Overview of energy flexibility services

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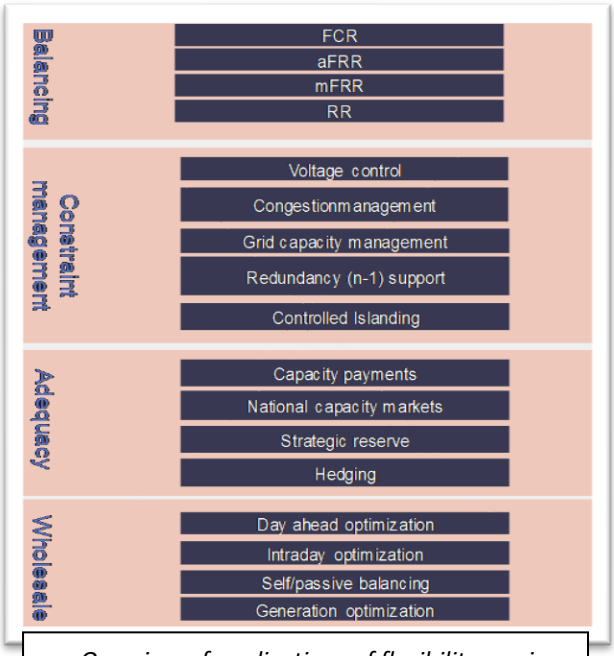
A. Preface/introduction

This document offers a structured description and overview of how a flexibility market can work. We took the view of what it takes to offer flexibility services to the market, including a Flexibility Service Provider preparing for offering flexibility energy services, selling and delivering these services. After delivery of the flexibility services settlement is done between the parties affected.



Overview of applications of flexibility services
Taken from USEF

In setting up this document we used as much as possible the good work already done by other groups, as the TSO-DSO collaboration project and USEF, although the re-usage will not be explicitly indicated in the text.

The challenge of the project was, while discussing all details of different kinds of flexibility services, keeping the overview at such an abstract level that in principle it covers all kind of different flexibility services and applications, ranging from balancing services, congestion services to services for portfolio optimisation (see the figure). In my view the project managed successfully to keep the right balance, even when the discussions sometimes were extremely detailed. There was much more detailed than presented in this overview document and the details can be made available on request.

We are convinced this overview will increase the general understanding of flexibility. In using this first broad overview of flexibility it will need a more detailed level in the respective areas. In applying this overview, even the role of Flexibility Service Provider may be detailed to more specific roles, such as Balance Service Provider for balancing flexibility services or Resource Aggregator for portfolio flexibility services or otherwise.

We hope to get feedback when organisations start to use the overview in setting up their flexibility services or even in setting up a flexibility market.

The reason for ebIX® to start modelling flexibility services was induced by the quickly growing interest in flexibility energy services and the increasing number of flexibility implementations, all be it most of them still experimentally. We tried to use as much experience as possible in the project to set up this overview.

I want to express my thanks to the project members.

March and November 2019,

Gerrit Fokkema,

Convenor.

B. About this document

This document is an overview of processes for exchange of information related to energy flexibility services within the European energy market. These processes will ease the access for the roles of Flexibility Service Providers, such as Aggregators, and help System Operators and other market roles to allow flexibility actors in existing and new products.

B.1. Participants in the project

This document has been prepared by the ebIX Flexibility project, consisting of representatives from ebIX® (and their countries), Eurelectric, USEF, DSOs and TSOs.

B.2. Main changes since last version

Old	New	Clarification	Date
Version 1.0.A			
	v1r0A	First published version.	20200106
v1r0A	v1r0B	Since ebIX® is closing down from the end of 2023, the link to the ebIX® secretary has been removed.	20231211

1 Basic principles and definitions

The following principles have been used when drafting this document:

- When defining the UseCases in this document, the electricity sector has been the focus area. However, it should be possible to also use the UseCases as a basis for other energy sources, such as gas or heat/cold.
- "The happy flow principle" is used in the UseCase descriptions, i.e. the focus is the expected outcome of a process and exceptions on this outcome (rejections, etc.) are described in the "exception row".
- It is not differentiated between flexibility services (trades) used by a System Operator (DSO or TSO) and other market parties. The overview should be applicable for all kinds of applications of flexibility.
- We use Accounting Point as the unit where energy (transfer) is measured for market purposes and where market players, including the customer, assume certain responsibilities in well-defined roles. The administration for these Accounting Points including the responsibilities is the Metering Point administration, performed by the Metering Point Administrator.
- We assume all Resources belong to continuously metered Accounting Points (with non-profiled allocation). From USEF:
    - Shifting load for customers at Accounting Points, that are allocated based on synthetic profiles, will not have a direct impact on the position of the BRP. This effect may be indirect, depending how the residual balancing surplus or shortage is allocated. A transfer of energy from/to the residual balancing surplus is imaginable, yet very cumbersome and not logical considering the trend to move away from synthetic profiles, and to base wholesale settlement on actual measurements (i.e. smart meter data for residential customers). If the Transfer of Energy (ToE) cannot be facilitated, the flexibility can only be used for flexibility services without a transfer of energy.
- We realise that not all market rules and regulations, roles, domains and processes are finally defined in the energy market.
- Although we modelled all trades as bilateral trades, it is possible to trade via markets and in that case the trade is indirectly via a Market Operator.

1.1 What are flexibility services?

Flexibility is defined as the capability to modify generation injection and/or consumption patterns on an individual (Accounting Point level) or aggregated level.

Flexibility Services are defined as energy services and/or ancillary services where Flexibility is used to meet the needs of energy market participants or system operators on different existing or new market places.

So, flexibility services are energy services (related to energy, power quality, congestion, balancing, etc.) that are offered and/or used in addition to the base load (confirmed scheduled energy volume), in order to adjust the actual generation and load, to optimise portfolios, congestion management or to

provide other ancillary services[1] to the corresponding system operator. Flexibility services include options that can be activated at a later stage.

1.2 What is a Flexibility Service Provider (FSP)?

A **Flexibility Service Provider** is defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties.

The Flexibility Service Provider is defined here as a general flexibility services provider for all kind of flexibility services and applications, that are generalised in this model. Therefore, the Flexibility Service Provider covers, for instance, the roles "Balancing Service Provider" and "Resource Aggregator", that are introduced in the Harmonised Role Model, for dedicated types of flexibility services and applications. All the interactions between the system operator (petitioner) and Flexibility Service Provider (supplier) are performed in a market scope.

1.3 What is a Resource Aggregator?

A Resource Aggregator is a party that aggregates resources for usage by a service provider for energy market services.

In this document we do not elaborate this role as a separate business partner, but include it in the Flexibility Service Provider, especially in the UseCase "Manage flexibility pool".

1.4 What is a Flexibility Settlement Responsible (FSR)?

In this document we introduce the new role **Flexibility Settlement Responsible** (FSR)[2], defined as a party that is responsible for settlement of the volume compensation (positive or negative) of the supplied energy for the delivered flexibility service.

1.5 What is a Resource?

In this overview it is assumed that a **Resource** (an object that represents a grid asset, a consumption resource or a production resource related to the energy industry[3]) represents an asset capable of offering flexibility behind an Accounting Point.

[1] For instance, the voltage control. This is performed by the system operator and the aim of this flexibility service is not adjust generation or load production, but their reactive output.

[2] The term Flexibility Settlement Responsible is an intermediate term that may be changed in the future.

[3] Source: ebIX, EFET and ENTSO-E Harmonised Role Model (HRM), see www.ebix.org.

1.6 What is a reference line?

A reference line is used as a fixed line (reference point) when flexibility is applied in order to calculate the amounts involved.

A **reference line** is the best approximation of the normal profile without flexibility being invoked. It is the only way of quantifying the flexibility services that are delivered. This is one of the following, dependent on the product specification:

1. the predicted and confirmed (but not necessarily validated) energy consumption/production, latest just before operational time, per time interval, normally on an aggregated level, but may depending on the service be "drilled down" to individual Accounting Points.
2. a reference line based on actual production/consumption.

2 Business Domain View: Provide energy flexibility services (Business Process UseCase)

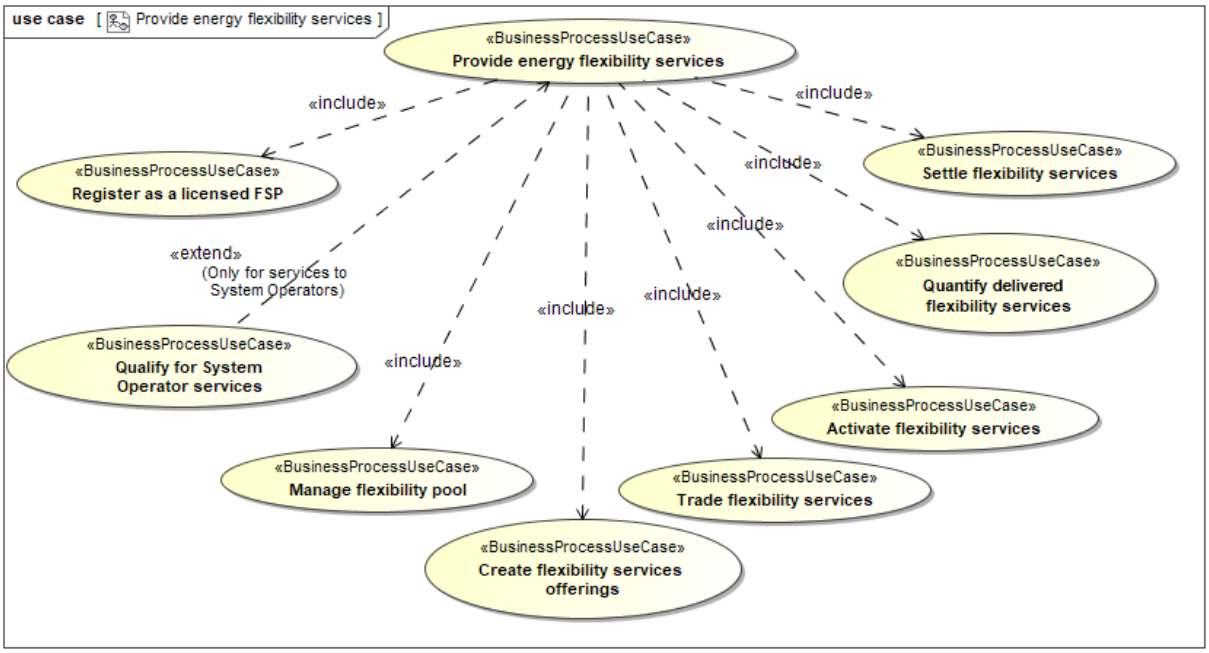


Figure 1 Provide energy flexibility services

The Use Cases: “Register as a licensed Flexibility Service Provider”, “Qualify for System Operator services” and “Create flexibility offerings” are expected to be manual or internal Use Cases (non-automated between roles), i.e. not run by standardised message exchange.

2.1 Description

UseCase description: **Provide energy flexibility services**	
definition	*This is an overview use case*. This is the process where a Flexibility Service Provider may contract Resources with/from Customers (e.g. prosumers, producers or consumers), offers and trades (this in) flexibility services on one or more markets (including bilateral trade) to have these flexibility services activated and settled.
beginsWhen	There is a demand for flexibility services and there is a provider to offer these services.
preCondition	There are Resources connected to the grid that can provide flexibility services.

endsWhen	When the license to operate for the provider is revoked or the provider withdraws from the market.
postCondition	Not applicable.
exceptions	None.
actions	Not applicable at this level.

2.2 Register as a licensed Flexibility Service Provider (FSP) (Business Process UseCase)

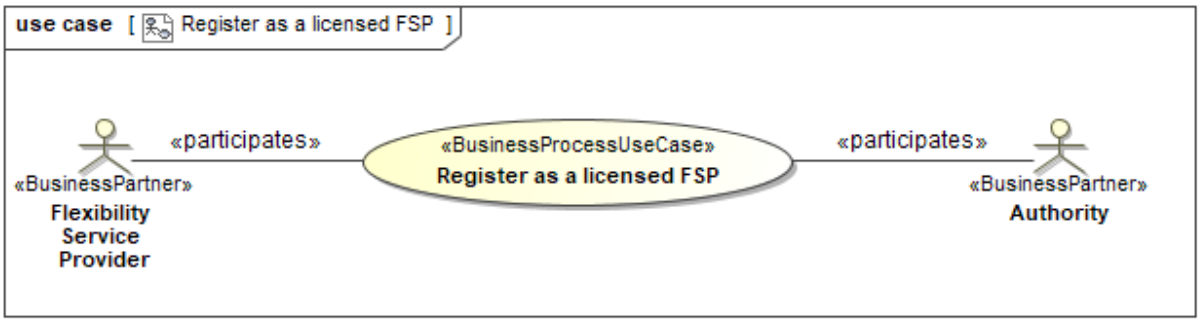


Figure 2 Business Process UseCase: Register as a licensed Flexibility Service Provider

2.2.1 Description

UseCase description: **Register as a licensed Flexibility Service Provider**[4]	
definition	In this process the Flexibility Service Provider gets licensed to operate[5] in a specific role in the energy market. The Flexibility Service Provider can deliver multiple services for multiple roles, such as Constraint management services, Capacity services, Wholesale services and Balancing services. These may require different licenses (certification).
beginsWhen	When a legal entity (person or organisation) applies for a license to operate as a Flexibility Service Provider in the energy market.
preCondition	The Flexibility Service Provider complies with the corresponding legal and technical requirements.
endsWhen	The Flexibility Service Provider receives his license and is registered.
postCondition	The Flexibility Service Provider is licensed and registered. The register is published according to national rules.
exceptions	The licensing is refused.
actions	This is a manual service between the Flexibility Service Provider and the licensing authority, hence not further elaborated.

[4] The Authority is the body that is responsible for licensing, such as the regulator.
[5] May be to operate towards the Customer or to operate as a specific role.

