier intend to close a contract and initiate a change of Supplier process.

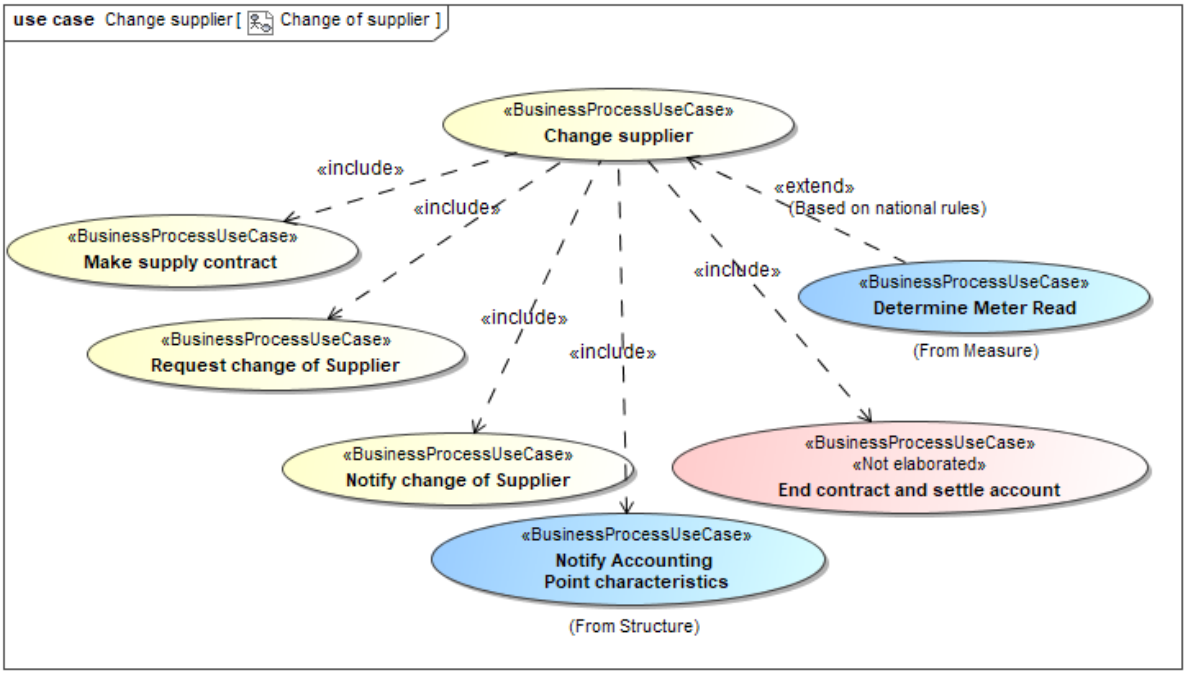


Figure 22 UseCase diagram: Change supplier

3.1.12 ebIX® BRS for Combined grid and supply billing

The ebIX® BRS for Combined grid and supply billing describes a process that enables the Energy Supplier to integrate the grid costs from the Grid Company in its bill to the Customer (to support the supplier centric model). This includes alignment of grid billing characteristics for Metering Grid Areas and individual Accounting Points, determination of quantities, which may include exchange of measured data for grid billing, and calculation of the costs associated with the quantities. Finally the BRS describes the alignment of the grid billing data between the Energy Supplier and the Grid Company.

The ebIX® model assumes a supplier centric market model and one of the centre pieces of a supplier centric market model is a combined grid and supply billing process, where the supplier bills the customer both for the energy supplied and the grid cost. Two distinct models can achieve a combined grid and supply billing process, i.e.:

1) A “subcontractor model” (also called wholesale model and cascading model) where the Supplier bills the Customer for the whole cost, both grid and energy cost. The grid cost is settled between the Grid Company and the Supplier, independent of the settlement with the Customer.
2) A “power of attorney model” where the Grid Company still owns the debt against the customer, even if the grid cost is billed by the supplier.

In the BRS, the subcontractor model is assumed.

In this BRS the role Billing Calculator, responsible for determining quantities and calculating associated grid costs, both on an Accounting Point and aggregated level, is introduced. This role can be performed by the Grid Company itself, a central data hub or the Energy Supplier. Based on national rules where the role is performed, some of the data exchange in this BRS may not be explicit.

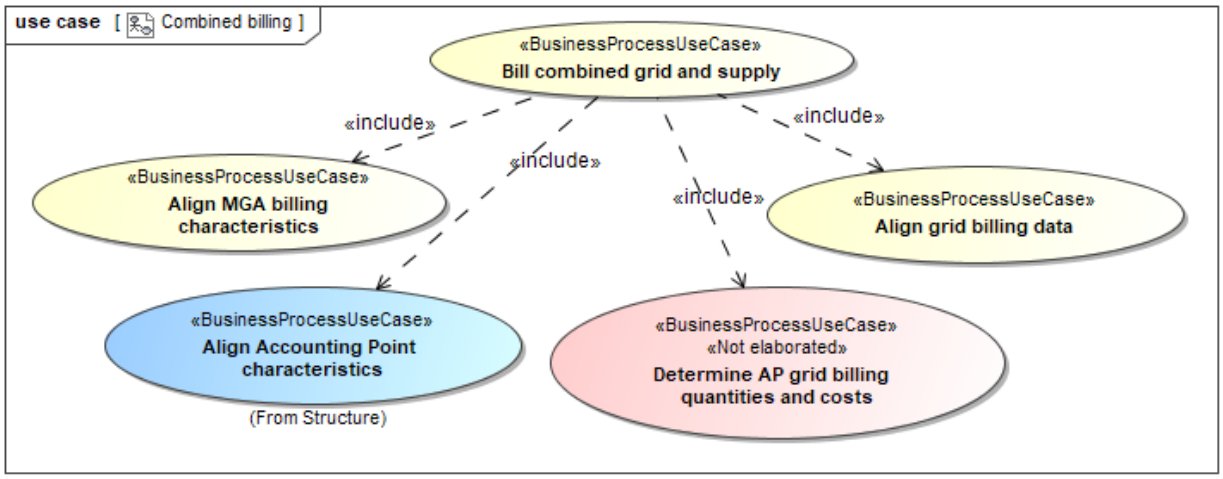


Figure 23 Combined grid and supply billing

3.1.13 ebIX® BRS for ebIX® Consented request for Accounting Point characteristics

The ebIX® BRS for Consented request for Accounting Point characteristics describes a process that can be used as a preparation for other processes, such as change of Supplier, to make these processes more efficient. An Energy Supplier may for instance run the consented request for Accounting Point characteristics to get needed information related to an Accounting Point when a Customer has given its explicit consent in the process for a new supply contract.

Contrary to the request Accounting Point characteristics process, the consented request for Accounting Point characteristics process demands upfront Customer consent and should only return a limited number of Accounting Point characteristics elements, i.e. the elements explicitly consented by the Customer for the Accounting Point.

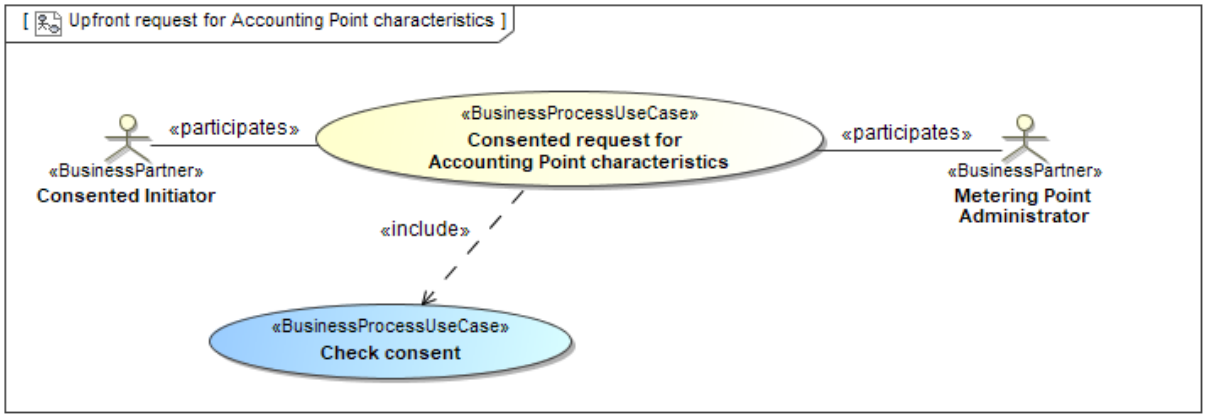


Figure 24 Consented request for Accounting Point characteristics

3.1.14 ebIX® BRS for Customer move

The ebIX® BRS for Customer move describes in general a complex process that potentially involves several parties. In most cases a customer moves into a new Accounting Point and virtually at the same time moves out of an old Accounting Point. The Customer shall always contact the Energy Supplier and no other roles, like the Grid Company (in the role of Grid Access Provider) or the Metering Point Administrator.

In this process, all necessary sub-processes will be fulfilled to move a new Customer into an Accounting Point, i.e. being responsible for the energy consumption at or energy infeed from the Accounting Point. The process includes update of the Energy Supplier, Balance Responsible Party and/or Shipper, in the Metering Point administration. The new Balance Responsible Party or new Shipper will be notified of the Customer move in. Because of the move in, the former Customer will be forced to move out (if not already done in a separate move out process), and the old Energy Supplier, the Consent Administrator, and if needed the old Balance Responsible Party, the old Shipper and the Flexibility Register Administrator will be notified.

The process may include making, or adjusting, a supply contract (which may include making a new grid access contract).

Further, all Linked Parties will get updated Accounting Point characteristics.

Finally, there must be a meter read for the move.

