Coordination of distributed flexibility resources in a marketplace

Based on IEC 62559-2 edition 1
Generated from UML Use Case Repository with Modsarus® (EDF R&D Tool)

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
	Distribution Management,Energy Markets,Transmission System,Distribution System,Users,Operational planning	Coordination of distributed flexibility resources in a marketplace

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	2018-03-15	Nermin Suljanovic, Andrej Souvent (EIMV); Hugo Morais, Belén Goncer, Jérôme Cantenot (EDF)	Final version	Approved by consortium members

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	- Validation of TSO/DSO coordination mechanism to distributed flexibility resources procurement avoiding double or counter activation of the same flexibility resource by TSO and DSO - Prevent the negative impact of offers activation in the networks - Definition of the data that should exchange between the TSO, the DSO and the market operator.
Objective(s)	Improve the system security. Take advantage of increasing amount of flexibility resources connected in the distribution grid for providing services for the benefits of the overall power. Achieve competitiveness of flexibility resources in a common pool and obtain market liquidity. Test different solutions to validate the flexibility offers both by TSO and DSO. Investigate different strategies for TSO-DSO coordination that will maximise usage of flexibility services.
Related business case(s)	Procurement of distributed flexibility resources in a marketplace with a common pool for different purposes Operational Planning activities

1.4. Narrative of Use Case

Narrative of use case
Short description
This use case defines information exchanges between TSO, DSO, Flexibility Operators and Market Operator necessary for procurement of flexibility provided by distributed energy resources. Flexibility Operator interacts both with TSO and DSO and it is necessary to validate coordination mechanism that will prevent double activation of the same service at the same time. TSO and DSO

should also collaborate in order to avoid negative impact of DFR (Distributed Flexibility Resource) activation on their respective networks.
Three main scenarios should be considered:

1. The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (for the resources connected in distribution network)
2. The Flexibility Operator provides services for the DSO (local flexibility market). The DSO should provide, in day-ahead, the forecast load/generation for each primary substation including the activation of the procured flexibilities. The TSO should take into account this information for the balancing and congestion detection proposes.
3. The Flexibility Operator connected to distribution network provides services for the both for TSO and DSO in a coordinated local and national market mechanism. The offers not accepted in the local market are sent to the national market. At national market the TSO can obtain flexibilities from the Flexibility Operators connected on transmission and distribution networks.
4. The Flexibility Operator provides services for the both for TSO and DSO in a single procurement platform (single market). The activation of the offers should be agreed both by TSO and DSO.

Complete description

Flexibility services can be used at the electricity market for the three types of actions:
- portfolio optimisation of market players
- constraints management in transmission and distribution networks (at day-ahead and intraday markets)
- balancing to ensure power system security (balancing market).

Enabling flexibility services must not lead to market fragmentation or competition distortion. However, settlement of constraint management and balancing must be clearly separated. DFR providers must be able to sell their services to both TSOs and DSOs. TSO procures flexibility services, from large industrial consumers or aggregators. DSO procures flexibilities also from aggregators and from several types of DERs (distributed generation, demand response, decentralized storage, electric vehicles) connected to the distribution grid with the purpose to maintain quality of service and the security of supply. DSO can procure flexibility services in long and short timescales. In the present BUC, the timeframes day-ahead and intraday are considered. **Coordination between TSO and DSO is needed since the same flexibility resources may be activated for balancing (TSO services) and congestion constraints management (TSO and DSO services) purposes.**

Scenario 1: TSO procures the flexibilities and the DSO should validate their activation
DFR are procured by TSO for the purpose of balancing or constraint management in the transmission grid. However, the activation of the flexibilities can jeopardizes the security of supply and reduces quality of services due to, for example, power line congestions, voltage constraints or overload the power transformer at TSO/DSO border. Since the DFR are connected to distribution network, DSO should be asked to validate the DFRs procured by the TSO to avoid constraints in the distribution system.

Scenario 2: DSO procures the flexibilities and provides the forecasted load/generation by primary substation
DSO can organises a local procurement of flexibilities to prevent the operation constraints in the distribution network. The constraints can be technical (HV/MV power transformer overload, lines congestion, voltage constraints) but also contractual (agreements between TSO/DSO in the TSO/DSO borders). Since the procurement of the DFR will impact the global system operation, the DSO should include the activation of the flexibility offers in the forecasts (load/generation by primary substation) sent to the TSO in day-ahead.

Scenario 3: Coordination mechanism between local and national market
The Flexible Operators connected in distribution network should place their offer in a local market and the Flexible Operators connected in the transmission network should place their orders in a national market. The clearing mechanism in local market should provide services for the DSO to solve the distribution network constraints. The offers that are not used in the local market should be technically

validated by the DSO and be transferred for the National market. After the clearing process both in local and national markets, the TSO should coordinate the activation of the flexibilities connected in the transmission system and the DSO should coordinate the activation of the flexibilities connected in the distribution network.