2.3 Qualify for System Operator services (Business Process UseCase)

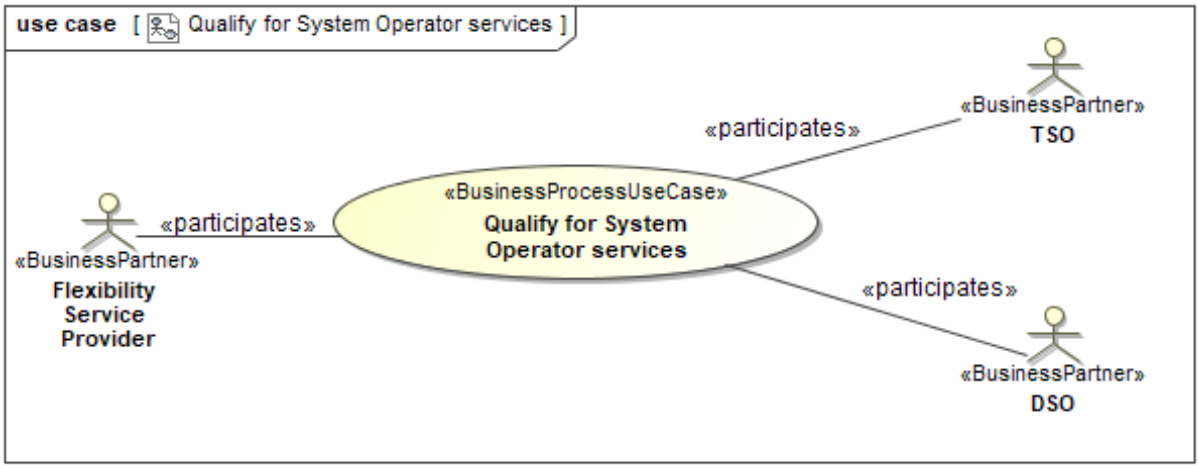


Figure 3 Business Process UseCase: Qualify for System Operator services

Note that qualification may be required at different levels, as qualification of the (capabilities of the) Flexibility Service Provider, qualification of the (resources at the) individual Accounting Point or qualification of the offered services from the location on the grid. In practice these qualifications may be joined, we model them at different levels in different use cases.

2.3.1 Description

UseCase description: Qualify for System Operator services	
definition	In this process the Flexibility Service Provider (Flexibility Service Provider's IT systems) gets qualified by the System Operator for a certain flexibility service and time frame (e.g. five years).
beginsWhen	The Flexibility Service Provider wants to deliver certain, qualifiable flexibility services to the corresponding System Operator (TSO or DSO).
preCondition	The Flexibility Service Provider is licensed as a Flexibility Service Provider.
endsWhen	When the Flexibility Service Provider is qualified to deliver flexibility services to System Operators for the service in question or the qualification is limited based on technical reasons[6].
postCondition	The Flexibility Service Provider is fully qualified to deliver flexibility services to System Operators for the service in question or the qualification for the flexibility services is limited based on technical reasons.

[6] European Regulation (SOGL-UE/2017/1485) Art 182.4.

exceptions	The qualification is rejected.
actions	This is a manual service between the Flexibility Service Provider and the qualifying System Operator, hence not further elaborated.

2.4 Manage flexibility pool (Business Process UseCase)

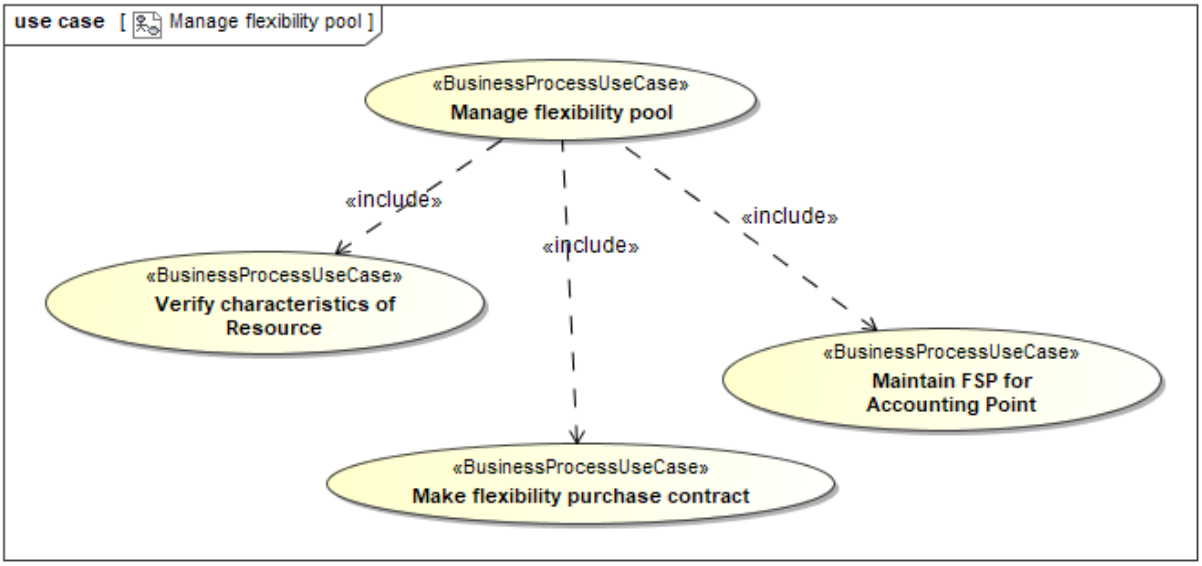


Figure 4 Business Process UseCase: Manage flexibility pool

2.4.1 Description

UseCase description: **Manage flexibility pool**	
definition	*This is an overview uses case* In this process the Flexibility Service Provider prepares and equips itself and one or more Resources linked to an Accounting Point for offering flexibility services, including verifying, contracting, registering and qualifying Resources to be included in flexibility services.
beginsWhen	When the Flexibility Service Provider wants to make an offering for flexibility services.
preCondition	The Flexibility Service Provider is licensed (admitted) for the market and if he wants to offer to a System Operator, he is licensed for that.
endsWhen	When the Flexibility Service Provider is equipped to make offerings.
postCondition	The Flexibility Service Provider is equipped to make offerings.
exceptions	None.
actions	Not applicable at this level.

2.4.2 Verify characteristics of Resource (Business Process UseCase)

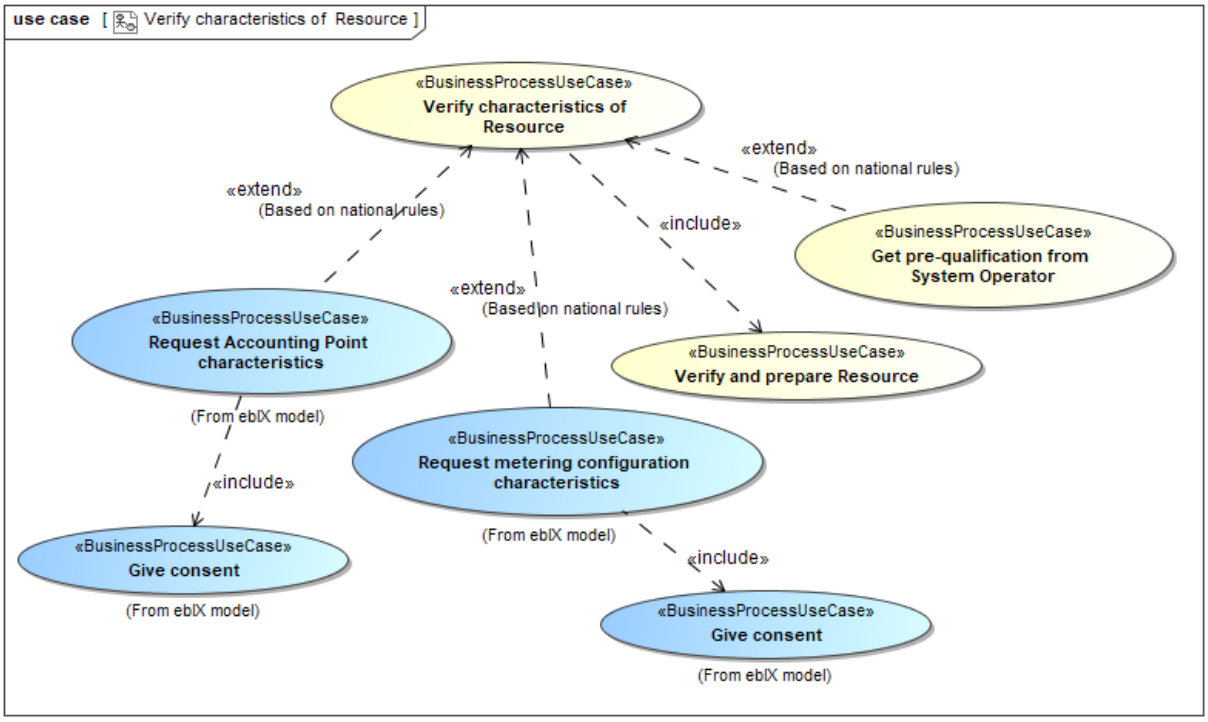


Figure 5 Business Process UseCase: Verify characteristics of Resource

2.4.2.1 Description

UseCase description: **Verify characteristics of Resource**	
definition	In this process the Flexibility Service Provider verifies and/or prepares Resource(s), metering configuration(s) and other (contractual) constraints related to the Accounting Point, for which he intends to make a flexibility purchase contract with the Customer[7]. If needed by national rules he has the Resource(s) and/or the intended flexibility services from the Accounting Point qualified.
beginsWhen	When the Flexibility Service Provider intends to make a contract for flexibility services with the Customer.
preCondition	• The Resource is linked to the Accounting Point. • The Accounting Point ID is known. • The link between the Customer and the Accounting Point is verified.

[7] The UseCase includes the USEF recommendations 501 (combination of implicit and explicit demand response) and 504 (Resources belonging to profiled Accounting Points should be excluded).

endsWhen	When the Flexibility Service Provider has obtained sufficient information to verify and resolve possible constraints.
postCondition	The Accounting Point constraints have been verified and resolved by the Flexibility Service Provider, i.e. the intended flexibility services can be delivered from the Accounting Point.
exceptions	None
actions	See 2.4.2.2

2.4.2.2 Business Process

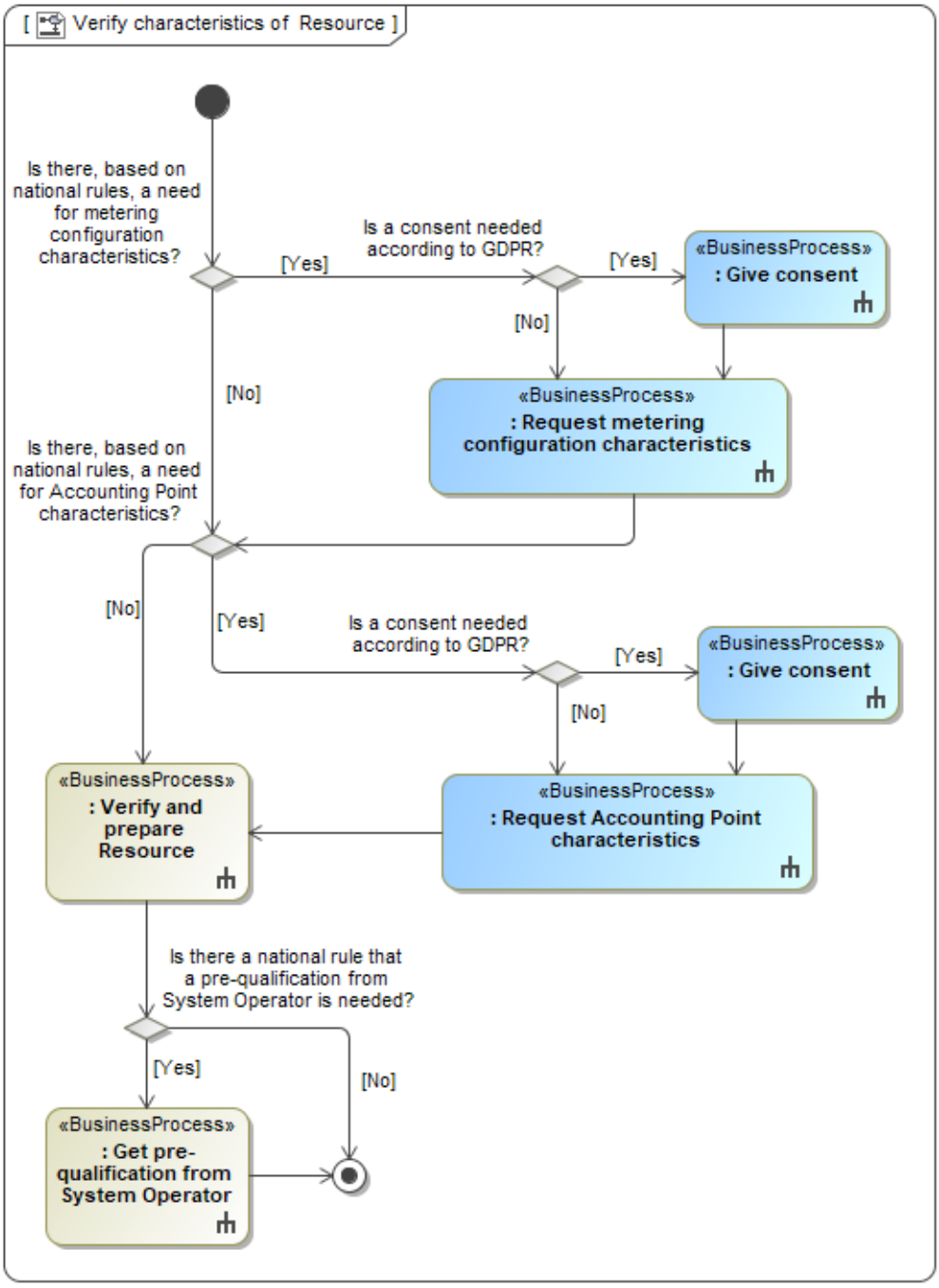


Figure 6 Business Process: Verify characteristics of Resource

2.4.3 Request Accounting Point characteristics (Business Process UseCase)

There may be a need to get Accounting Point characteristics (Name, address etc.) from the Metering Point administration before a Resource can be installed and verified. The “Request Accounting Point characteristics” process is documented in a separate document, see ebIX® BRS for alignment of Accounting Points at www.ebix.org.

2.4.4 Request Metering Configuration characteristics (Business Process UseCase)

There may be a need to get Metering Configuration characteristics (Voltage Level, Metered data collection method, Meter technique, etc.) from the Meter administration before a Resource can be installed and verified. The “Request Metering Configuration characteristics” process is documented in a separate document, see ebIX® BRS for Alignment of Metering Configuration Characteristics for an Accounting Point at www.ebix.org.

2.4.5 Give consent (Business Process UseCase)

There may be a need to get a consent from the Customer before the Meter Administrator can send requested Metering Configuration Characteristics to the Flexibility Service Provider, in line with the General Data Protection Regulation (GDPR). The “Give consent” process is documented in a separate document, see ebIX BRS for administration of consent at www.ebix.org.