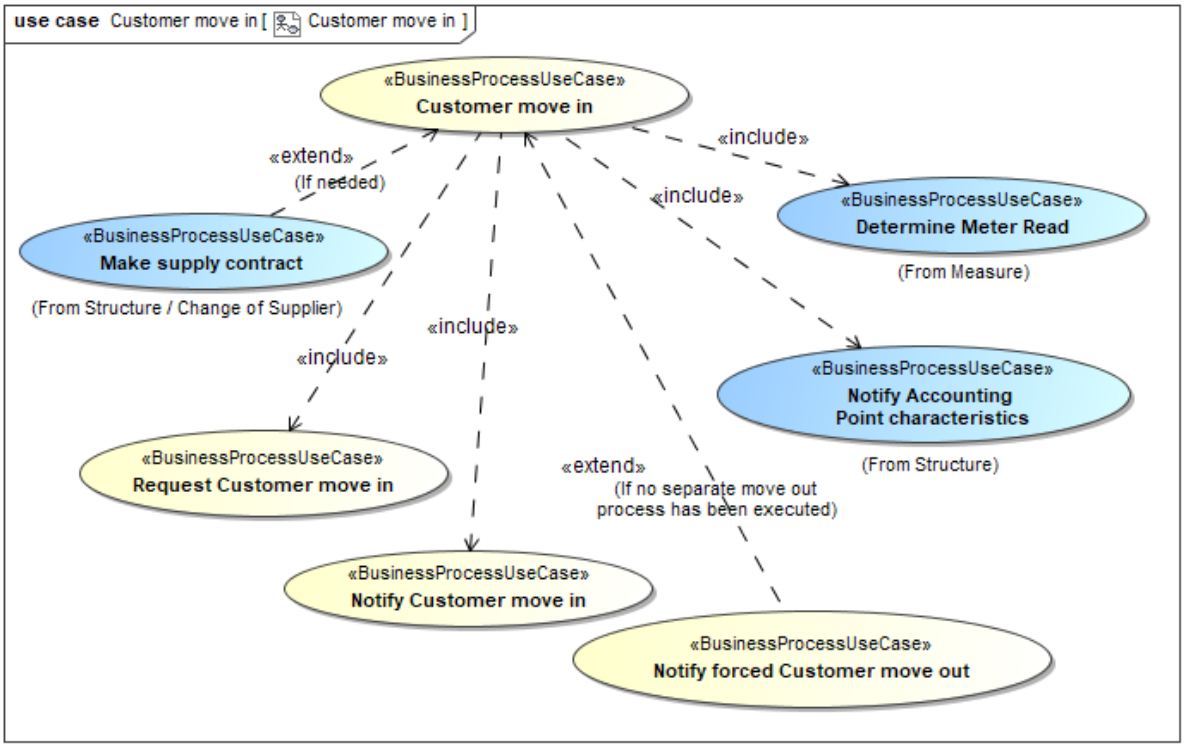


Figure 25 Customer move in

3.1.15 ebIX® BRS for End of Metered Data Responsible

The ebIX® BRS for End of Metered Data Responsible describes a process where the Metered Data Responsible requests end of its responsibility for the Accounting Point by a given date to be registered in the Metering Point administration.

The Metering Point Administrator confirms it and makes all necessary updates for the end Metered Data Responsible, including distribution of master data for alignment of the business partner data bases.

The end of Metered Data Responsible may result in the end of the Metered Data Administrator, as both roles are often within one company.

The end of metered data responsibility may trigger other processes, based on national rules:

- Change of Administrative status of Accounting Point; to be set to inactive.
- Physical disconnection of the Accounting Point.
- Removal of meter(s).

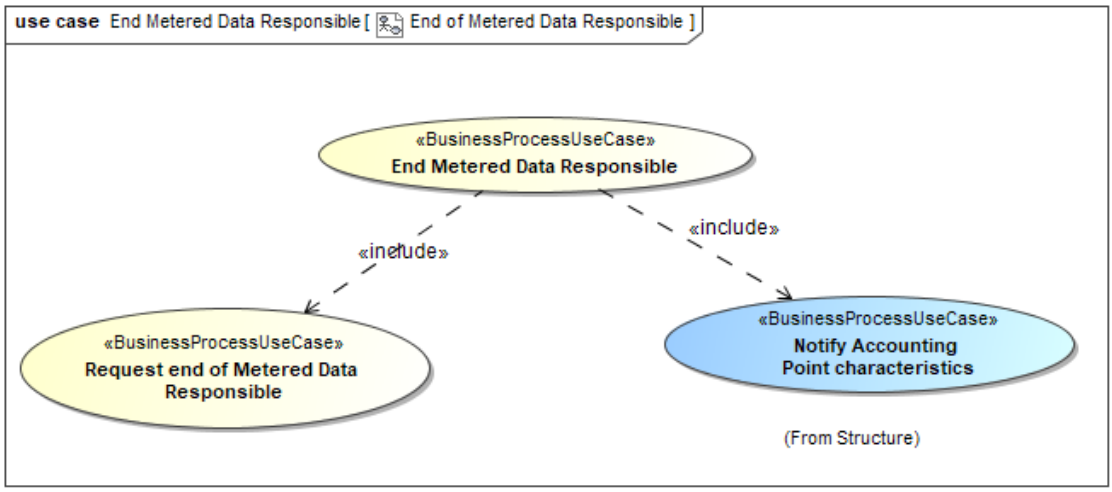


Figure 26 End of Metered Data Responsible

3.1.16 ebIX® BRS for End of Supply

The ebIX® BRS for End of Supply describes a process where the Energy Supplier requests end of supply to be registered by a given date at the Accounting Point in the Metering Point register.

The Metering Point Administrator makes all necessary updates for the end of supply, including distribution of master data for alignment of the business partner data bases.

The end of supply process may trigger other processes, based on national rules:

- Change of Administrative status of Accounting Point; to be set to inactive.
- Change to supplier of last resort or default supplier.
- Physical disconnection of the Accounting Point.

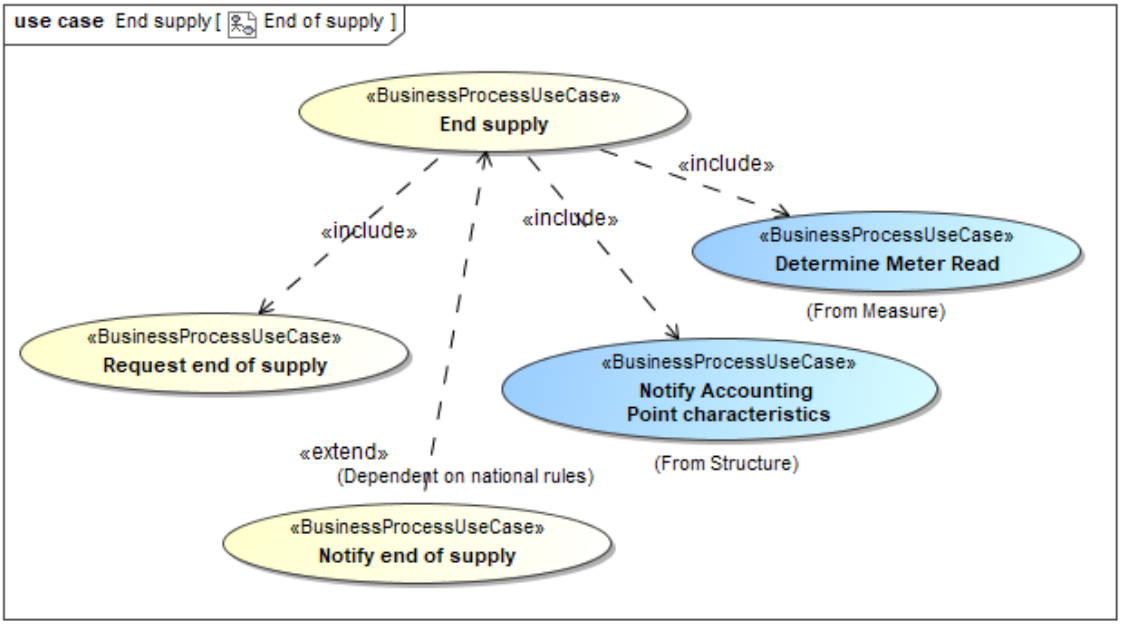


Figure 27 End of supply

3.1.17 ebIX® BRS for Manage Accounting Points

The ebIX® BRS for Manage Accounting Points describes processes related to the lifecycle management of an Accounting Point. In these processes, the Grid Company can create, activate, deactivate and/or decommission an Accounting Point.

In the life cycle of an Accounting Point, the first state is the “Under construction”, which includes issuing of the Accounting Point ID and registration in the Metering Point administration. Thereafter the Accounting Point usually becomes “Connected”. An Accounting Point may be “Connected” and “Disconnected” several times during the lifecycle. Finally, the Accounting Point is “Decommissioned” and can no longer be used.

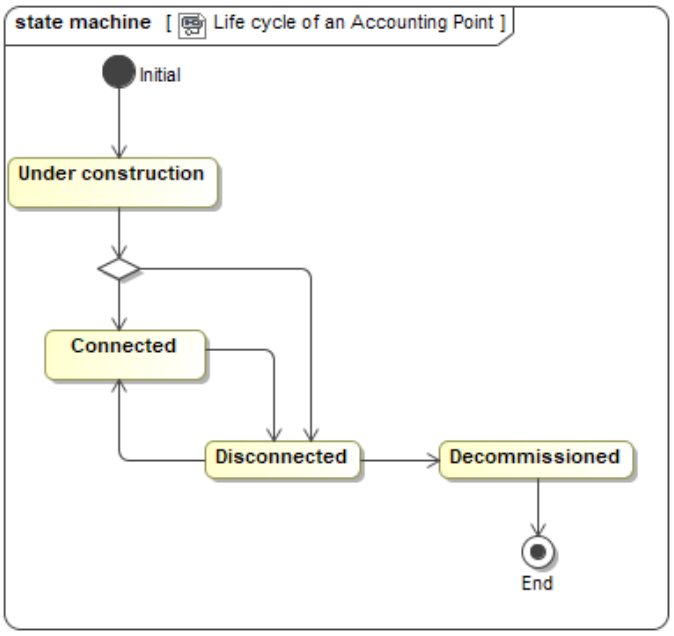


Figure 1 State diagram: Life cycle of an Accounting Point

This is the process where an Accounting Point is created and maintained for usage in market processes or taken out of usage from the market.