2.4.6 Verify and prepare Resource (Business Process UseCase)

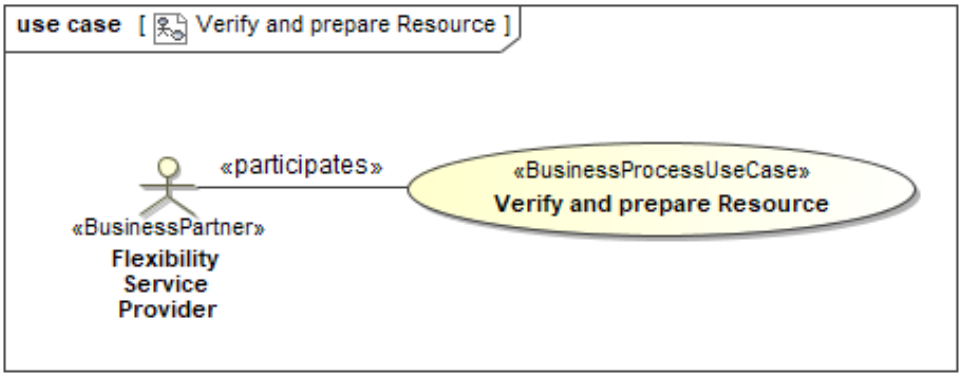


Figure 7 Business Process UseCase: Verify and prepare Resource

2.4.6.1.1 Description

UseCase description: Verify and prepare Resources	
definition	In this process the Flexibility Service Provider verifies and prepares (all) the Resource(s) at the Accounting Point, that are involved in the intended flexibility service(s).
beginsWhen	The Flexibility Service Provider wants to settle a contract for the Resource at the Accounting Point.
preCondition	The Flexibility Service Provider has consent from the Customer on the Accounting Point to access data related to the Accounting Point.
endsWhen	All the relevant Resources are set for the flexibility service(s) as to be agreed in the contract.
postCondition	The Accounting Point and all relevant Resources have been prepared for the flexibility services for the contract.
exceptions	None.
actions	This is a manual service, hence not further elaborated.

2.4.7 Get pre-qualification from System Operator (Business Process UseCase)

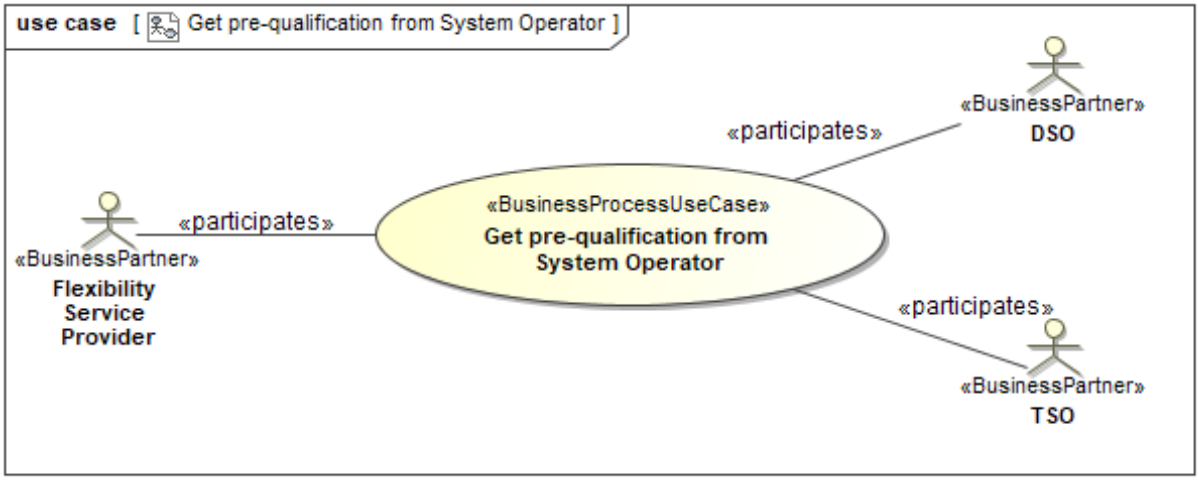


Figure 8 Business Process UseCase: Get pre-qualification from System Operator

2.4.7.1 Description

UseCase description: **Get pre-qualification from System Operator**[8] [and 9]	
definition	In this process the Accounting Point with the relevant Resource(s) and the linked metering configuration gets pre-qualified for delivery of certain flexibility service(s) to the corresponding System Operator (DSO or TSO).
beginsWhen	When the Flexibility Service Provider decides to apply for pre-qualification per service to offer relevant flexibility services to the System Operator.
preCondition	The Resources have been verified and prepared for the relevant flexibility service(s) to be offered to the System Operator.
endsWhen	When the Flexibility Service Provider is pre-qualified for Accounting Point with the relevant Resource (and Resource(s)) linked to the Accounting Point by the System Operator (DSO or TSO) for the desired flexibility service(s) or the Flexibility Service Provider has got the pre-qualification for the Accounting Point the Accounting Point with limits.
postCondition	The Flexibility Service Provider has got pre-qualification for the Accounting Point with the Resource and metering configuration from the System Operator (DSO or TSO) for the desired flexibility service(s) or with limitations. A DSO or TSO may temporally limit or exclude the delivery of a

[8] According to the SOGL (EU regulation 2017/1485) the prequalification at Accounting Point level is done by the TSO (SOGL Art. 155, 159, 162 and 182); The difference to the "normal" operator is that the TSO does not own the connection point. However, it is expected that also the DSO may play a central part in the future.

[9] This includes USEF recommendation 701 (prequalification on pool level instead of Resource level).

	given service from the Accounting Point in this part of its Grid, despite having passed pre-qualification[10]. The restrictions must be announced before the offers have to be submitted.
exceptions	The Resource does not pass pre-qualification and the process is ended.
actions	This is a manual service, hence not further elaborated.

[10] see SOGL (System Operator Guide Lines), article 182 (section 4).

2.4.8 Make flexibility purchase contract (Business Process UseCase)

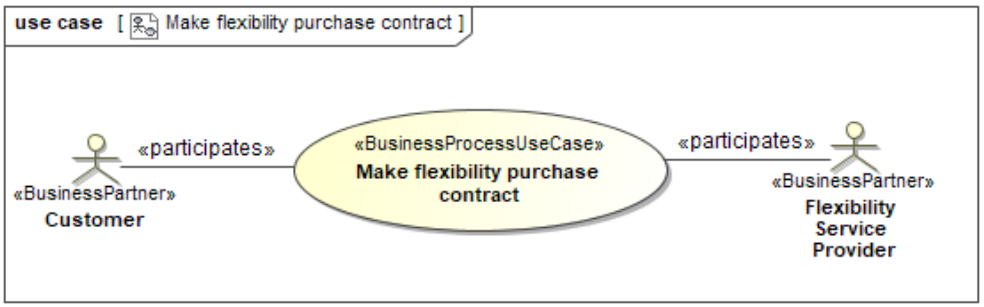


Figure 9 Business Process UseCase: Make flexibility purchase contract

2.4.8.1 Description

UseCase description: **Make flexibility purchase contract**[11]	
definition	In this process the Flexibility Service Provider contracts the Customer to make use for one or more Flexibility Services of the Resource(s) available at the Accounting Point and included in the contract.
beginsWhen	Initial processes have ended successfully, and both parties still intend to contract.
preCondition	The Flexibility Service Provider has verified Accounting Point constraints upfront and, based on national rules, got pre-qualification from the relevant System Operator when needed.
endsWhen	The Flexibility Service Provider and the Customer have signed the contract.

[11] Comments from USEF recommendation 308:

Recommendation:

After signing a contract with a Customer, the Flexibility Service Provider should communicate the structural information or technical characteristics of the flexibility contract to the corresponding TSO or DSO (depending whether the associated Customer is connected to the TSO or DSO grid).

Rationale:

For grid management and grid safety analysis, both TSO and DSO need to know the structural information of the load and generation connected to their grid. This includes information about DR (Demand Response) contracts (available power, ramp up/down rates, type of flexibility service). This information exchange should however not be limited to DR contracts with an Aggregator. The DSO should e.g. also be informed about flexible load that is exposed to implicit DR by the Supplier.

Structural information should be provided to the TSO/DSO before the pre-qualification. Otherwise, the grid operator cannot make the qualification process.

postCondition	The contract to make use of the capabilities of Resources available at the Accounting Point for flexibility services can go in operation.
exceptions	None.
actions	This is a manual service between the Flexibility Service Provider and the Customer, hence not further elaborated.

2.4.9 Maintain Flexibility Service Provider (FSP) for Accounting Point

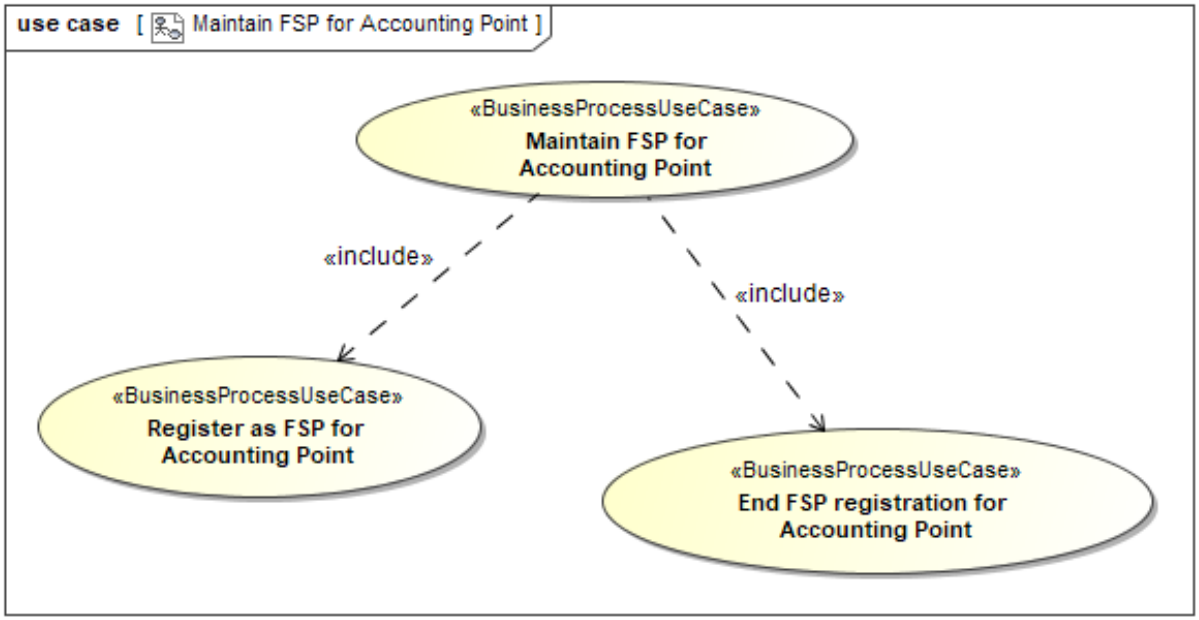


Figure 10 Business Process UseCase: Maintain Flexibility Service Provider for Accounting Point

2.4.9.1 Description

UseCase description: **Maintain Flexibility Service Provider for Accounting Point**	
definition	*This is an overview use case.* In this process the Flexibility Service Provider maintains his registration for the Accounting Point, i.e. registration at the start of a contract or end of the registration at the ending of the flexibility service contract he has for that Accounting Point.
beginsWhen	The Flexibility Service Provider has a flexibility service contract at the Accounting Point.
preCondition	The process requires a consent from the Customer.
endsWhen	The Flexibility Service Provider has an ending contract for the Accounting Point, or the Customer moved out of the Accounting Point.
postCondition	The Flexibility Service Provider is not registered for the Accounting Point in the Metering Point Administration.
exceptions	
actions	Not applicable at this level.

2.4.9.2 Register as Flexibility Service Provider (FSP) for Accounting Point (Business Process UseCase)

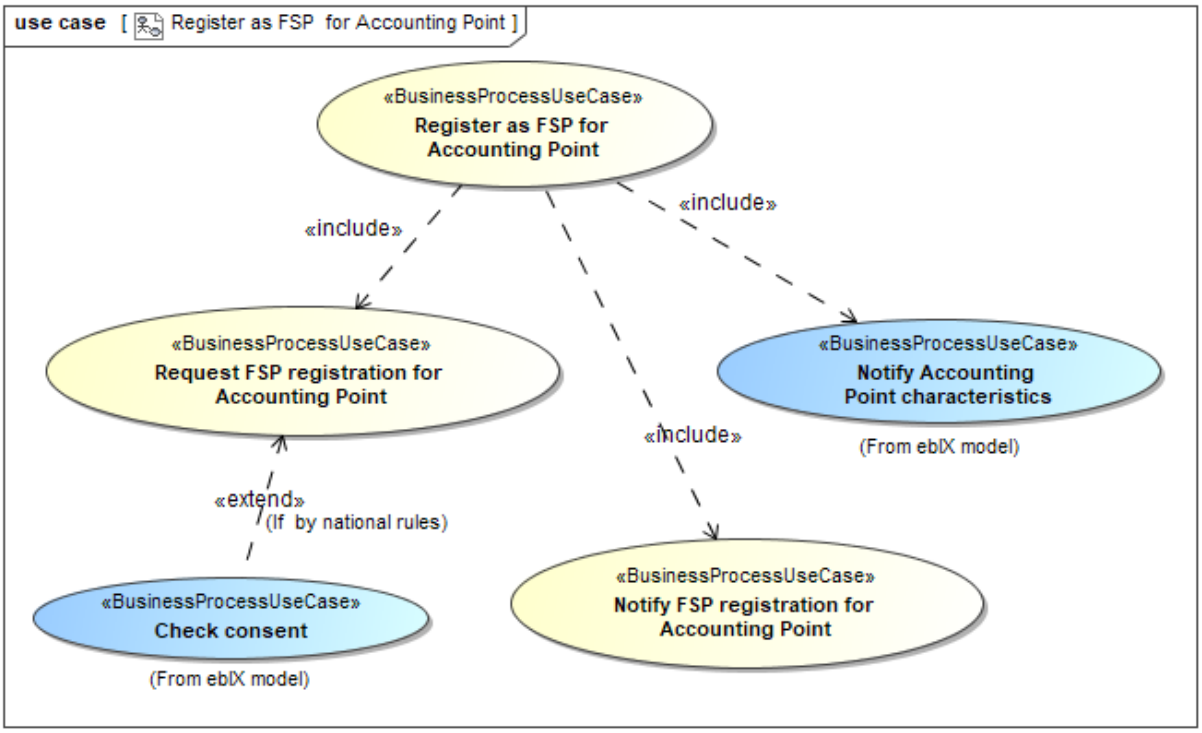


Figure 11 Business Process UseCase: Register as Flexibility Service Provider for Accounting Point

2.4.9.2.1 Description

UseCase description: **Register as Flexibility Service Provider for Accounting Point**	
definition	In this process the Flexibility Service Provider is registered for an Accounting Point, indicating the relevant service, Affected Roles are notified, and also master data are distributed to all Affected Roles.
beginsWhen	The Flexibility Service Provider has a contract with the Customer for flexibility services at the Accounting Point.
preCondition	There is a contract between the Flexibility Service Provider and the Customer for flexibility services at the Accounting Point. The Flexibility Service Provider is licensed. The Flexibility Service Provider is consented to register in de Metering Point administration.
endsWhen	The Flexibility Service Provider is registered for the Accounting Point, the Affected Roles have been notified and Accounting Point characteristics have been sent to all Affected Roles.

postCondition	The Flexibility Service Provider is registered for the Accounting Point, the Affected Roles have been notified, and the Flexibility Service Provider and Affected Roles have received Accounting Point characteristics
exceptions	When the request for registration was rejected the process stops.
actions	Not relevant in an overview.