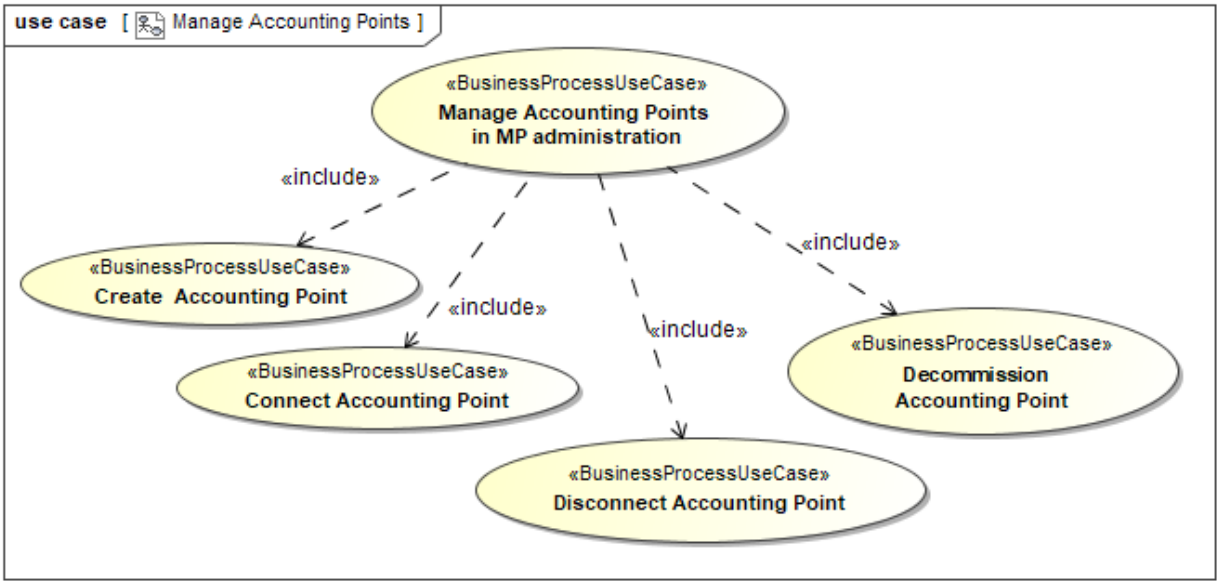


Figure 28 Manage Accounting Points

3.1.18 ebIX® BRS for Rearrange Accounting Points between grids

The ebIX® BRS for Rearrange Accounting Points between grids describes a process where a Grid Company requests an administrative move of one or more Accounting Point(s) from one Metering Grid Area to another Metering Grid Area, most likely under responsibility of another Grid Company. It is a prerequisite that the requesting party is authorised to move the Accounting Point(s), hence the requesting party should be the old Grid Company. The move of an Accounting Point affects all parties linked to that Accounting Point. An example of usage is clean-up of grid structure, such as if a Grid Company has islands with only a few Accounting Points in a different part of a country, then the Grid Company can transfer these Accounting Points to another Grid Company.

In this process, Accounting Point(s) are moved from the responsibility of one Grid Company to another. Consequently, the Accounting Point(s) are moved from one Metering Grid Area, Calorific Value Area or Aggregated Reception Station to another. In other words, the process concerns a group of Accounting Points that will belong to the same new Metering Grid Area, Calorific Value Area or Aggregated Reception Station.

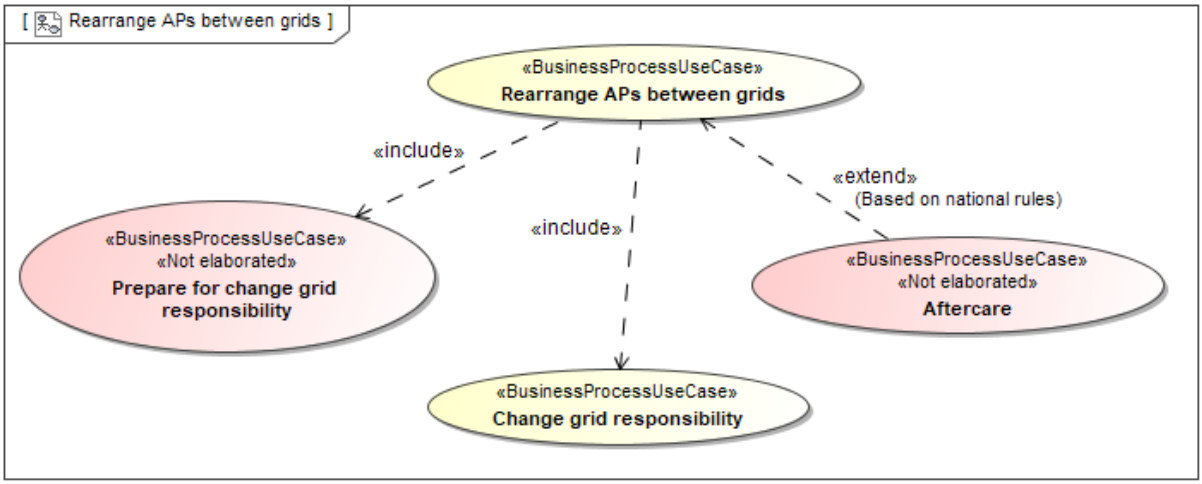


Figure 29 Rearrange Accounting Points between grids

3.2 BRSs related to distribute flexibility services processes

3.2.1 ebIX® BRS for Flexibility register administration

The ebIX® BRS for Flexibility register administration describes the processes needed to administer a Flexibility register for Resources for use in flexibility services.

In this BRS we introduce a flexibility register with a Flexibility Register Administrator, who keeps track of parties (roles), such as the Flexibility Service Provider and it's Balance Responsible Party, and flexibility services related data for Accounting Points and Resources involved in flexibility processes. The Flexibility register is closely related to the Metering Point administration and may, based on national rules, be linked to or added to the Metering Point register. The Flexibility register can, based on national rules, be centralised or distributed.

The Flexibility register will contain the Resources used for flexibility services in the flexibility market and their characteristics, such as status for grid- and/or product pre-qualification and if the Resource is part of a pool of Resources. Such a Flexibility register will ease the access for the Flexibility Service Providers[3] and help System Operators and other market roles to allow flexibility actors in existing and new products.

The BRS describes the process in which a flexibility register is administered and maintained, which among others includes:

- The Flexibility Service Provider registers, updates and ends a Resource in the flexibility register. Based on national and European rules, the registration and update of the flexibility register may include grid pre-qualification information, product pre-qualification information, activation windows and other roles linked to the Resource.
- End of Resource registration if the Customer linked to the Resource moves out of the Accounting Point.

An Entitled Role for Flexibility Register Information can request information from the flexibility register or be notified by the Flexibility Register Administrator when registration, update or end of a Resource or the related Flexibility Service Provider has occurred. It is assumed that, when the Customer moves out of the linked Accounting Point, the Resource is ended and the Flexibility Register Administrator will notify linked roles.

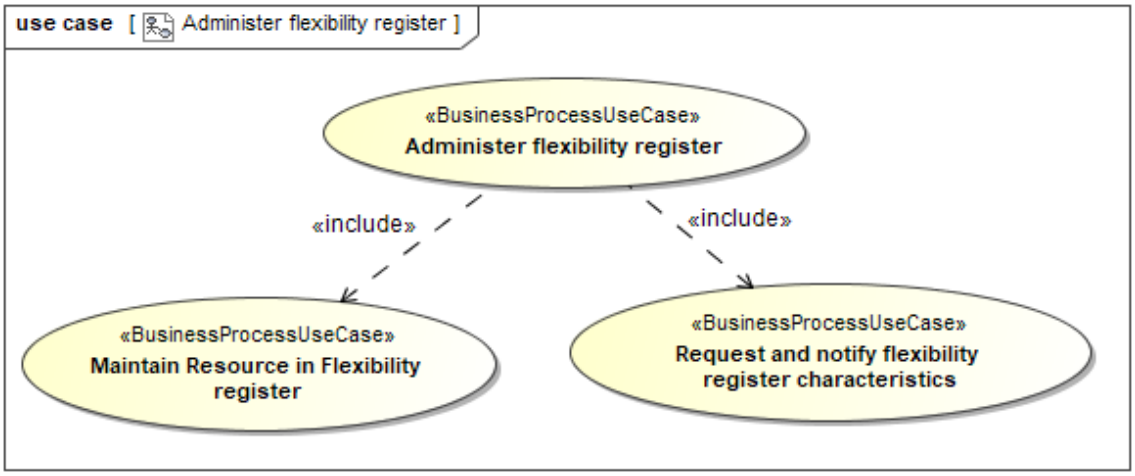


Figure 30 Flexibility register administration

[3] Sometimes called (Resource) Aggregator.

3.2.2 ebIX® BRS for Prepare and aggregate Resources for flexibility services

The ebIX® BRS for Prepare and aggregate Resources for flexibility services describes the processes needed to prepare and aggregate Resources for use in flexibility services. In these processes the Flexibility Service Provider prepares and equips one or more Resources for offering flexibility services, including verifying, contracting, registering and qualifying the Resources (grid pre-qualification and product pre-qualification), in order to use the Resource(s) in a flexibility product or to aggregate the Resource(s) in flexibility services pool(s) and to prepare the pool(s) for operation.

The Flexibility Service Provider plays a dominant role in this BRS. Most processes modelled in this BRS are focused around the individual Resource at an Accounting Point or a pool of Resources, from where the flexibility service is to be delivered. The two core processes are:

Prepare Resource(s): The Flexibility Service Provider onboards and adjusts a Resource for a flexibility product or a pool of Resources, including verification and preparation of the Resource, such as added remote control equipment, and other contractual and/or technical metering configuration requirements.

Aggregate Resources for pool(s)": The Flexibility Service Provider aggregates Resources for a pool of Resources and prepares the pool(s) for a flexibility service offering or product. The process may, if needed by national rules, include "product pre-qualification" and/or "grid pre-qualification".

In this BRS we introduce two new roles, one that is responsible for grid pre-qualification and one that is responsible for product pre-qualification:

The **Flexibility Grid Qualifier** is a party responsible for pre-qualifying a Resource or a pool of Resources for specific requirements in an energy grid. The grid pre-qualification includes a verification if the grid can (technically) accept the delivery of flexibility services from the Resource or pool of Resources. The Flexibility Grid Qualifier may be a role within, or closely linked to, a System Operator (DSO or TSO).

The **Flexibility Product Qualifier** is a party responsible for pre-qualifying a Resource or a pool of Resources for a specific product for delivery of flexibility services to the energy market. The product pre-qualification includes an assessment whether the Resource or the pool of Resources meets the requirements of the product.

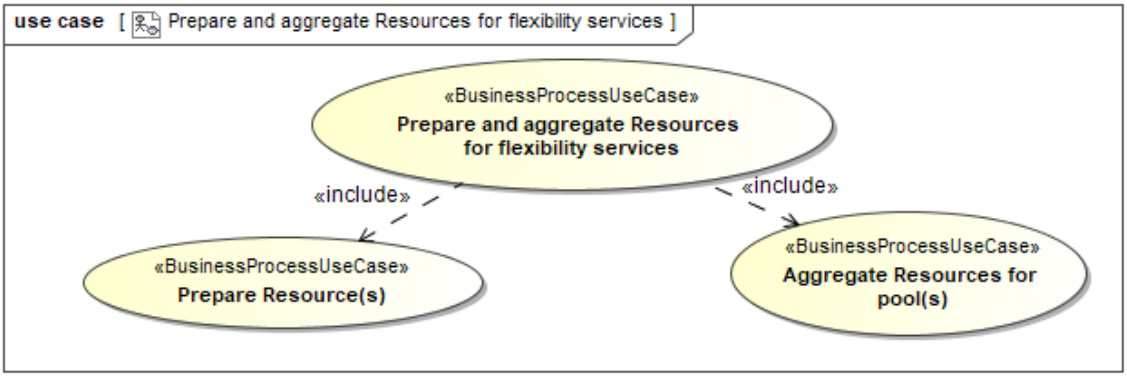


Figure 31 Prepare and aggregate Resources for flexibility services

3.2.3 ebIX® BRS for Quantification and settlement of flexibility services

The ebIX® BRS for Quantification and settlement of flexibility services describes the processes and the exchange of information related to quantification and settlement of flexibility services.

In this process the Flexibility Settlement Responsible quantifies and settles volumes of flexibility services and communicates the result to the Entitled Roles. Hence, the process includes the Flexibility Settlement Responsible receiving or requesting measured data for quantification and settlement of flexibility services, either from the Metered Data Administrator or the Metered Data Collector. Also he receives the reference line (also called baseline) from the Reference Line Responsible, who determines the reference line, either based on schedules or based on actual production/consumption measurements.

Delivered (and non-delivered) quantities are quantified based on measured data, the established reference line and requested activation signals before the determined flexibility volume is sent from the Flexibility Settlement Responsible to the Flexibility Service Provider and other Entitled Roles.

For contracted available capacity, the agreement is the basis for the settlement.

Thereafter the agreed flexibility services (delivered services and, if applicable, contractual conditions) are settled between the Flexibility Service Provider and the Buyer of Flexibility and if needed (dependent on market rules and the used services) compensation of the Energy Supplier for the energy volume and/or compensation of the imbalances between the Balance Responsible Parties involved.

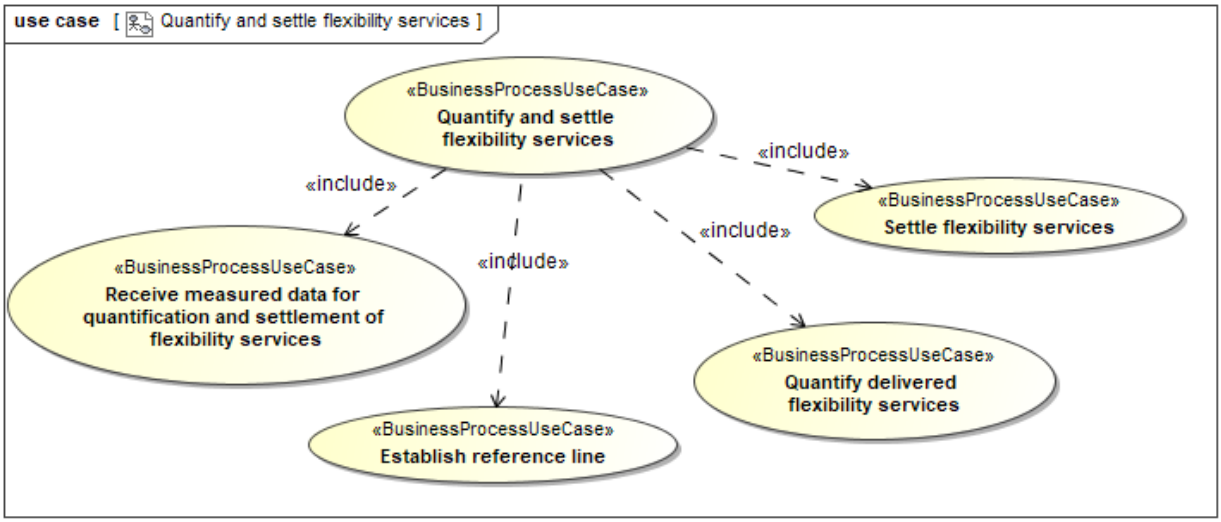


Figure 32 Quantify and settle of flexibility services

3.3 BRSs related to measure processes

3.3.1 ebIX® BRS for Measure for Billing

The ebIX® BRS for Measure for Billing is a business requirements specification for the process to exchange measured and validated data for billing energy and grid cost, both for the electricity- and gas sectors. This is the process where validated measured data for a Metering Point for the process of billing (energy and/or grid cost) is provided to the Energy Supplier, Grid Company and Billing Calculator, and if applicable to the Consented Party.

In addition information about calorific values are established, published (and distributed) for billing gas volumes for an Accounting Point.

This BRS regards Customer related validated measured data for billing of Accounting Points and for billing related to Exchange Points between grids (Metering Grid Areas). Customer privacy protection is supposed to be based on GPDR.

The basis for this BRS is validated measured data that have been exchanged from a Validator (harmonised role: Metered Data Responsible) to the Metered Data Administrator, who is responsible for distribution of the validated measured data to all entitled parties. Normally, validated measured data for billing for Accounting Points are always sent to the Energy Supplier and in addition, depending on national rules, to the Grid Company and Billing Calculator. Also, validated measured data for billing for Exchange Points may be sent to the Grid Companies connected to the Exchange Point.

If applicable, validated measured data for billing of an Accounting Point will also be sent to Consented Parties.

Part of the billing of gas volumes includes the calorific value of the gas for the Accounting Point to be billed. For this reason, the publication of the calorific values is included in this BRS.

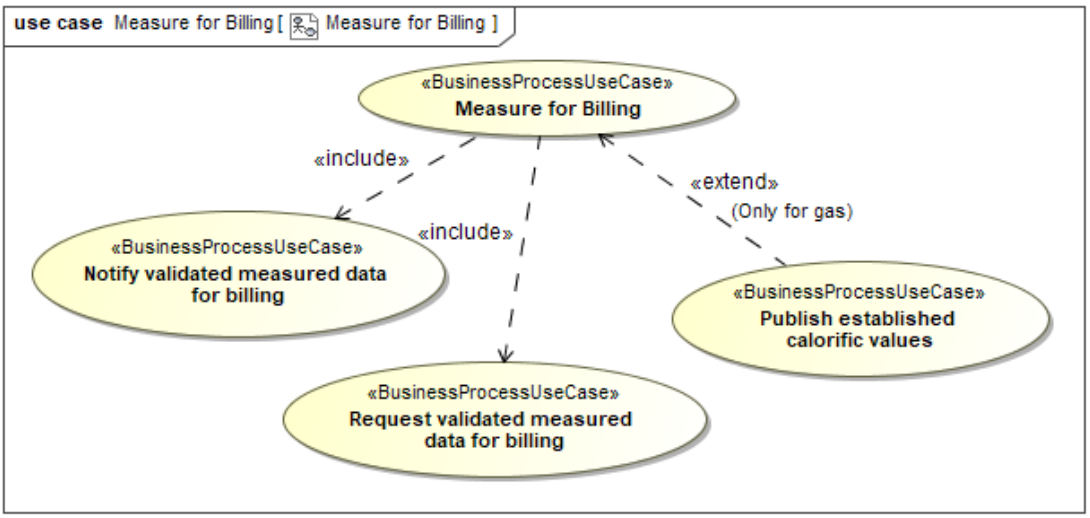


Figure 33 Measure for Billing

3.3.2 ebIX® BRS for Collect and distribute measured data

The ebIX® BRS for Collect and distribute measured data describes the process where a Metered Data Collector[4] periodically or on request collects and distributes (notify or on request) collected measured data to the Metered Data Responsible.

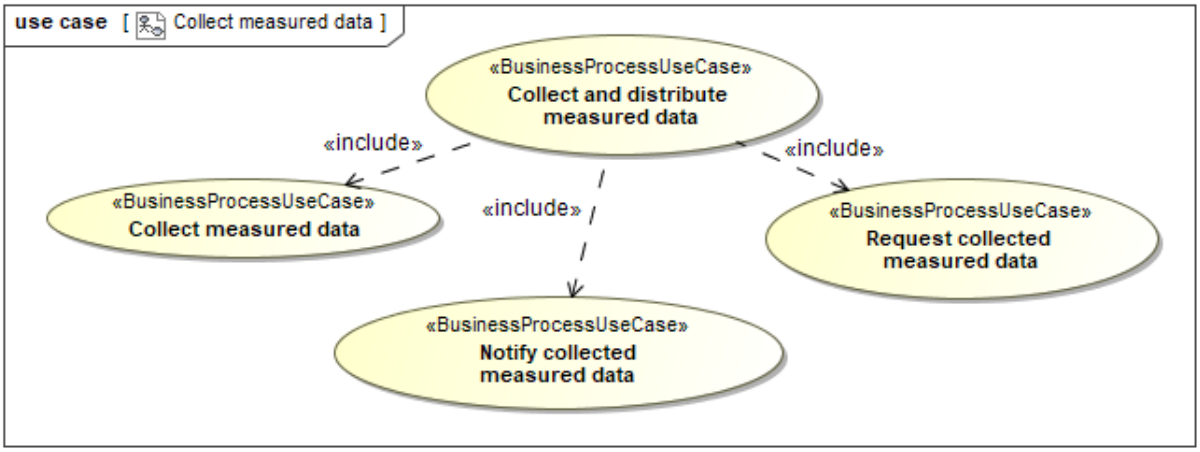


Figure 34 Collect and distribute measured data

[4] it is assumed that the Metered Data Collector does not store collected metered data

3.3.3 ebIX® BRS for Measure for Determine and notify validated meter read

The ebIX® BRS for "Determine and notify validated meter read" describes the processes regarding the measured data for determining and exchanging a validated meter read for a switch (such as change of supplier, change of Balance Responsible Party, Customer move, etc.) or other changes that require a validated meter read, both for electricity and for gas.