2.4.9.3 End Flexibility Service Provider (FSP) registration for Accounting Point

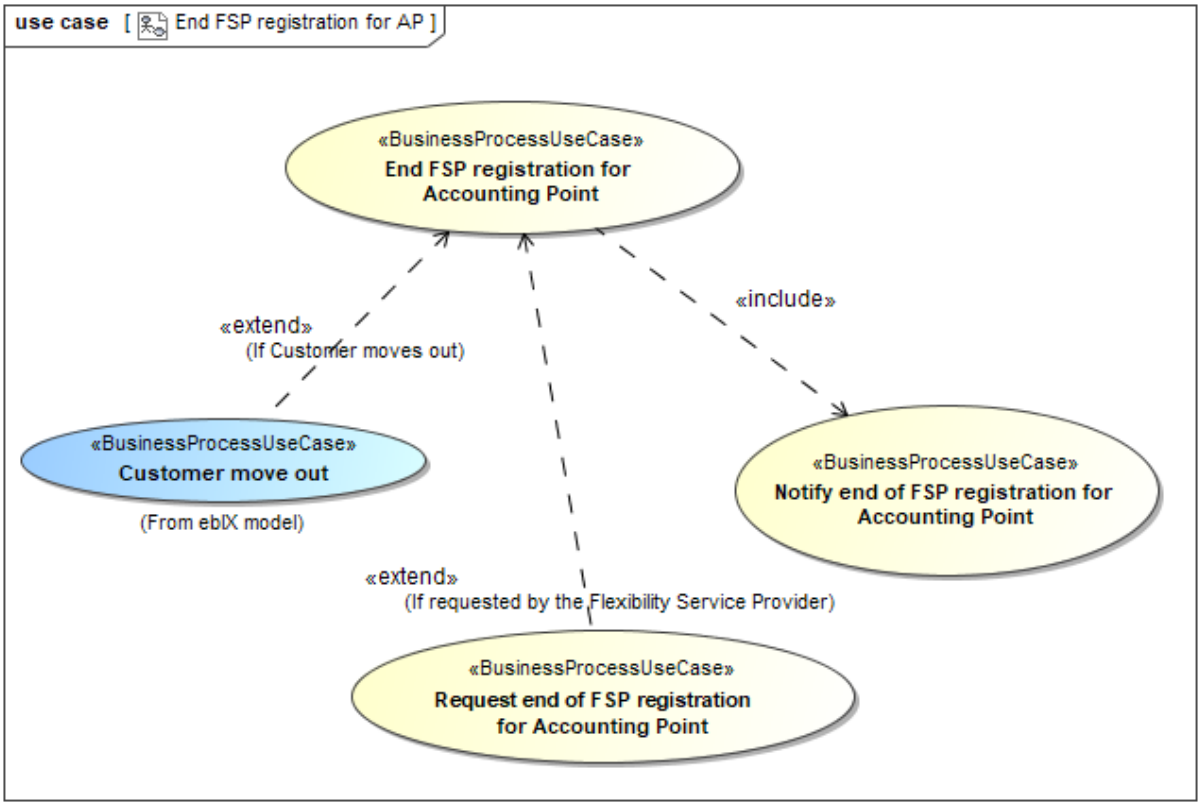


Figure 12 End Flexibility Service Provider registration for Accounting Point

2.4.9.3.1 Description

UseCase description: **End Flexibility Service Provider registration for Accounting Point**	
definition	In this process the responsibility of the Flexibility Service Provider to provide flexibility services for the Accounting Point ends by a given date either on request end of registration by the Flexibility Service Provider or triggered by the Customer move out of the Accounting Point. The process includes notification of end of Flexibility Service Provider for the Accounting Point.
beginsWhen	When the Flexibility Service Provider sends a request to end the Flexibility Service Provider registration for the Accounting Point or when the Customer is moving out of the Accounting Point.
preCondition	The contract between the Flexibility Service Provider and the Customer is ending.
endsWhen	When the Request end of Flexibility Service Provider registration for the Accounting Point or when the Customer move out has been confirmed and Affected Roles have been informed about the end.

postCondition	The Flexibility Service Provider is no longer registered as Flexibility Service Provider for the Accounting Point and all involved parties have been notified.
exceptions	When the request end of Flexibility Service registration was rejected the process stops. The end of Flexibility Service Provider for an Accounting Point may be triggered by the Customer withdrawing its consent to the Flexibility Service Provider.
actions	Not relevant in an overview.

2.5 Create flexibility services offerings (Business Process UseCase)

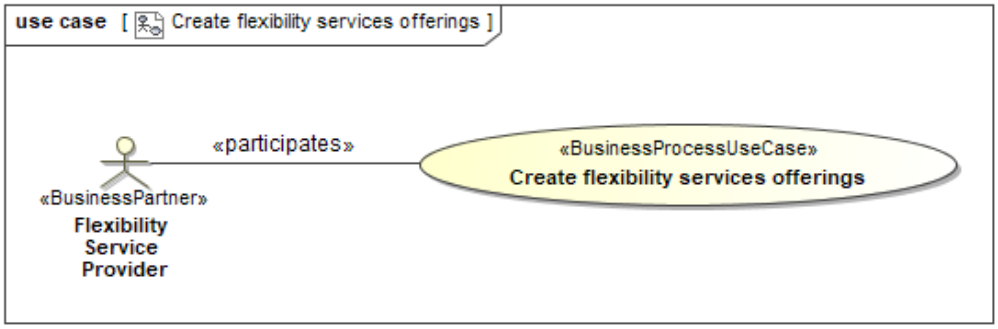


Figure 13 Business Process UseCase: Create flexibility services offerings

2.5.1 Description

UseCase description: **Create flexibility services offerings**	
definition	The process in which the Flexibility Service Provider offers Resources for the demands of its potential buyer(s) of flexibility services.
beginsWhen	When the Flexibility Service Provider wants to bring offers to the market.
preCondition	The Flexibility Service Provider has (contracted) Recourses.
endsWhen	This is an ongoing process.
postCondition	The Flexibility Service Provider has offerings to the market.
exceptions	When the Flexibility Service Provider leaves the market.
actions	“Create flexibility services offerings” is an internal process, i.e. not run by standardised message exchange, hence this process is not further elaborated.

2.6 Trade flexibility services (Business Process UseCase)

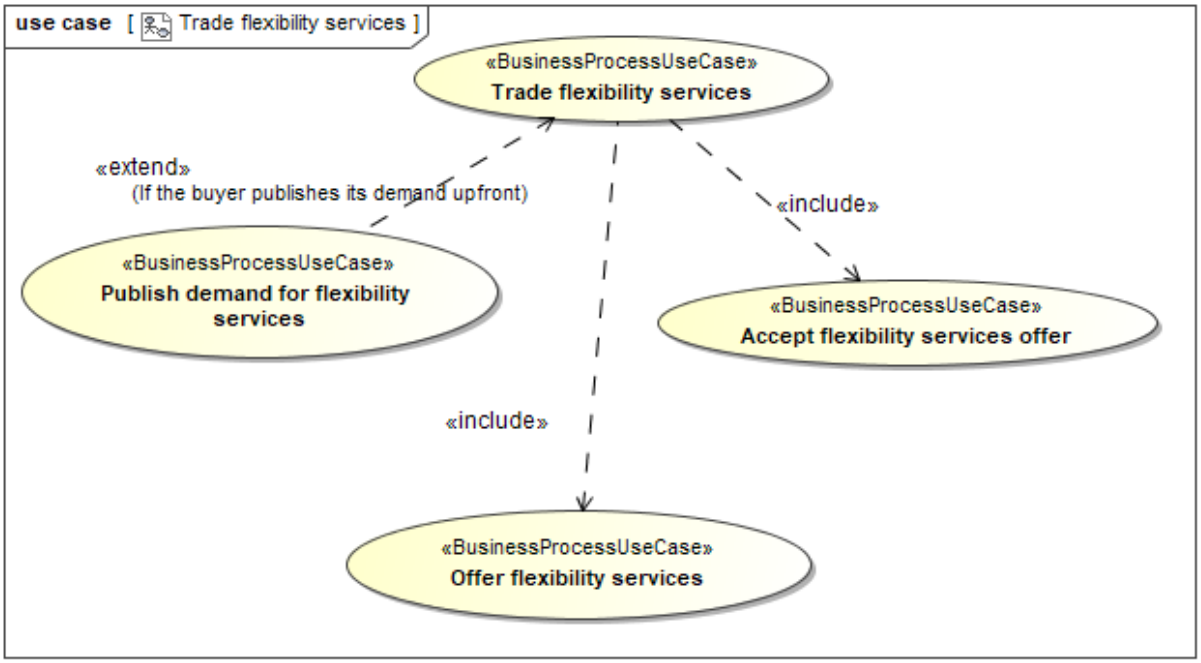


Figure 14 Business Process UseCase: Trade flexibility services

2.6.1 Description

UseCase description: **Trade flexibility services**	
definition	The process where a demand for flexibility services from potential buyers of flexibility meets an offer of flexibility services (or vice versa), and the Flexibility Service Provider and the buyer of flexibility services make a deal that serves as the basis for activation of the flexibility services.
beginsWhen	When a buyer asks for a flexibility services and/or a seller offers flexibility services.
preCondition	There are at least one seller and one buyer of flexibility services. The Flexibility Service Provider is licensed to provide flexibility services.
endsWhen	When the deal is concluded.
postCondition	There is a deal, adhering to all qualification and allowance needs, between the seller and buyer of flexibility services.
exceptions	The deal is not agreed, and the process stops.
actions	See 2.6.2

2.6.2 Business Process

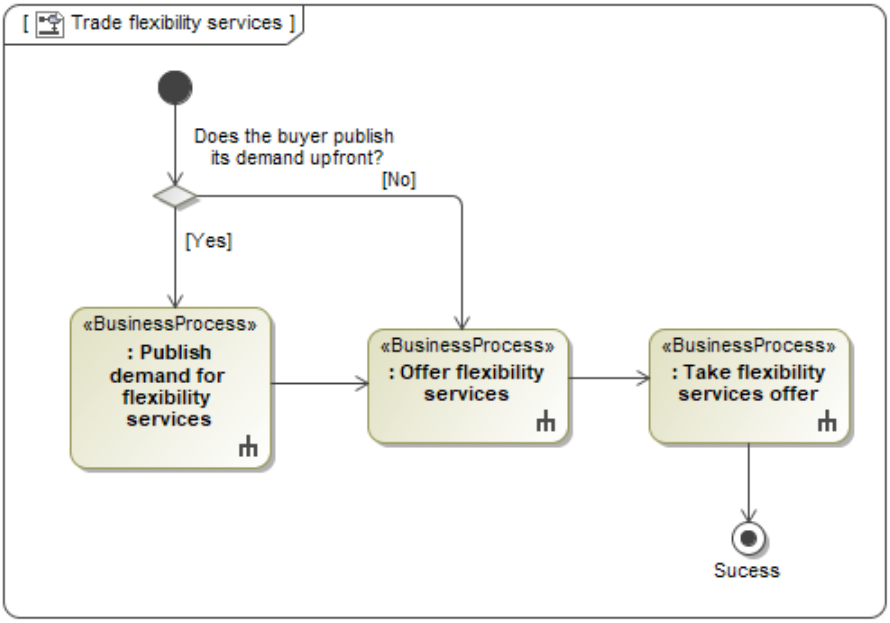


Figure 15 Business Process: Trade flexibility services

2.6.3 Publish demand for flexibility services (Business Process UseCase)

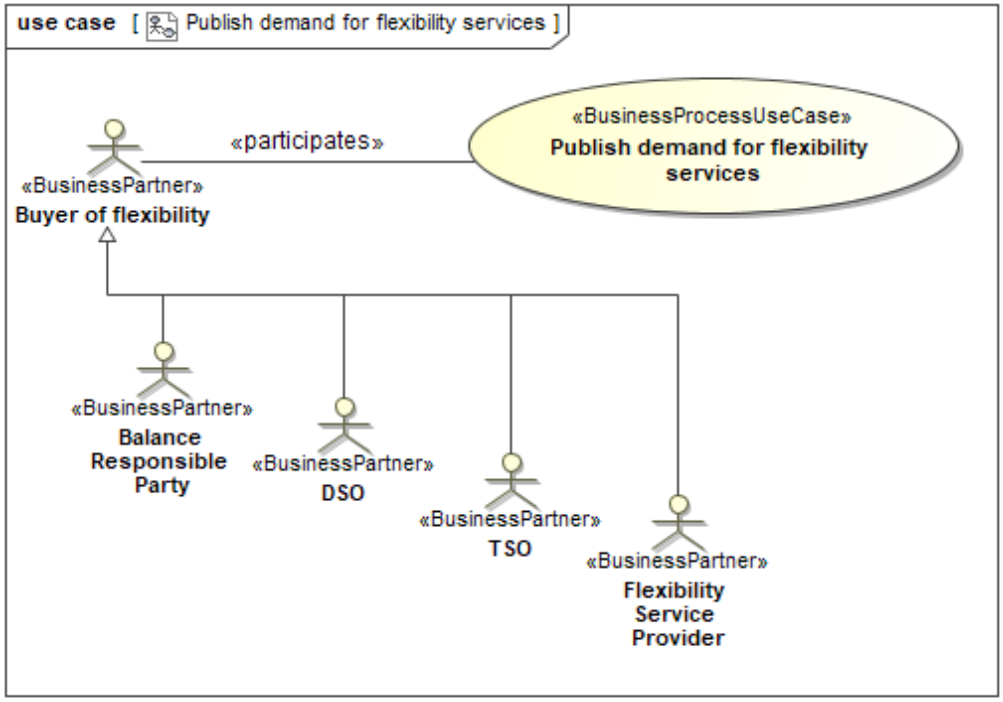


Figure 16 Business Process UseCase: Publish demand for flexibility services

2.6.3.1 Description

UseCase description: **Publish demand for flexibility services**[12]	
definition	In this process the potential Buyer of Flexibility publishes its demands for specific flexibility services.
beginsWhen	When the Buyer of Flexibility decides to publish his demand for flexibility services. This may be an ongoing process where the potential buyer of flexibility publishes its demand for flexibility, or the process may be triggered by unforeseen external circumstances.
preCondition	The potential Buyer of Flexibility has a need for flexibility.
endsWhen	The need for flexibility services has been published.
postCondition	The need for flexibility services is published.
exceptions	None.