This is the process where the Metered Data Responsible, triggered by a notification of a change in the Accounting Point characteristics (such as change of supplier or customer move) from the Metering Point Administrator, will determine a validated meter read, and if applicable the associated volume, for an Accounting Point at change date and distribute the validated meter read and the volume via the Metered Data Administrator.

In this process the Metered Data Responsible may request the Metered Data Collector to collect a meter read on the change date.

It all starts with a trigger from a relevant change of master data, for example as an effect after a customer finding a new Energy Supplier or notifies that he has moved, or the Grid Company has changed the metering or settlement method. In some cases the customer may also present a recent meter reading to his contact (the Energy Supplier). In these cases the Energy Supplier will from thereon start the necessary procedures like requesting the Metering Point Administrator to change master data for an Accounting Point. In any case of changing Accounting Point characteristics, the Metering Point Administrator will notify the Metered Data Responsible of the changed characteristics, when relevant triggering the Metered Data Responsible that there is a need for a validated meter read at the change date. In case the Metered Data Responsible has no recent validated meter read available (either from the customer or from some other source) he will ask the Metered Data Collector to collect the data.

It is assumed that the availability of a validated meter read at the Metered Data Responsible will trigger the next relevant measure process(es), such as Measure for Reconciliation or Measure for Billing.

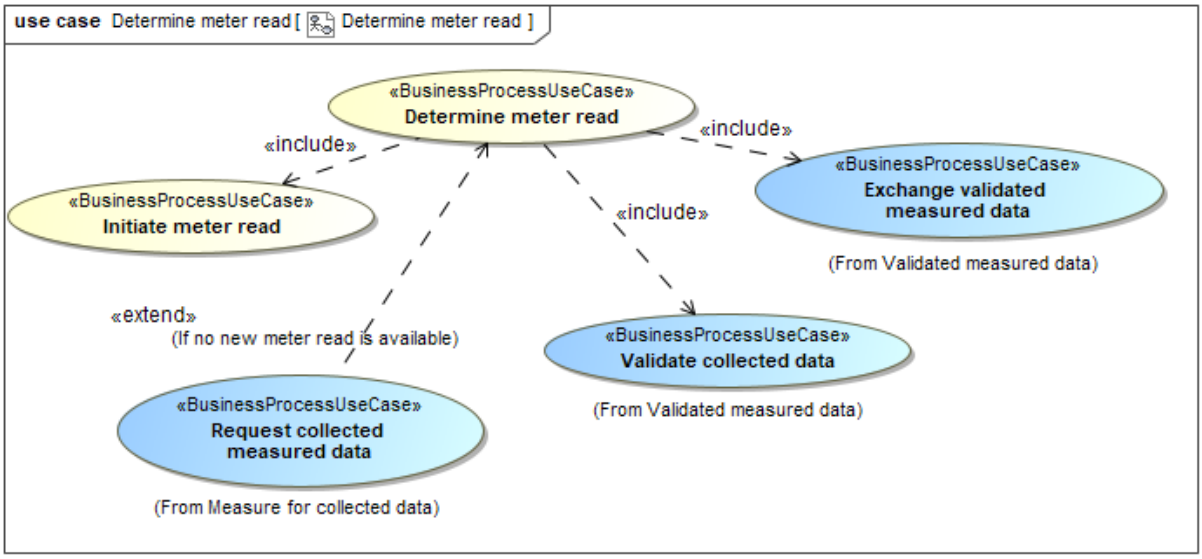


Figure 35 Determine and notify validated meter read

3.3.4 ebIX® BRS for Measure for reconciliation

The ebIX® BRS for Measure for reconciliation regards the processes related to the validated measured data for reconciliation exchanged between Metered Data Administrator and the Reconciliation Responsible.

In this process the Metered Data Administrator notifies validated measured data from Accounting Points for reconciliation to the Reconciliation Responsible.

This BRS regards the exchange of validated measured data for (profiled) Accounting Points between the Metered Data Administrator and the Reconciliation Responsible, to enable the Reconciliation Responsible to run the reconciliation (recalculation of preliminary assigned (estimated) energy volumes to the Balance Responsible Party and Energy Supplier) for the Accounting Points in question. Normally the Metered Data Administrator will notify the validated measured data for the profiled Accounting Points on schedule or when received, to the Reconciliation Responsible. Occasionally the Reconciliation Responsible can request validated measured data from the Metered Data Administrator.

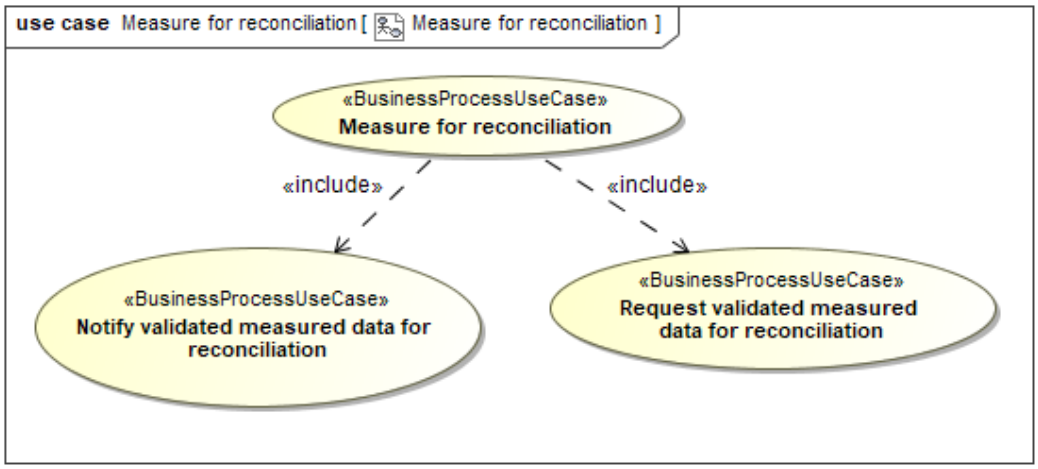


Figure 36 Measure for reconciliation

3.3.5 ebIX® BRS for Measure for Imbalance settlement

The ebIX® BRS for Measure for imbalance settlement regards validated measured data used for imbalance settlement, both data for individual Metering Points (Accounting Points and Exchange Points), aggregated data for areas and for exchange between areas. Customer privacy protection is supposed to be based on GPDR.

The basis for this BRS is validated measured data from a Metered Data Responsible, who is responsible for the validation of measured data for imbalance settlement, sent to the Metered Data Administrator, who is responsible for the distribution of the validated measured data for imbalance settlement. The starting point for this BRS is the Metered Data Administrator distributing validated measured data used for imbalance settlement to “entitled roles for validated measured data for imbalance settlement”, i.e. Balance Responsible Parties, Metered Data Aggregator(s) and Consented Parties.

The Metered Data Aggregators are thereafter responsible for the aggregation of the individual validated measured data used for imbalance settlement. The validated measured data used for imbalance settlement may be aggregated based on different aggregation criteria, such as:

- For all validated measured data in an area.
- For all Exchange Points between two areas.
- For a certain Balance Responsible Party in an area.
- For a certain Balance Responsible Party and Energy Supplier in an area.

Aggregated validated measured data used for imbalance settlement is sent from the Metered Data Aggregator to “entitled roles for aggregated validated measured data per area”, i.e. Balance Responsible Parties, Energy Suppliers and Imbalance Settlement Responsible.

Aggregated validated measured data of the energy exchanged between two areas is sent per neighbouring area to the Imbalance Settlement Responsible involved and the neighbouring Metered Data Aggregator. In some countries, such as the four Nordic countries, the Imbalance Settlement Responsible is responsible for confirmation of the received aggregated validated measured data for Exchange Points for a neighbouring area to the two concerned Metered Data Aggregators. The confirmation includes a matching of the aggregated validated measured data per neighbouring area from the other Metered Data Aggregator and may be split into an intermediate and a final confirmation, the latter to be sent after gate closure.

If needed, all entitled roles can request validated measured data used for imbalance settlement for Metering Points, aggregated for an area or for exchanged energy between areas.

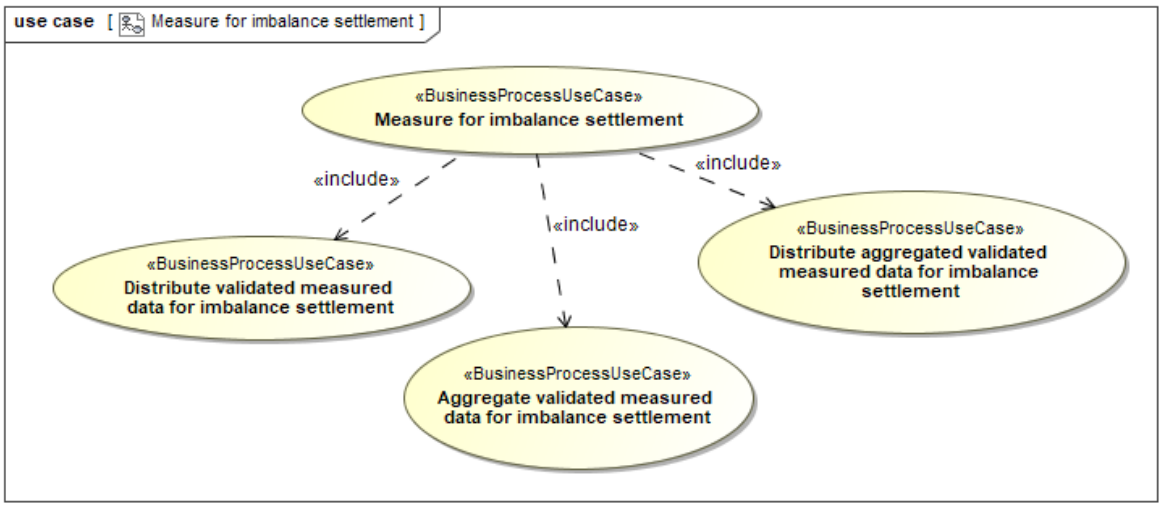


Figure 37 Measure for imbalance settlement

3.3.6 ebIX® BRS for Measure for renewable energy certificates

The ebIX® BRS for Measure for renewable energy certificates regards the processes related to the exchange of information related to measured data for renewable energy certificates (also called green certificates) for electricity. This document was earlier called BRS for Measure for Labelling.

In this process the Metered Data Administrator provides validated measured data for use in the renewable energy certificate process to the Certificate Issuer. If the Certificate Issuer needs to, validated measured data for renewable energy certificates can be requested from the Metered Data Administrator.

These requirements describe the exchange of validated measurement data from the Metered Data Administrator to the Certificate Issuer, to be used when preparing certificates to be sent to AIB (Association of Issuing Bodies) for storage, publication and finally redemption. We therefore assume:

- That collected measured data, resulting in validated measured data, may be obtained from (Registers of) Energy Meters either directly linked to a production Resource or linked to an Accounting Point.
- The validated measured data are always exchanged per Accounting Point, but the specification of the origin of the data has two options, either a generated quantity measured at the production Resource, or a quantity delivered to the grid (as established at the Accounting Point).

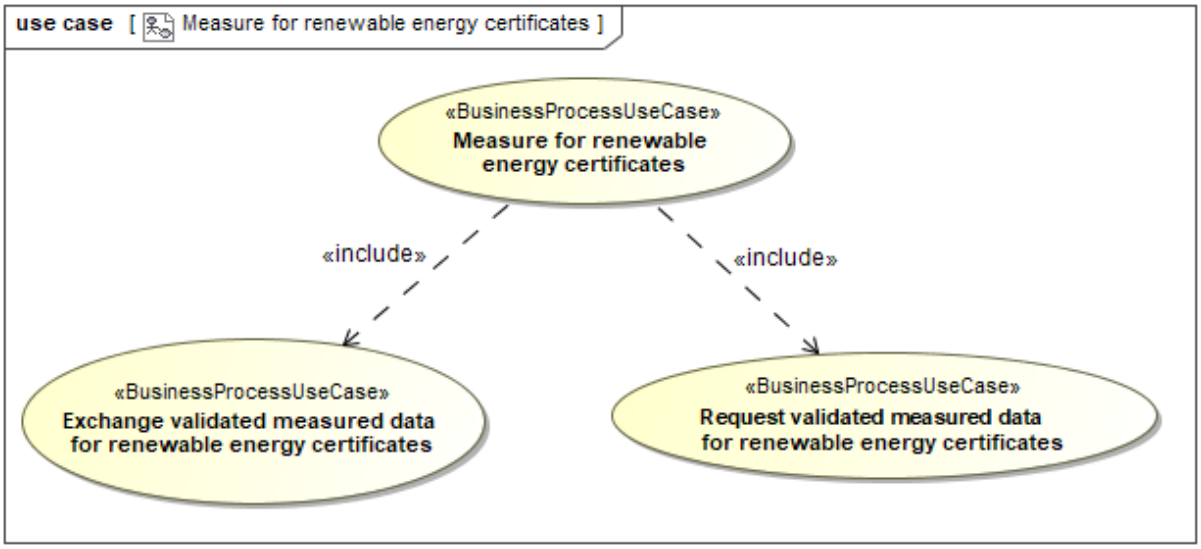


Figure 38 Measure for renewable energy certificates

3.3.7 ebIX® BRS for Validate and notify measured data

The ebIX® BRS for Measure for Validate and notify measured data regards the processes related to the process of validating measured data and the notification of these from the Metered Data Responsible (responsible for validating the measured data) to the Metered Data Administrator.

It all starts at the Metered Data Responsible, normally receiving collected data from the Metered Data Collector. These collected data are validated according to national rules. If no collected data is received within a time frame based on national rules, the Metered Data Responsible will calculate or estimate based on national rules the validated measured data. After validation or calculation, the validated measured data are sent to the Metered Data Administrator.[5]

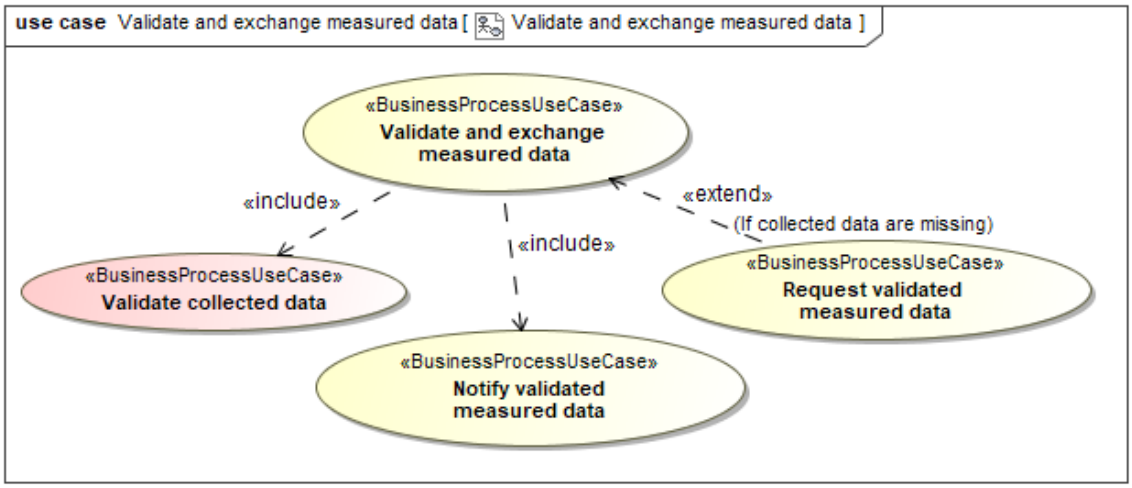


Figure 39 Validate and notify measured data

[5] The Metered Data Administrator is responsible for distribution of the validated measured data to all entitled parties, such as the Energy Supplier, Grid Company, Balance Responsible Party and Consented Parties.

Appendix A. Brief inroduction to UML

A.1. Terms

Choice: A choice is a concept to represent decision points. It is represented using a diamond-shaped symbol with multiple outgoing arrows, each labelled with a condition or constraint. When a choice is encountered the condition(s) associated with each outgoing arrow are evaluated and the path that matches the condition is selected.

Classifier: A classifier is a fundamental concept used to represent any entity that has certain characteristics and behaviours. It serves as a generalisation for classes, interfaces, components, and other UML elements that share common attributes and operations. It describes a set of instances that have features in common.

Fork: A fork is a control node used in activity diagrams to represent the simultaneous execution of multiple actions or paths. It is part of the flow control mechanisms in UML that allow the workflow to split into parallel threads of execution. The fork symbol in an activity diagram looks like a horizontal bar with one incoming flow and multiple outgoing flows, where each outgoing flow represents a separate parallel thread of execution.

When a fork is encountered during the execution of an activity, it creates multiple concurrent flows, each proceeding independently and simultaneously. These parallel flows represent different actions or tasks that can be executed concurrently, enabling the model to represent concurrent and parallel behaviour within a system.

See also Join.

Guard: A guard represents a Boolean expression that must be satisfied for a particular transition to occur. It specifies a condition that is evaluated when an event is triggered, and if the condition evaluates to true, the transition is allowed to happen. If the guard condition evaluates to false, the transition is blocked, and the object or system remains in its current state. Guards are denoted within square brackets “[ ]”.

Join: A join is a control node used in activity diagrams to represent the merging or synchronisation of multiple parallel threads of execution. It is part of the flow control mechanisms in UML that allow the workflow to join back together after branching into parallel flows using Forks. The join symbol in an activity diagram looks like a horizontal bar with multiple incoming flows and one outgoing flow, where each incoming flow represents a separate parallel thread of execution, and the outgoing flow represents the single merged flow.

When a join is encountered during the execution of an activity, it waits until all the incoming flows to the join node are completed or enabled. Once all the incoming flows are ready, the join node merges the concurrent flows, and the activity proceeds with a single thread of execution.

Package: A package is used to group elements and provides a namespace for the grouped elements. A package can be contained in other packages.

A.2. UseCases and UseCase diagrams

UseCase Diagrams are a specialisation of Class Diagrams such that the Classifiers shown are restricted to being either Actors or UseCases.

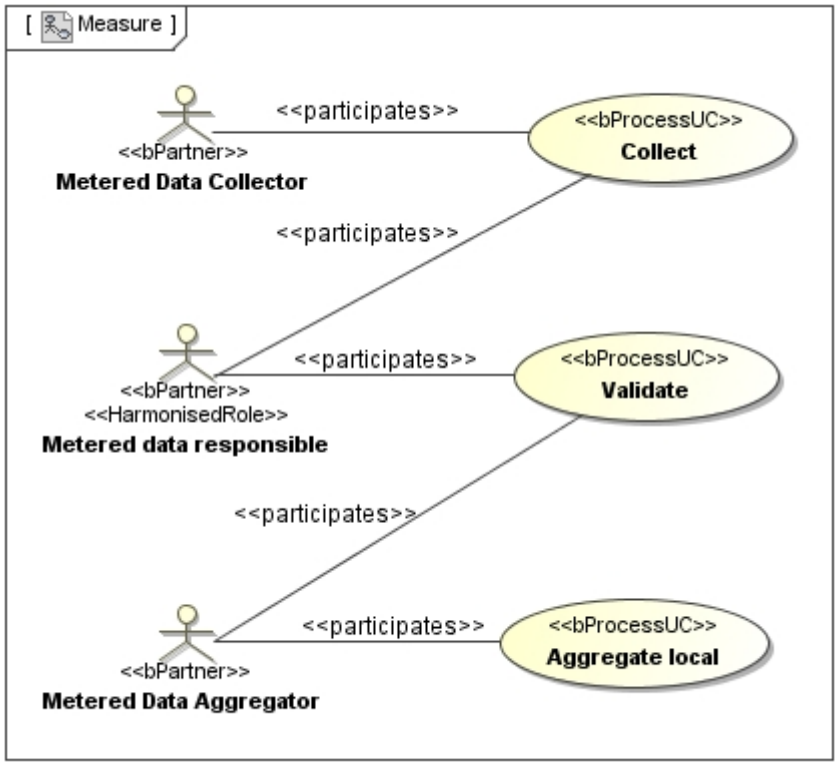


Figure 40 UseCase diagram

A.2.1. UseCase

Typically UseCases are used to capture the requirements of a process, that is, what the process is supposed to do. The key concepts associated UseCases are actors, UseCases, and the subject. The subject is the process under consideration to which the UseCases applies. The users and are represented as actors. The required behaviour of the subject is specified by one or more UseCases, which are defined according to the needs of the actors. UseCases and actors are described using UseCase diagrams.