[12] This may involve coordination between DSOs and TSOs beforehand.

actions	See 2.6.3.2

2.6.3.2 Business Process

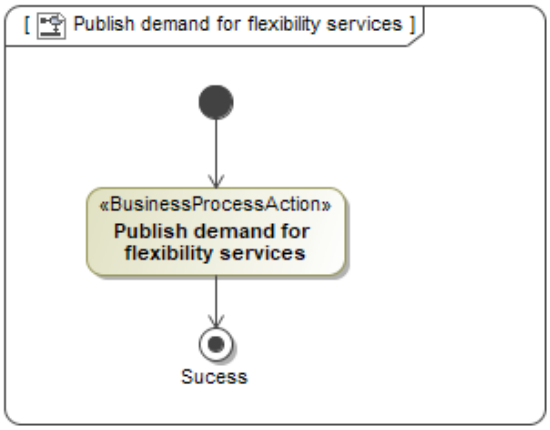


Figure 17 Business Process: Publish demand for flexibility services

2.6.4 Offer flexibility services (Business Process UseCase)

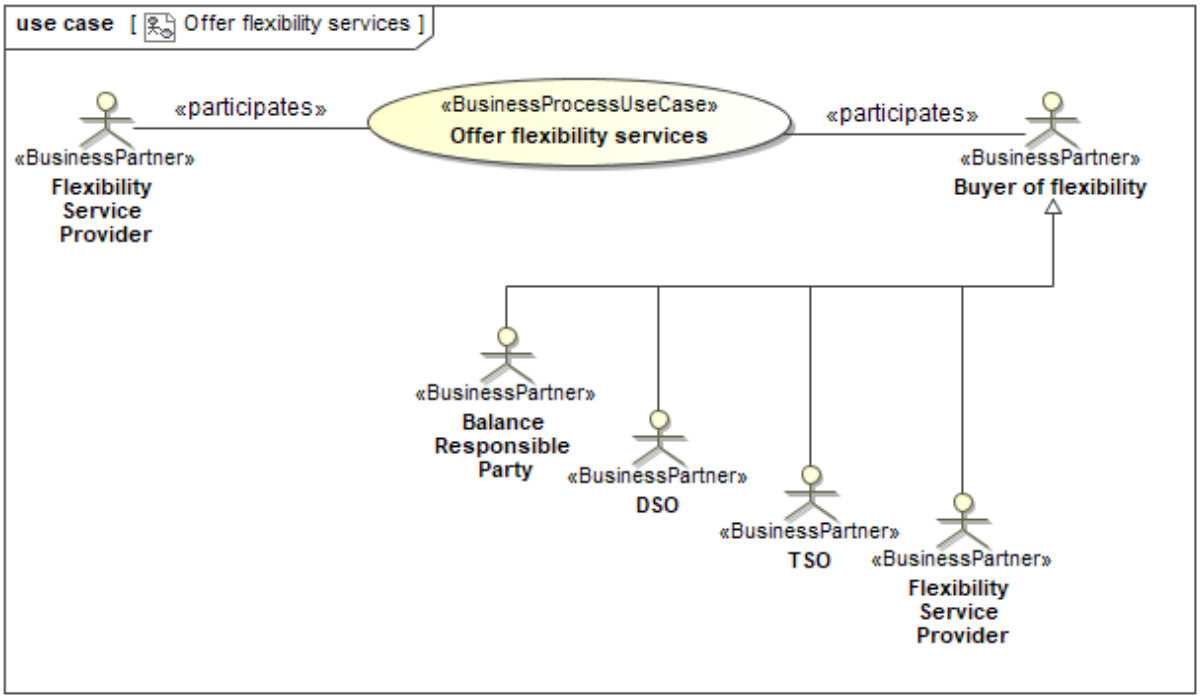


Figure 18 Business Process UseCase: Offer flexibility services

2.6.4.1 Description

UseCase description: **Offer flexibility services**	
definition	In this process the Flexibility Service Provider offers flexibility proactively or in response to a specific published demand for flexibility services.
beginsWhen	When the Flexibility Service Provider decides to offer flexibility.
preCondition	The Flexibility Service Provider has flexibility on offer.
endsWhen	The offer for flexibility has been sent.
postCondition	The flexibility has been offered.
exceptions	The offer for flexibility has been rejected, expired or revoked.
actions	Not relevant in an overview.

2.6.5 Accept flexibility services offer (Business Process UseCase)

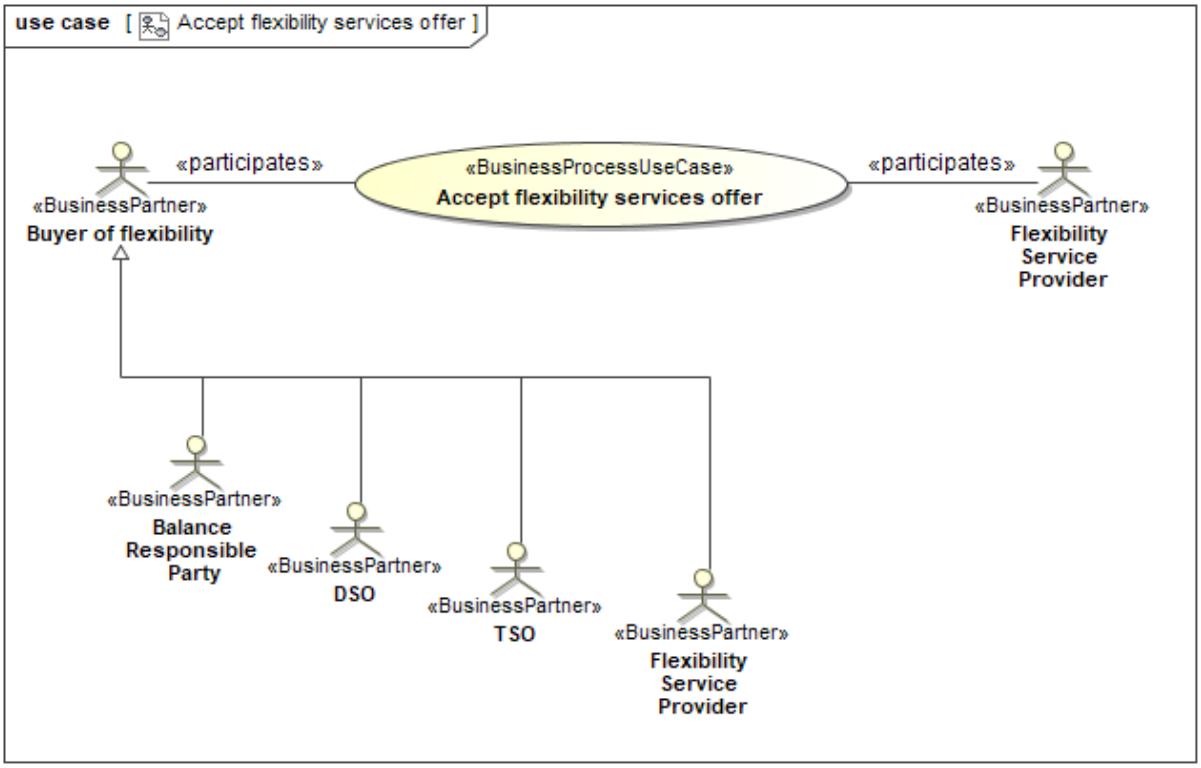


Figure 19 Business Process UseCase: Accept flexibility services offer

2.6.5.1 Description

UseCase description: **Accept flexibility services offer**	
definition	In this process the Buyer of Flexibility accepts the offer from the Flexibility Service Provider and establishes the deal.
beginsWhen	The Buyer of Flexibility decides to accept the offer for flexibility.
preCondition	The offer for flexibility has not expired and has not been revoked. The offer fulfils the requirements from the Buyer of Flexibility.
endsWhen	The Buyer of Flexibility accepts the offer from the Flexibility Service Provider. The offer may not be explicitly accepted beforehand (the taking may be implicit during activation).
postCondition	A (implicit) deal is established on taking of the offer.
exceptions	None (There is no rejection of the flexibility services offer).
actions	Not relevant in an overview.

Remark:
There may be a need to communicate the trade and the (potential) activation of the flexibility to the Flexibility Settlement Responsible and/or the corresponding BRP of the Energy Supplier for the Accounting Point for proper scheduling and nominations. At the moment it is not clear how the Affected Roles are linked so we postpone the modelling of it.

2.7 Activate flexibility services (Business Process UseCase)

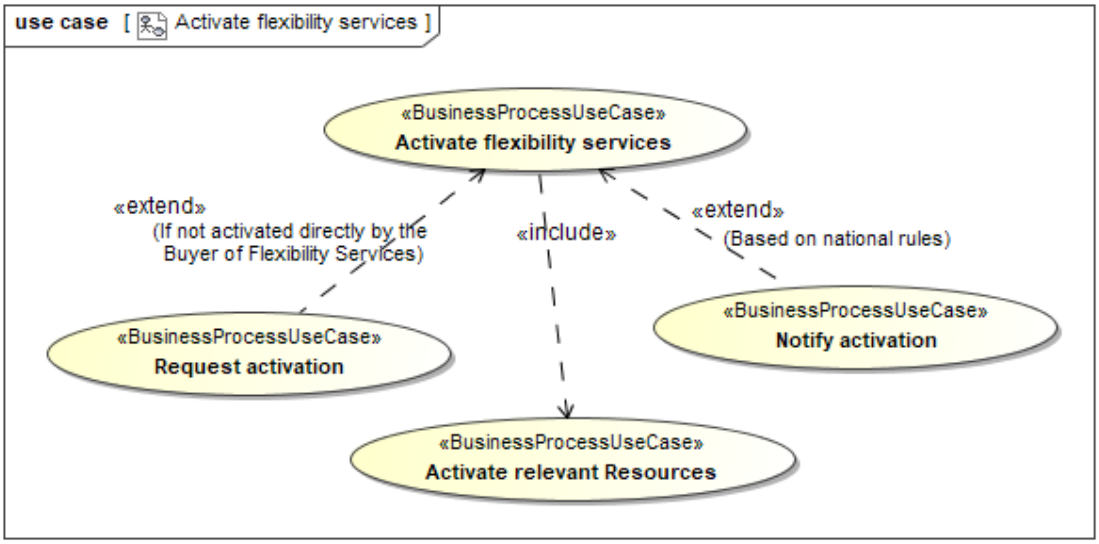


Figure 20 Business Process UseCase: Activate flexibility services

2.7.1 Description

UseCase description: **Activate flexibility services**	
definition	In this process the Buyer of Flexibility activates (partly or totally) the offered flexibility service[13]. The flexibility service on Resource level is usually activated through the Flexibility Service Provider[14].
beginsWhen	When the Buyer sees a need to activate the agreed flexibility services.
preCondition	There is an (implicit) deal between a Buyer of Flexibility and Flexibility Service Provider on the offered flexibility services. The activation is within the agreed conditions.
endsWhen	When the operating window[15] for activation of the flexibility service has ended

[13] It is expected this will be for the activation window as agreed in the offered flexibility service.

[14] For Resources that are monitored on-line, the BRP of the supplied Accounting Point needs to know what is being activated to avoid online compensation of the activation (without knowing the BRP would interpreted an activation as an imbalance and would compensate it), ref USEF consideration 305.

[15] With the operating window we indicate the offered or contractual time frame within which the services are offered or agreed to be activated.

postCondition	The agreed flexibility services have been delivered (with or without overshoot) or have partly been delivered or have not been delivered at all during the activation window and Affected Roles have been informed.
exceptions	• The Buyer of Flexibility Services is directly activating the Resource. • The FCR (Frequency Containment Reserves) is activated automatically, hence no explicit (external) activation is needed. • The activation is rejected by the Flexibility Service Provider. A rejection may result in a penalty. • Depending on national rules Affected Roles are informed.
actions	See 2.7.2