A.2.2. Actor

An Actor models a type of role played by an entity that interacts with the subject (e.g., by exchanging signals and data). Actors represent roles played by a Business Partner.

An "actor" represents an external role that interacts with a process. Actors are among others used in UseCase diagrams and activity diagrams to model the roles that initiate and participate in interactions with the process. Actors help to identify and depict the roles that interact with a system, aiding in understanding the process's UseCases and the relationships between the UseCases and its users. An actor is represented by “stick man” icon with the name of the actor below the icon.

A.2.3. Relationships

There are four basic relationships that can be used within UseCase diagrams:

- Relationship between *Actors* and *UseCases*:
  - Association
- Relationship between *Actors*:
  - Generalisation
- Relationship between *UseCases*:
  - Include
  - Extend

A.2.3.1. Association

An association describes a relationship between an Actor and a UseCase. In UMM the association is stereotyped «participates» to show that the Actor is participating in the UseCase. .

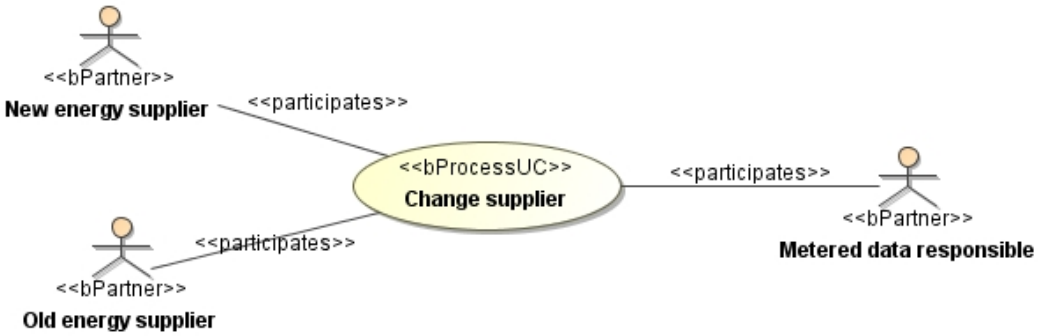


Figure 41 Association

A.2.3.2. Generalisation

A generalisation is a taxonomic relationship between a more general actor and one or more specialisations of this general actor. Each instance of the specific Classifier Is also an indirect instance of the general Classifier. Thus, the specific Classifier inherits the features of the more general Classifier.

A Generalisation is shown as a line with a hollow triangle as an arrowhead between the symbols representing the involved Classifiers. The arrowhead points to the symbol representing the general Classifier.

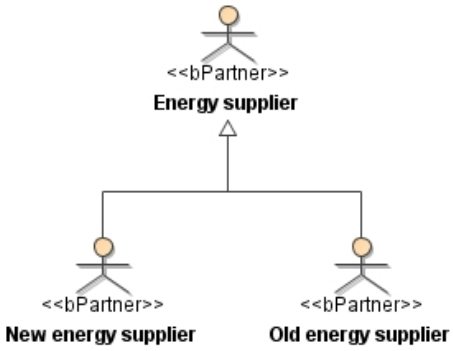


Figure 42 Generalisation

A.2.3.3. Extend relationship

The extend relationship specifies that the behaviour of a UseCase may be extended by the behaviour of another (usually supplementary) UseCase. The extension takes place at one or more specific extension points defined in the extended UseCase. Note, however, that the extended UseCase is defined independently of the extending UseCase and is meaningful independently of the extending UseCase. Note that the same extending UseCase can extend more than one UseCase. Furthermore, an extending UseCase may itself be extended. It is a kind of *Directed Relationship*, such that the source is the extending UseCase, and the destination is the extended UseCase.

An extend relationship between UseCase s is shown by a dashed arrow with an open arrowhead from the UseCase providing the extension to the base UseCase. The arrow is labelled with the keyword «extend». The condition of the relationship as well as the references to the extension points are optionally shown in a Note attached to the corresponding extend relationship.

A.2.3.4. Include relationship

An include relationship between two UseCases means that the behaviour defined in the including UseCase is included in the behaviour of the base UseCase. The include relationship is intended to be used when there are common parts of the behaviour of two or more UseCases. This common part is then extracted to a separate UseCase, to be included by all the base UseCases having this part in common. Since the primary use of the include relationship is for reuse of common parts, what is left in a base UseCase is usually not complete but dependent on the included parts to be meaningful. This is reflected in the direction of the relationship, indicating that the base UseCase depends on the addition but not vice versa.

Execution of the included UseCase is analogous to a subroutine call. All the behaviour of the included UseCase is executed at a single location in the included UseCase before execution of the including UseCase is resumed.

An include relationship between UseCase s is shown by a dashed arrow with an open arrowhead from the base UseCase to the included UseCase. The arrow is labelled with the keyword «include».

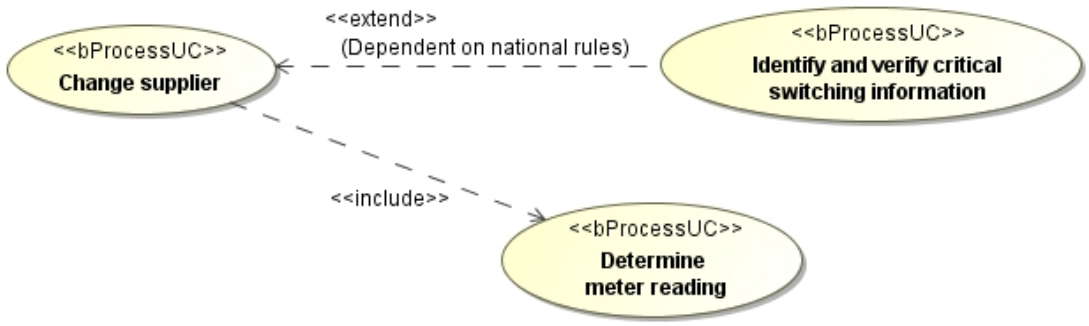


Figure 43 UseCase diagram with include and extend relations

A.3. Actions, Activities and Activity diagrams

Actions, Activities, and Activity diagrams are related concepts used to model the dynamic behaviour of a process or a system. They are primarily used to represent the flow of actions or steps involved in completing a process or accomplishing a specific task.

A.3.1. Actions

Actions are the individual steps or behaviours that can be performed within a system. They represent the smallest unit of behaviour in an activity diagram. Actions can be simple, like assigning a value to a variable, or complex, involving multiple sub-actions.

A.3.2. Activities

Activities are higher-level descriptions of behaviour that consist of a collection of interconnected actions. They represent a set of actions that are performed in a defined sequence to achieve a specific goal or produce a desired outcome. Activities can be used to model processes, workflows, algorithms, or any series of steps required to accomplish a task.

A.3.3. Activity Diagrams

Activity diagrams are graphical representations used to visualise the flow of activities and actions within a system. They provide a clear and intuitive way to represent complex processes or workflows. Activity diagrams use various symbols, such as nodes, edges, initial and final nodes, decision points, and Forks, to depict the sequence of actions and decision-making paths.

In an activity diagram, actions are represented as nodes, and arrows (edges) connect these nodes to show the flow of control between actions. Decision points and branching conditions are used to represent Choices or alternative paths in the flow of the activity.

Within UMM, activity diagrams are especially useful for modelling business processes and UseCases. They can be used to document and analyse the steps involved in various scenarios, allowing stakeholders to understand the process's behaviour and identify potential improvements.

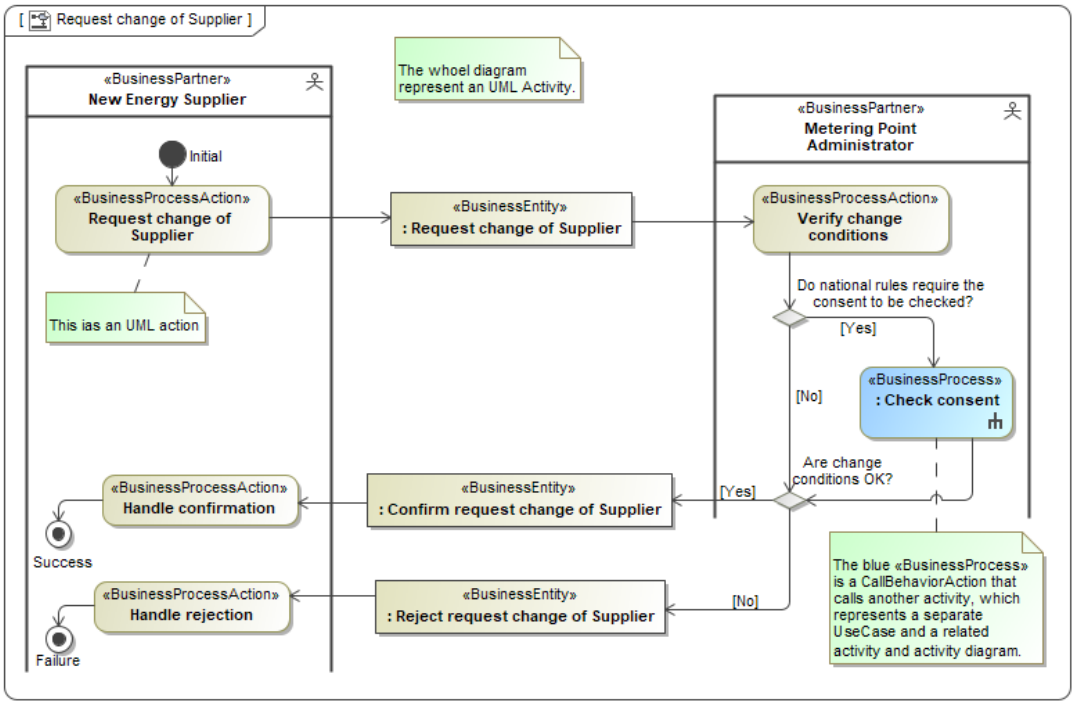


Figure 44 Actions, Activities and Activity diagrams

A.3.4. CallBehaviorAction

A CallBehaviorAction is an action that represents the invocation of a behaviour, i.e. within UMM a call to an external activity, which represents a separate UseCase and a related activity and activity diagram. It allows you to incorporate the behaviour of one part of a model into another part, providing a way to reuse and modularise behaviours within a process or a system.