2.7.2 Business Process

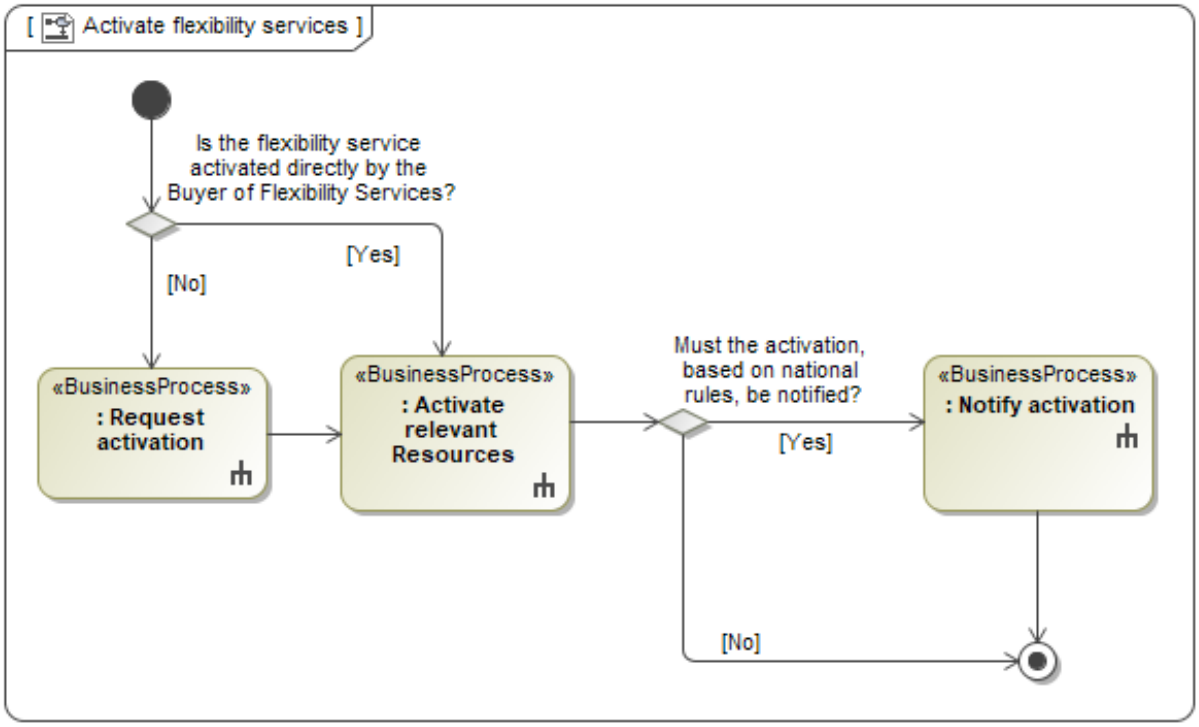


Figure 21 Business Process: Activate flexibility services

2.7.3 Request activation (Business Process UseCase)

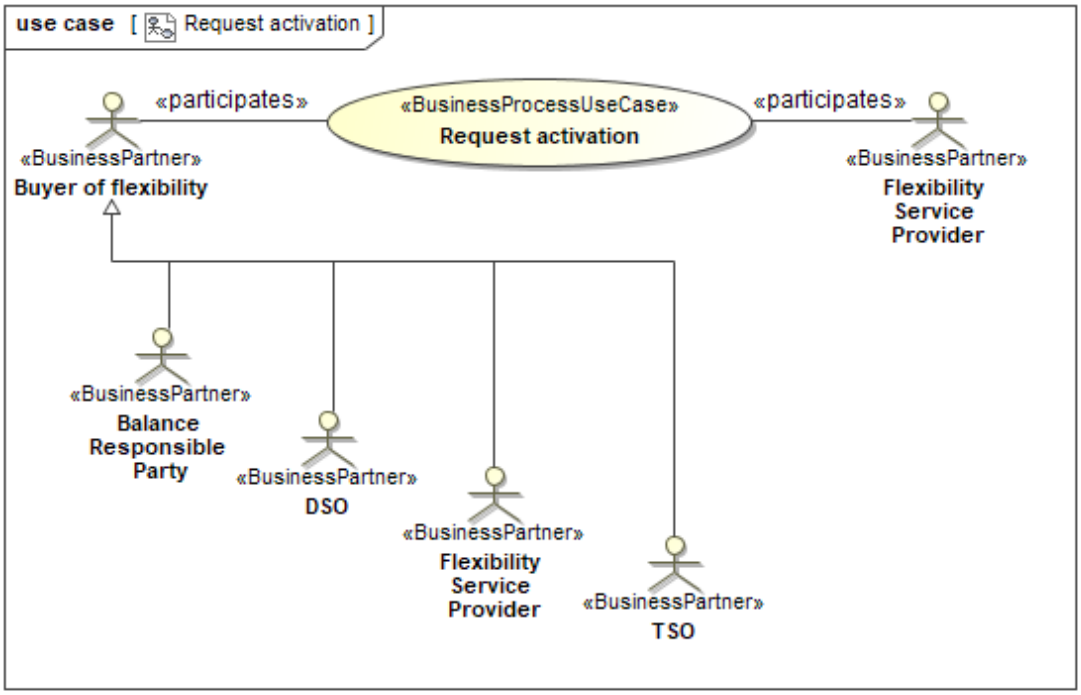


Figure 22 Business Process UseCase: Send activation signal

2.7.3.1 Description

UseCase description: Request activation	
definition	In this process the Buyer of Flexibility requests to activate a specific flexibility service of the Flexibility Service Provider and the Flexibility Service Provider confirms it.
beginsWhen	When the Buyer of Flexibility has a need to activate the flexibility services.
preCondition	The Buyer of Flexibility has (implicitly) contracted offer(s) for flexibility services from the Flexibility Service Provider and has decided to activate a specific flexibility service.
endsWhen	The activation request has been confirmed by the Flexibility Service Provider.
postCondition	The Flexibility Service Provider has confirmed the activation request for a specific service from the Buyer of Flexibility.
exceptions	There is no explicit signal for FCR and Intraday markets.

	The activation signal is rejected or ignored by the Flexibility Service Provider. A rejection may result in a penalty.
actions	Not relevant in an overview.

2.7.4 Activate relevant Resources (Business Process UseCase)

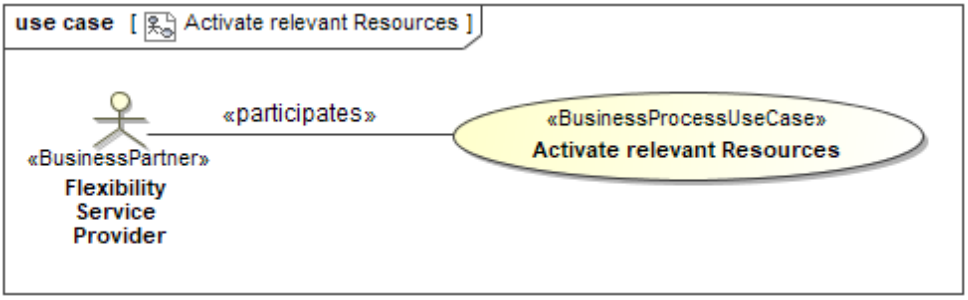


Figure 23 Business Process UseCase: Activate relevant Resources

2.7.4.1 Description

UseCase description: Activate relevant Resources	
definition	In this process the Flexibility Service Provider activates relevant Resources to deliver the specific flexibility service to the Buyer of Flexibility. If the flexibility has been offered from specific Resources, the Resources are activated according to the offering. If the flexibility has been offered from a portfolio, the Flexibility Service Provider chooses which Resources to activate during operation[16].
beginsWhen	When the Flexibility Service Provider has received an activation request for that service.
preCondition	The Flexibility Service Provider has received an activation request from the Buyer of Flexibility for the specific service.
endsWhen	The Flexibility Service Provider has activated relevant Resources.
postCondition	Relevant Resources have been activated to deliver the specific flexibility service to the Buyer of Flexibility.
exceptions	The activation has not been completed.
actions	This is an internal process within the Flexibility Service Provider, hence not further elaborated. During activation there may be, for operational purposes, real-time measurements and communication with the Resource.

[16] USEF calls this dynamic pooling, i.e. the Flexibility Service Provider decides at real-time which Resources to activate.

2.7.5 Notify activation (Business Process UseCase)

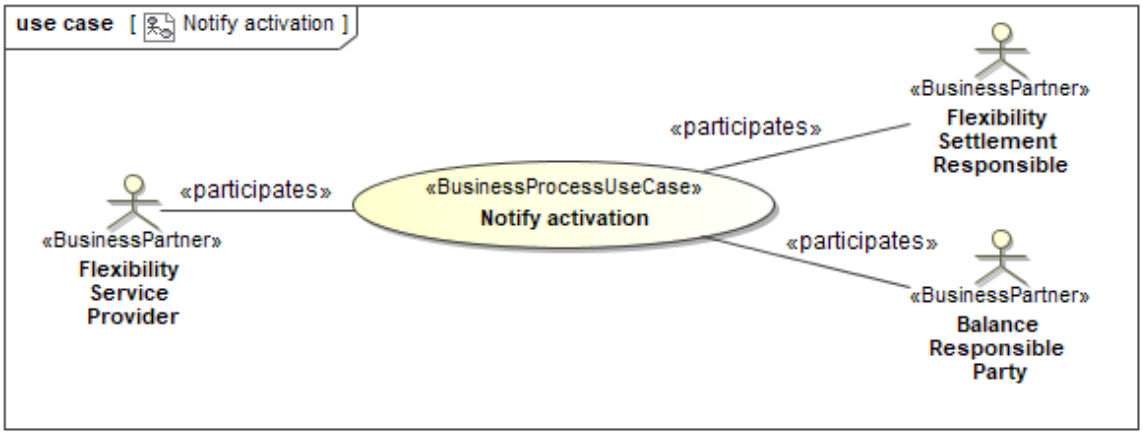


Figure 24 Business Process UseCase: Notify activation

2.7.5.1 Description

UseCase description: Notify activation	
definition	In this process, based on national rules, the Flexibility Service Provider notifies the Affected Roles (the Flexibility Settlement Responsible and the Balance Responsible Party of the supplied Accounting Point) of the activation of a flexibility service on the Accounting Point for an activation window[17+18].
beginsWhen	After the Flexibility Service Provider has activated flexibility services.
preCondition	The Flexibility Service Provider activated one or more Resources at the associated Accounting Point.
endsWhen	The Affected Roles have received activation information.
postCondition	Activation information has been received by the Affected Roles.
exceptions	Dependent on national rules, it may be necessary to send activation information to both the Balance Responsible Party and the Energy Supplier for the Accounting Point.
actions	Not relevant in an overview.

[17] The information is needed to prevent counterbalancing by the BRP for supply of the Accounting Point.

[18] The Flexibility Settlement Responsible may send the notification of activation to the Balance Responsible Party on behalf of the Flexibility Service Provider.

2.8 Quantify delivered flexibility services (Business Process UseCase)

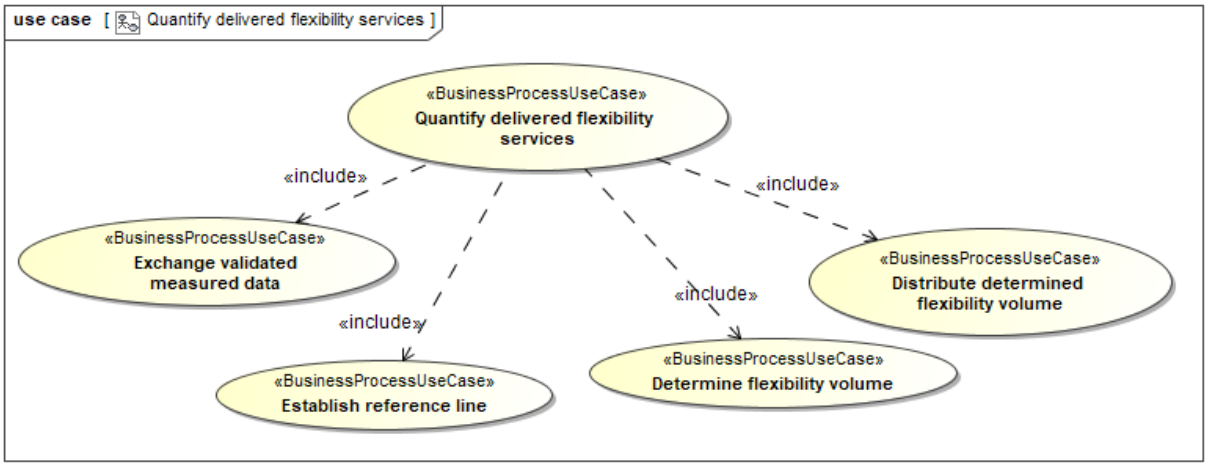


Figure 25 Business Process UseCase: Quantify delivered flexibility services

2.8.1 Description

UseCase description: **Quantify delivered flexibility services**	
definition	In this process, the activated flexibility services are quantified based on validated measured data and the established reference line. Thereafter the determined flexibility volume is communicated to the Affected Roles.
beginsWhen	When the activation window for the flexibility service has ended.
preCondition	The activated Resources are identified. All the data for quantification of delivered flexibility services (validated measured data and reference line) are available.
endsWhen	When the quantification of real delivered flexibility services has been done and the determined flexibility volume has been communicated to the Affected Roles.
postCondition	The quantities are calculated, and the determined flexibility volume has been communicated to the Affected Roles.
exceptions	It is assumed that calculations are based on measured volumes. There are other methods for calculations, however not elaborated in this UseCase.
actions	See 2.8.2

2.8.2 Business Process

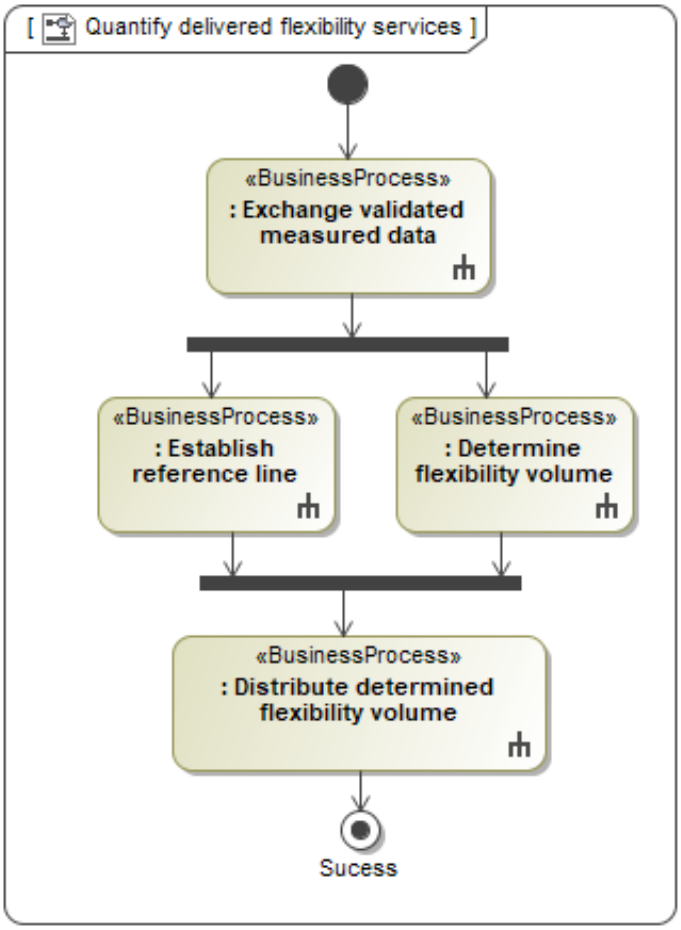


Figure 26 Business Process: Quantify delivered flexibility services

2.8.3 Exchange validated measured data (Business Process UseCase)

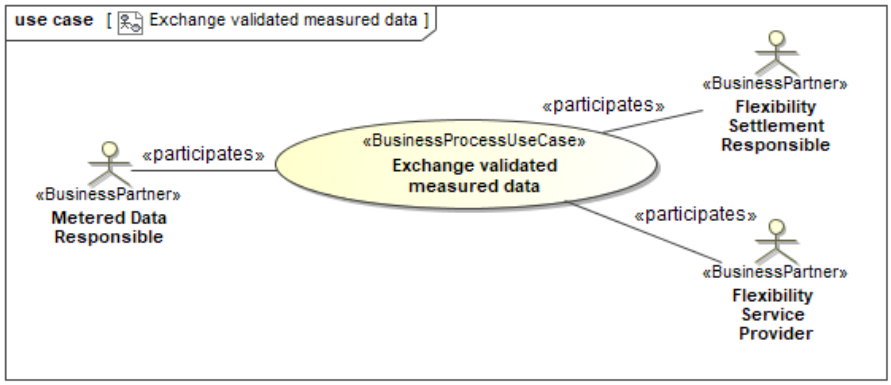


Figure 27 Business Process UseCase: Exchange validated measured data

2.8.3.1 Description

UseCase description: Exchange validated measured data	
definition	In this process, the Metered Data Responsible sends validated measured data for the involved Accounting Points to the Flexibility Settlement Responsible and the Flexibility Service Provider.
beginsWhen	After the activation window has ended.
preCondition	Validated measured data for the involved Accounting Points, for the relevant time intervals, is available.
endsWhen	When the validated measured data has been received by the Flexibility Settlement Responsible and the Flexibility Service Provider.
postCondition	The Flexibility Settlement Responsible and the Flexibility Service Provider have received validated measured data.
exceptions	None.
actions	Not relevant in an overview.