A CallBehaviorAction is typically used to invoke complex behaviours that have been defined separately in an activity. Instead of duplicating the entire behaviour in multiple places, you can use a CallBehaviorAction to reference and execute the behaviour as needed, promoting better organisation and maintainability of the model.

In an activity diagram, a CallBehaviorAction is represented as a rectangular symbol with the name of the behaviour it calls written inside the symbol. It is connected by arrows representing the flow of data into and out of the behaviour being invoked.

For example, if you have defined a series of steps as a separate activity, you can use a CallBehaviorAction in other parts of the model to invoke that activity when needed. This way, you avoid redundancy and promote reusability, making the model more concise and easier to understand.

An example is shown in Figure 44 (see the blue «BusinessProcess»).

A.4. Class diagram

A.4.1. Class

A class is a fundamental building block used to represent an object-oriented concept in a system. Classes are depicted as rectangles with three compartments. The top compartment contains the class name, the middle compartment lists the class attributes (data members), and the bottom compartment shows the class methods (member functions or operations). However, the latter is not used in ebIX® BRSs.

Classes define the structure and behaviour of objects within the system and the attributes represent the data that each object of the class holds.

Classes form the basis of object-oriented programming, where they encapsulate data and behaviour into cohesive units, promoting modularity and reusability. They help in modelling real-world entities, abstract concepts, and interactions between objects in a system.

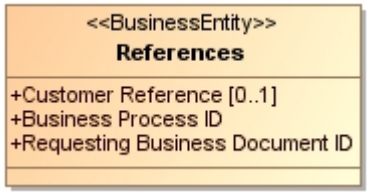


Figure 45 Class

A.4.2. Attribute

An "attribute" is a property or characteristic of a class in an object-oriented system. It represents the data or state that each object of the class possesses. Attributes define the internal data members of a class and describe the various features or information associated with each instance of that class. They help in defining the structure and properties of objects and provide the necessary data storage for the behaviour defined by the class methods.

In class diagrams, attributes are represented within the middle compartment of the class rectangle. Each attribute is specified with a name, followed by a colon and its data type. Optionally, you can indicate the visibility, such as public (“+”) or private (“-“).

A.4.3. Data type

A data type is a classification or category that specifies the type of data that can be stored or manipulated by a variable, attribute, parameter, or operation within a system. Data types provide a way to define the format and range of values that a particular piece of data can take. They help ensure that data is correctly stored and used, providing constraints and rules that govern how data can be handled in a program or system. Data types can be of various kinds, including primitive types (e.g., integer, string, Boolean, etc.) and user-defined types (e.g., classes, enumerations). Primitive data types represent basic data elements, while user-defined data types are custom types defined by the modeller to represent more complex data structures.

In class diagrams, data types are used to specify the types of class attributes and operation parameters. They are typically indicated next to the attribute or parameter name, separated by a colon. For example, if you have a class representing a "Person" in a system, you might have attributes like "name" (string data type), "age" (integer data type), and "isEmployed" (Boolean data type).

Data types play a crucial role in ensuring data integrity, validity, and consistency in a system. They help in modelling the structure of classes and defining the properties of data elements, contributing to the clarity and correctness of UML models.

A.4.4. Enumeration

An enumeration is a data type that represents a finite set of named values, often referred to as "literals." It is used to model data structures that have a predefined set of possible values, where each value represents a distinct constant. Enumerations are particularly useful for representing lists of related constants, such as categories, states, or options, where the values have a well-defined and limited scope. By using enumerations, you can ensure that the data is constrained to a specific set of valid values, making it easier to understand and maintain the model.

In class diagrams, enumerations are represented as a separate class with a special notation, consisting of a rectangle with the name of the enumeration at the top and a list of literals in the compartments below.

For example, consider an enumeration called "Colour," which might have enumerators like "Red," "Green," "Blue," and "Yellow." In this case, "Colour" would be the enumeration, and "Red," "Green," "Blue," and "Yellow" would be the enumerators.

Enumerations play a vital role in modelling, as they provide a concise and clear way to represent predefined sets of constant values in the system. They help improve the readability of UML models and ensure that data with limited and specific options are correctly represented and used.

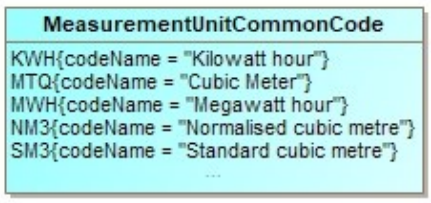


Figure 46 Enumeration

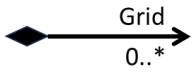
A.4.5. Association

An association is a fundamental relationship between two or more classes or objects, representing a connection or link between them. It depicts how instances of one class are related to instances of another class. Associations are used to model the interactions and dependencies among classes in a system. They indicate that objects of one class can be connected or associated with objects of another class in some way.

In class diagrams, associations are represented by a line connecting the participating classes, with optional arrowhead(s) at one or both end(s) to indicate the directionality of the association. The association line may also include labels to specify roles, multiplicities (cardinalities), or other properties of the association.

Associations can have various characteristics, such as:

- Multiplicity (cardinality): Specifies how many instances of each class are associated with one instance of the other class, e.g., one ([1]), zero-or-more ([0..*]) or one-or-more ([1..*]).
- Roles: Indicates the roles that each class plays in the association, e.g., "Grid Customer".



- Navigation: Specifies whether the association can be navigated from one class to the other or both ways. The navigability is represented by an open arrowhead.
- Composition: Is a type of association that represents a strong "part-whole" relationship between two classes, where one class (the whole) contains or is composed of one or more instances of another class (the part). In other words, the lifetime of the part is directly tied to

the lifetime of the whole. Composition implies a strong ownership and dependency between the whole and its parts. When the whole is deleted or destroyed, all its parts are also deleted or destroyed automatically. This characteristic distinguishes composition from other types of associations, such as aggregation, where the lifetime of the parts is independent of the whole. A composition relationship is represented by a solid diamond shape at the end of the association line connecting the whole class to the part class. The diamond shape points towards the whole class, indicating the direction of ownership and dependency.

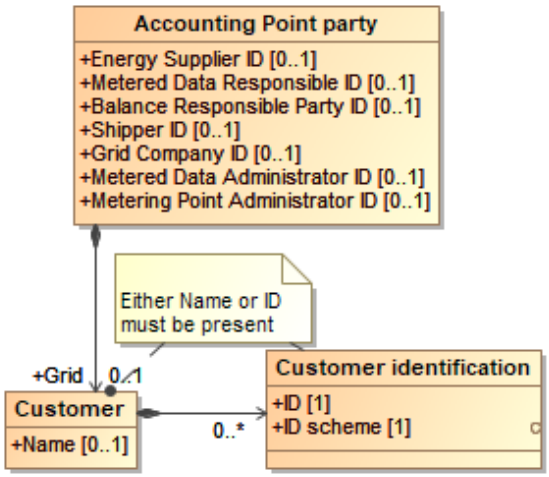


Figure 47 Class diagram

A.4.6. Dependency

A "dependency" is a relationship between two elements, where a change in one element may affect the other element. It represents a weak relationship, indicating that one element depends on the other in some way, but there is no strong ownership or containment between them. In a dependency relationship, one element (the client) relies on or uses another element (the supplier) to perform its function or provide certain functionality. However, the client does not own or control the supplier, and the relationship is typically more transient or loosely coupled.

A dependency is represented by a dashed arrow pointing from the client element to the supplier element. The arrow indicates the direction of the dependency, showing which element depends on the other.

Dependencies are commonly used in various UML diagrams, such as class diagrams, to show how different classes interact and rely on one another. They help in illustrating the relationships and interconnections between elements in the system, aiding in the understanding of the system's structure and behaviour.

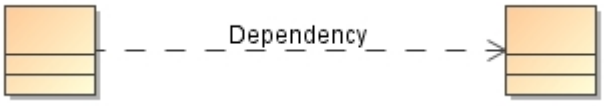


Figure 48 Dependency

A.4.7. Generalisation

A generalisation is a fundamental relationship between classes, representing an inheritance or "is-a" relationship. It allows one class, called the subclass or derived class, to inherit attributes, methods, and relationships from another class, known as the superclass or base class. Generalisation is a key concept in object-oriented programming, where it enables the creation of hierarchical relationships among classes. The subclass inherits the characteristics of its superclass, which means it gains access to the attributes and behaviours defined in the superclass.

In class diagrams, generalisation is represented by a solid line with an open arrowhead pointing from the subclass to the superclass. The arrow indicates the direction of inheritance, showing that the subclass inherits from the superclass.

Generalisation promotes code reuse and abstraction, allowing you to create a hierarchy of classes that share common characteristics while also providing the flexibility to define specialised behaviours in individual subclasses. It helps in modelling the "is-a" relationship between classes, where a subclass is a more specialised version of the superclass.

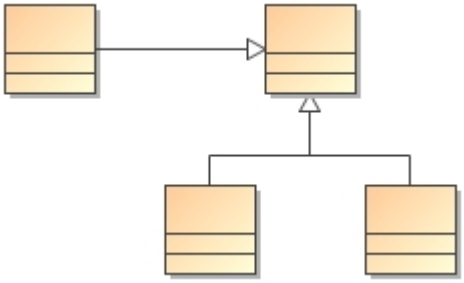


Figure 49 Generalisation

Appendix B. UN/CEFACT rules for message diagrams

The following rules apply when making class diagrams for messages (*Canonical model*) based on the UN/CEFACT Requirements Specification Mapping (RSM).

- All classes shall be normalised. That is to say:
    1. An attribute shall represent a single piece of information
    2. An attribute shall appear only once (i.e. it cannot be repeated)
    3. An attribute shall have a distinct name
    4. Each instance of a class must be uniquely identifiable
    5. There is no positional dependence between the attributes
    6. All attributes contribute to the definition of the class
- The only relationship permitted in a UMM compliant class diagram is a composite aggregation. All compositions shall be unidirectional (directed composition).
- The multiplicity of an attribute is only used to indicate a conditional attribute with the convention [0..1] that immediately follows the attribute name.
- The multiplicity of an association shall only appear at the target end of the association.
- Only XOR constraints are allowed between associations.
- Enumerations shall be used to identify code lists. In the *canonical model* an enumeration shall be used to identify a restriction on a generic code list.
- No association classes or association names are permitted in the *canonical model*