2.8.4 Establish reference line (Business Process UseCase)

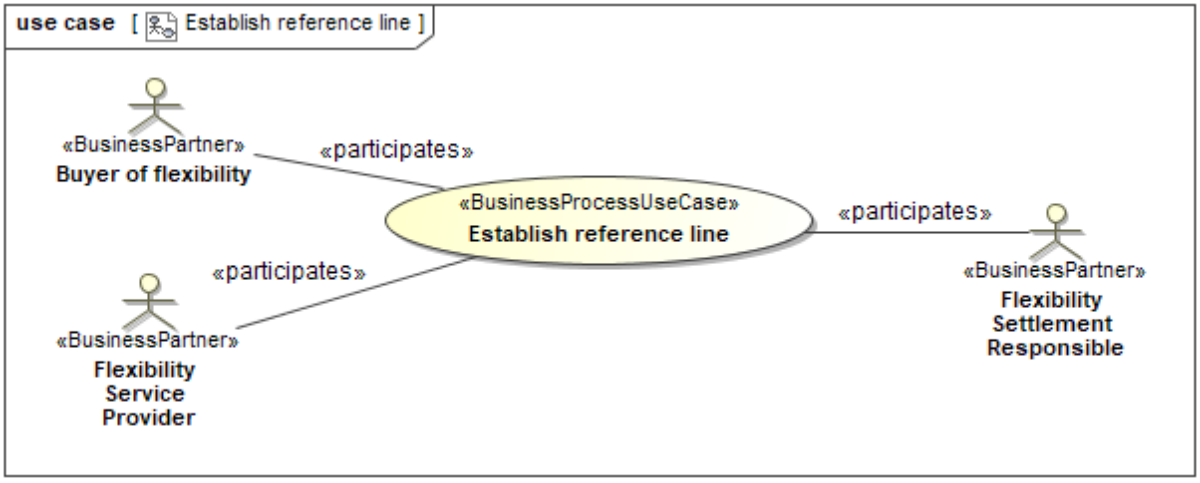


Figure 28 Business Process UseCase: Establish reference line

2.8.4.1 Description

UseCase description: Establish reference line	
definition	In this process the reference line (see 1.6) of the Accounting Point for flexibility services is determined between the Flexibility Service Provider and the Buyer of Flexibility, and thereafter communicated to the Flexibility Settlement Responsible.
beginsWhen	Dependent on the methodology, before or after the activation has been completed.
preCondition	The Flexibility Service Provider may activate or has activated the flexibility services.
endsWhen	The reference line has been established.
postCondition	There is an established reference line.
exceptions	If the flexibility is offered to energy markets, the reference line equals the nomination and hence the Buyer of Flexibility is not involved.
actions	This process is not further elaborated.

2.8.5 Determine flexibility volume (Business Process UseCase)

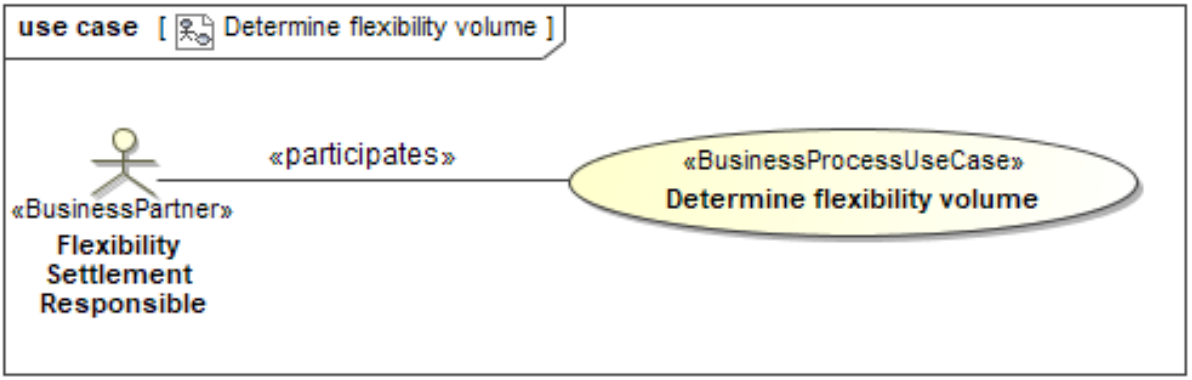


Figure 29 Business Process UseCase: Determine flexibility volume

2.8.5.1 Description

UseCase description: Determine flexibility volume	
definition	In this process the Flexibility Settlement Responsible determines the flexibility volume based on validated measured data and the reference line, of the Accounting Point.
beginsWhen	When the Flexibility Settlement Responsible has received validated measured data for activated flexibility services at the Accounting Point and knows the reference line for the flexibility services on the Accounting Points.
preCondition	The Flexibility Settlement Responsible has received validated measured data for activated flexibility services at the Accounting Point and knows the reference line for the flexibility services at the Accounting Points.
endsWhen	The Flexibility Settlement Responsible has determined the flexibility volume for the activated flexibility services on the Accounting Point.
postCondition	The flexibility volume (amount of energy or capacity activated) for the activated flexibility services on the Accounting Point has been determined.
exceptions	There may be a need for “proof of delivery” for the Buyer of Flexibility. In case of value stacking[19] (multiple services), the volumes of the other product(s) must be taken into account in the determination.
actions	This is an internal process within the Flexibility Settlement Responsible, hence not further elaborated.

[19] See USEF whitepaper value stacking.

2.8.6 Distribute determined flexibility volume (Business Process UseCase)

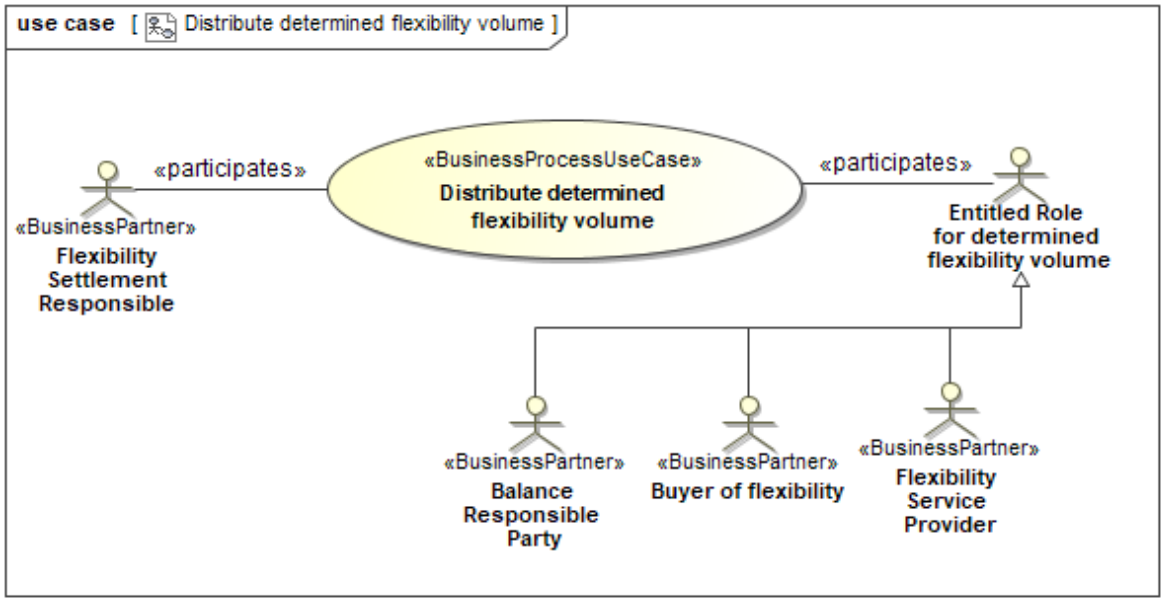


Figure 30 Business Process UseCase: Distribute determined flexibility volume

2.8.6.1 Description

UseCase description: Distribute determined flexibility volume	
definition	In this process the Flexibility Settlement Responsible distributes the determined flexibility volume to the Entitled Roles, Balance Responsible Party[20], Buyer of Flexibility and Flexibility Service Provider.
beginsWhen	When the Flexibility Settlement Responsible has determined the flexibility volume.
preCondition	The activation of flexibility energy services has ended.
endsWhen	The determined flexibility volume has been distributed to the Entitled Roles.
postCondition	The Entitled Roles have received the determined flexibility volume.
exceptions	Not needed for market trades.
actions	Not relevant in an overview.

[20] Dependent on national rules and product, the Balance Responsible Party is either the Balance Responsible Party of the Energy Supplier of the Accounting Point or the Balance Responsible Party of the Flexibility Service Provider.

2.9 Settle flexibility services (Business Process UseCase)

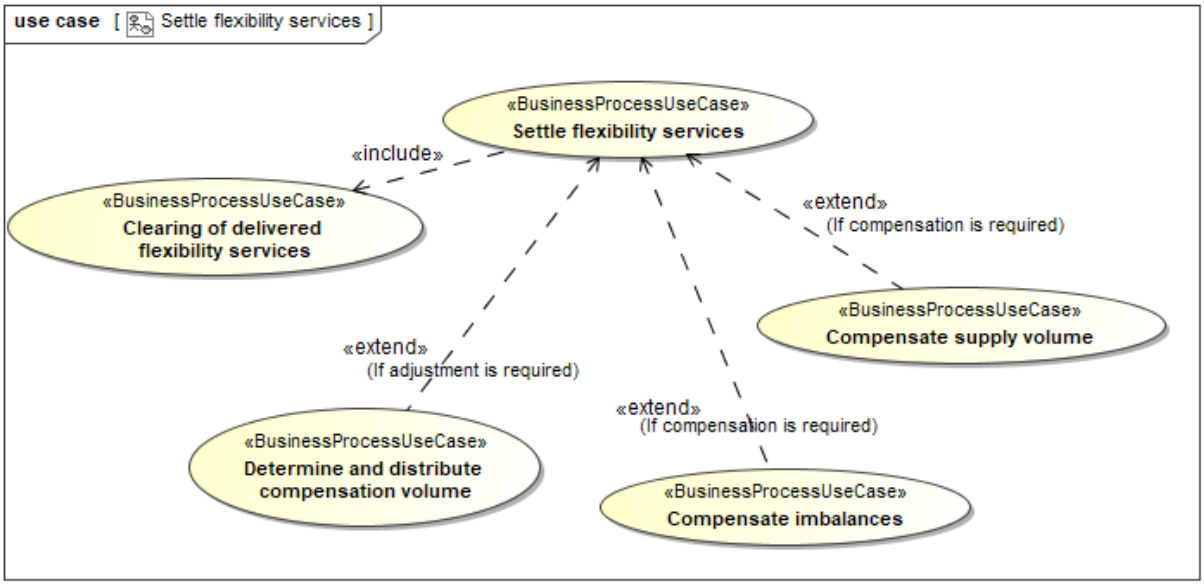


Figure 31 Business Process UseCase: Settle flexibility services

2.9.1 Description

UseCase description: **Settle flexibility services**	
definition	*This is an overview use case.* In this process the agreed flexibility services (delivered services and, if applicable, contractual conditions) are cleared 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.
beginsWhen	When the flexibility volume has been determined and/or the operational window has expired.
preCondition	Flexibility volumes are quantified.
endsWhen	All involved roles have received the settlement information and if applicable are compensated.
postCondition	The effects of the flexibility services transaction(s) between the Flexibility Service Provider and the Buyer of Flexibility services are determined, and the settlement is ready for billing.

	The influence of the flexibility services transaction(s) on the portfolios (offerings)/positions, of all other involved roles, is known/assigned and ready to be compensated.
exceptions	None.
actions	Not applicable.

2.9.2 Clearing of delivered flexibility services

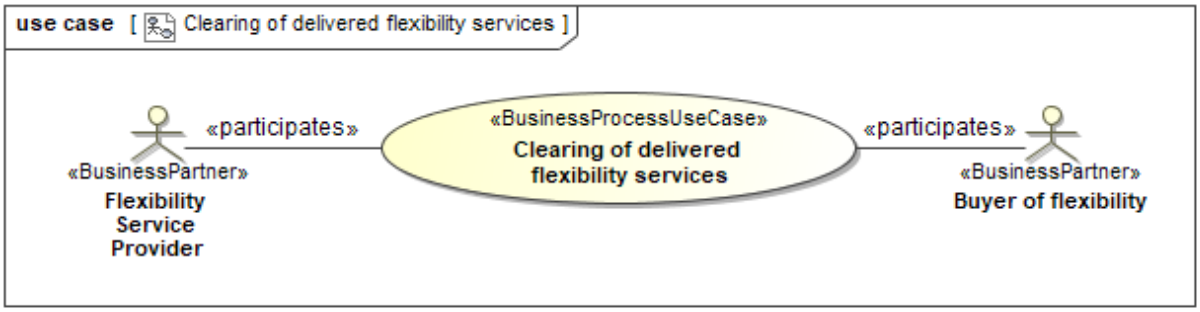


Figure 32 Business Process UseCase: Clearing of delivered flexibility services

2.9.2.1 Description

UseCase description: Clearing of delivered flexibility services	
definition	In this process the accepted flexibility services (delivered services and, if applicable, contractual conditions) are cleared between the Flexibility Service Provider and the Buyer of Flexibility.
beginsWhen	When the flexibility volume has been determined and/or the operational window has expired.
preCondition	Flexibility services are determined.
endsWhen	The flexibility service has been cleared between the Flexibility Service Provider and the Buyer of Flexibility.
postCondition	The effects of the flexibility services transaction(s) between Flexibility Service Provider and Buyer of Flexibility services are determined, and the clearing is done.
exceptions	None.
actions	This is not further elaborated, as it is for the time being expected to be a bilateral, diverse process.

2.9.3 Determine and distribute compensation volume (Business Process UseCase)

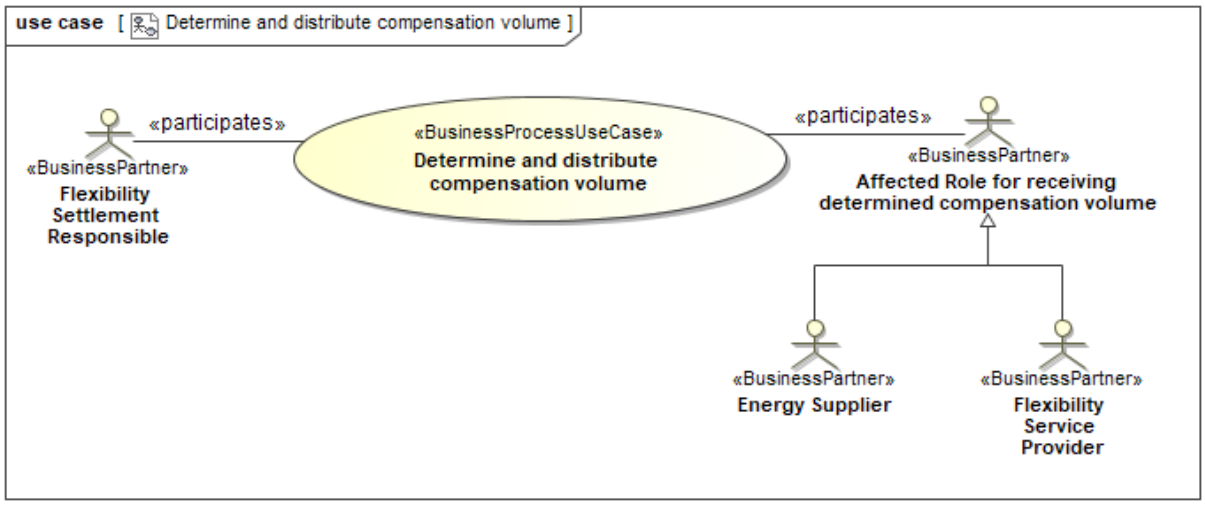


Figure 33 Business Process UseCase: Determine and distribute compensation volume

2.9.3.1 Description

UseCase description: Determine and distribute compensation volume	
definition	In this process the Flexibility Settlement Responsible determines the compensation volume for the affected Energy Supplier(s) and communicates it to the Energy Supplier(s) and the Flexibility Service Provider.
beginsWhen	When the settlement process has started.
preCondition	The flexibility volume has been determined.
endsWhen	The compensation volume has been determined and communicated to the Energy Supplier(s) and the Flexibility Service Provider.
postCondition	The compensation volume for the affected Energy Supplier (s) has been determined and made available at the affected Energy Supplier(s) and the Flexibility Service Provider.
exceptions	None.
actions	Not relevant in an overview.

2.9.4 Compensate imbalances (Business Process UseCase)

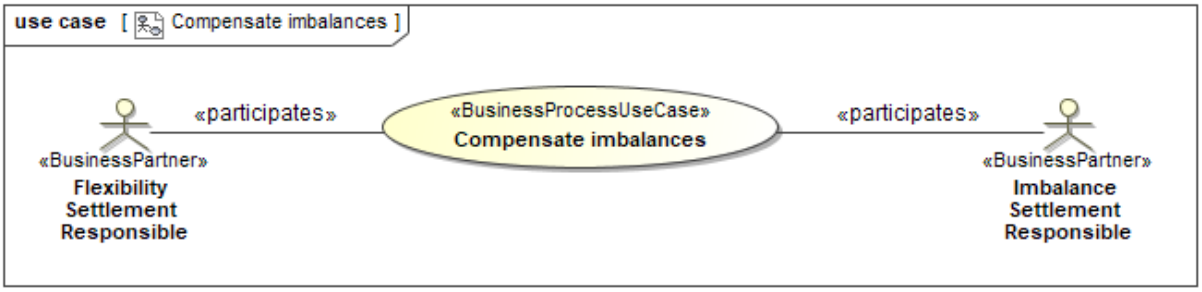


Figure 34 Business Process UseCase: Compensate imbalances

2.9.4.1 Description

UseCase description: Compensate imbalances	
definition	In this process the imbalances caused by activation of the flexibility service(s) by the Flexibility Service Provider are compensated in the (regular) imbalance settlement process by the Imbalance Settlement Responsible.
beginsWhen	When the imbalance settlement process has started.
preCondition	The flexibility volume has been determined.
endsWhen	The imbalance is compensated.
postCondition	The imbalance consequences have been determined and compensated.
exceptions	None.
actions	This is not further elaborated, as it is for the time being expected to be a bilateral, diverse process.

2.9.5 Compensate supply volume (Business Process UseCase)

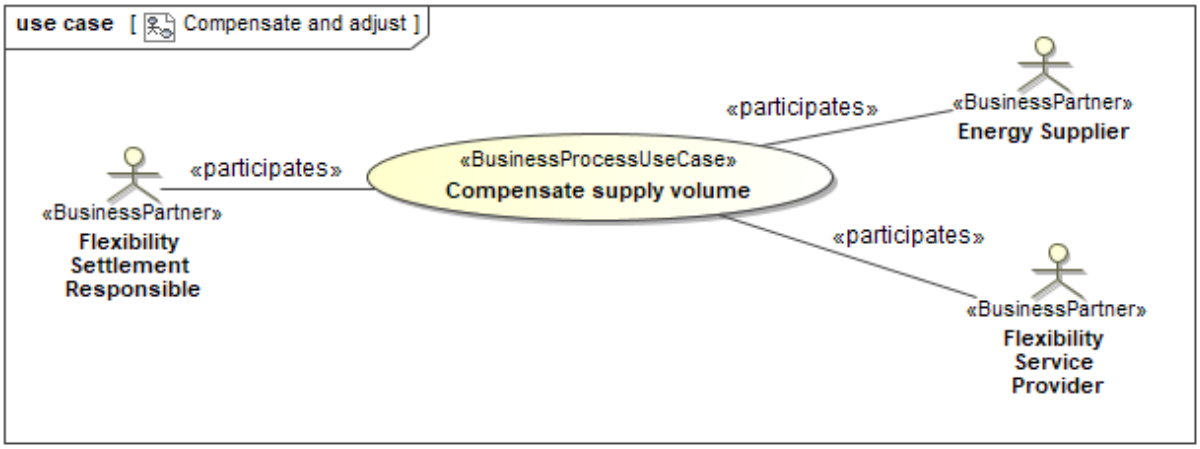


Figure 35 Business Process UseCase: Compensate supply volume

2.9.5.1 Description

UseCase description: Compensate supply volume	
definition	In this process the deviation of the supply volume caused by activation of the flexibility service is compensated.
beginsWhen	When the settlement process has started.
preCondition	The compensation volume caused by the activation of the flexibility service(s) has been determined by the Flexibility Settlement Responsible.
endsWhen	The compensation volume has been settled.
postCondition	The compensation volume has been settled between the Flexibility Service Provider and the affected Energy Supplier(s).
exceptions	None.
actions	Communication in this process is expected to be bilateral with no standard messages, hence the use case is not further elaborated.

3 Business Partner View: Provide flexibility services

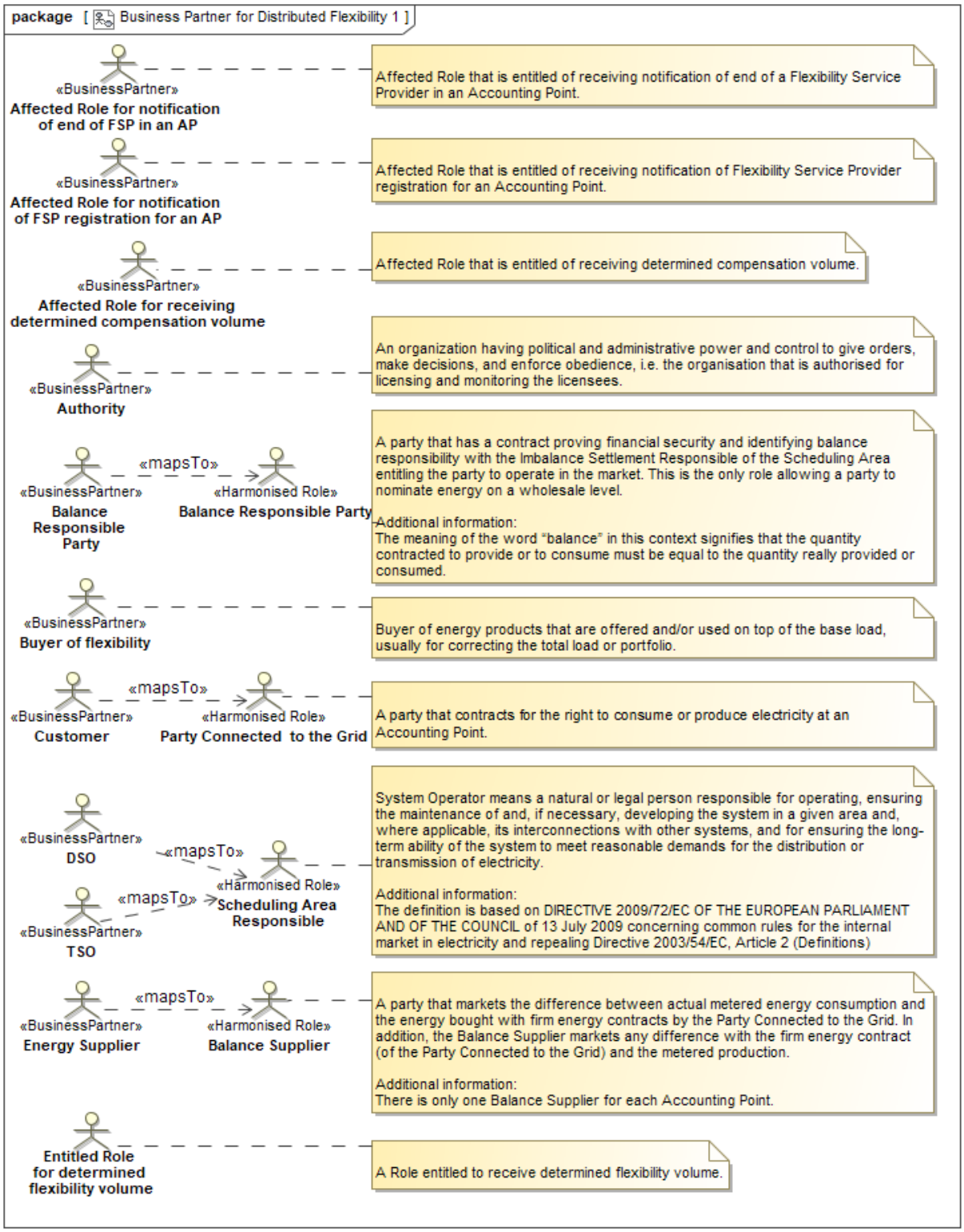


Figure 36 Business Partners related to "Provide flexibility services" (1)

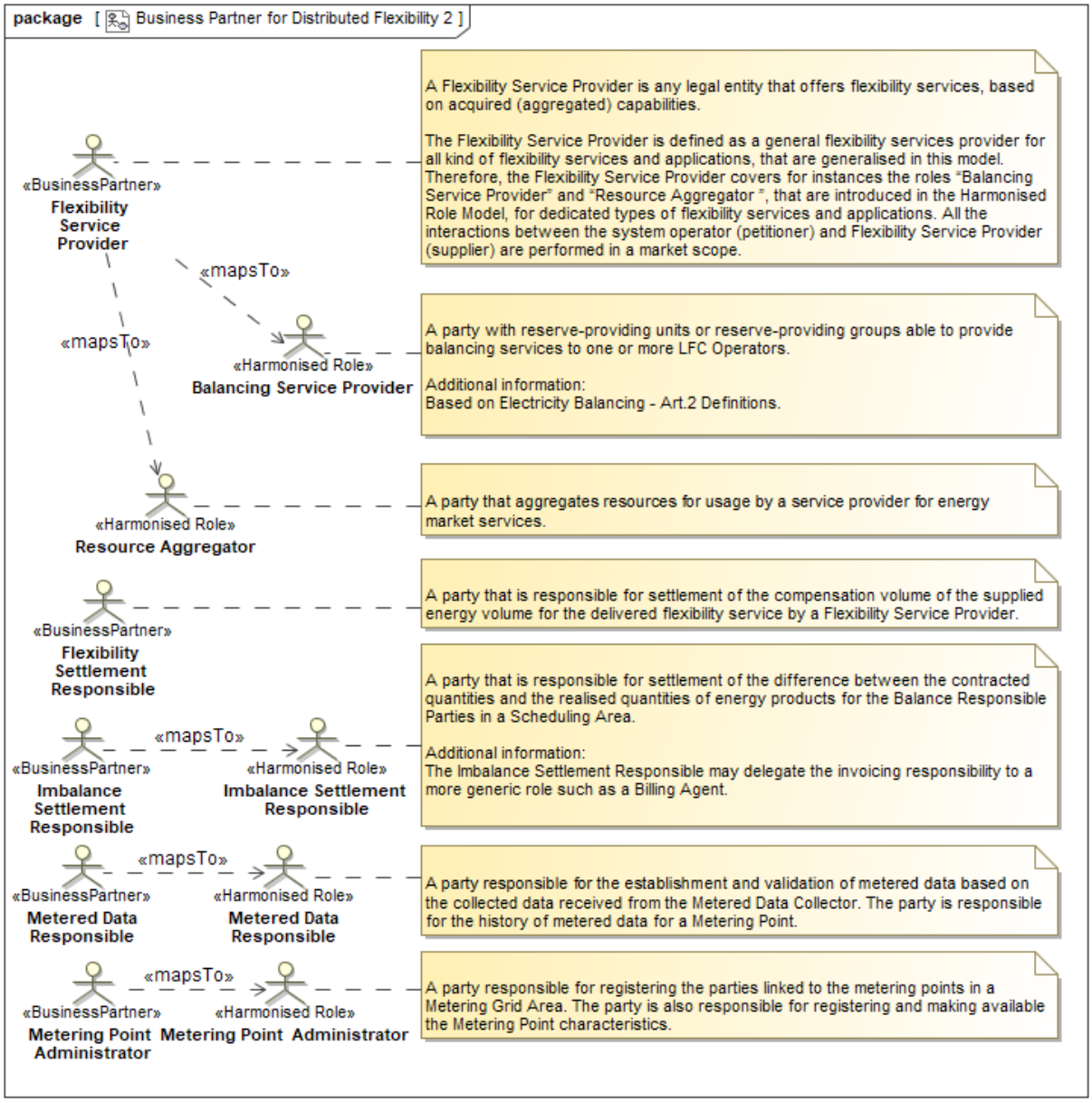


Figure 37 Business Partners related to "Provide flexibility services" (2)

Note:

- The Flexibility Service Provider may be mapped to yet undefined roles.
- In the definition of the Resource Aggregator it is only aggregating and still needs a FSP (or other service provider).