Scenario 4: TSO and DSO procure flexibility in a single flexibility market
To ensure the market liquidity, building a level playing field for different service providers in a single marketplace and to joint procurement of services both for TSOs and DSOs a single procurement system is needed [1]. In this single procurement platform (market) the TSO and the DSOs should include their needs to balancing and congestion management (TSO) and for congestion and voltage management (DSO). It is important to mention that some voltage constraints can appear in distribution network even if a good reactive management is implemented.

Flexibility platform enables well-structured and organised exchange of data between TSO, DSO and flexibility service provider. **DSO should have visibility of aggregated resources in the distribution grid and information about individual activations.** This information should be available (day ahead or intraday time frames) to ensure that market schedules are not in the conflict with network operation.

Summary of use case

- **Scenario1A: The offers are validated before the market clearing**
  Description: The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (for the resources connected in distribution network)

  - Send the Flexibility offers
    Description: The Flexibility Operator should send the offers to the market
  - Offers acknowledged
    Description:
  - Gate Closure
    Description: Market gate closure
  - Determine the needs to assure the operation of transmission system (balancing and congestions)
    Description: The TSO should identify the flexibility needs to avoid constraints in transmission network
  - Offers Validation
    Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)
  - Needs and offers validation acknowledged
    Description:
  - Offers Pre-validation
    Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
    The changes can be of 3 types:
    - Change the power of the flexibility offers
    - Change the timeframe of activation of the offers
    - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operators can change the offer according the market operator demand.

- Offers acknowledged
  Description:

- Market Clearance
  Description:

- Publication of Market Results
  Description:

- **Scenario1B: The offers are validated after the market clearing**
  Description: The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (for the resources connected in distribution network)

  - Offers acknowledged
    Description:

  - Send the Flexibility offers
    Description: The Flexibility Operator should send the offers to the market

  - Offers acknowledged
    Description:

  - Gate Closure
    Description: Market gate closure

  - Determine the needs to assure the operation of transmission system (balancing and congestions)
    Description: The TSO should identify the flexibility needs to avoid constraints in transmission network

  - Needs acknowledged
    Description:

  - Market Clearance
    Description:

  - Offers Validation
    Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

  - Offers Pre-validation
    Description: Based on offers provided by the Flexibility Operators and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
    The changes can be of 3 types:
    - Change the power of the flexibility offers
    - Change the timeframe of activation of the offers
    - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same

- Offers acknowledged
  Description:

- Offers redefinition
  Description: The Flexibility Operator can change the offer according the market operator demand.

- Publication of Market Results
  Description:

- **Scenario2: Local Market to provide services to the DSO**
  Description: The Flexibility Operator provides services for the DSO (local flexibility market) and the TSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (Consider the impact in the transmission system)

  - Send the Flexibility offers
    Description: The Flexibility Operator should send the offers to the market

  - Offers acknowledged
    Description:

  - Gate Closure
    Description: Market gate closure

  - Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)
    Description: The DSO should identify the flexibility needs to avoid constraints (congestions and voltage profiles) in distribution network

  - Offers Validation
    Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

  - Needs and margins acknowledged
    Description:

  - Offers Pre-validation
    Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
    The changes can be of 3 types:
    - Change the power of the flexibility offers
    - Change the timeframe of activation of the offers
    - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

    The price of the offers should remain the same

  - Offers redefinition
    Description: The Flexibility Operators can change the offer according the market operator demand.

  - Offers acknowledged
    Description:

- Market Clearance
  Description:

- Publication of Market Results
  Description:

- Definition of the consumption profiles of each primary substation
  Description: The DSO should inform the TSO concerning the forecasted consumption and or generation of each primary substation. Beyond the forecasted values the DSO should include the procured flexibility offers.

- Forecasted primary substations use profiles acknowledged
  Description:

- **Scenario 3: Coordination between National Market and Local Market**
  Description: The Flexibility Operators connected in distribution network should place their offer in a local market and the Flexible Operators connected in the transmission network should place their orders in a national market. The clearing mechanism in local market should provide services for the DSO to solve the distribution network constraints. The offers that are not used in the local market should be technically validated by the DSO and be transferred for the National market. After the clearing process both in local and national markets, the TSO should coordinate the activation of the flexibilities connected in the transmission system and the DSO should coordinate the activation of the flexibilities connected in the distribution network

  - Send flexibility offers
    Description: The Flexibility Operator connected to transmission network should send the offers to the market

  - Offers acknowledged
    Description:

  - Local Market Gate Closure
    Description: Market Gate closure

  - Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)
    Description: The DSO should identify the flexibility needs to avoid constraints (congestions and voltage profiles) in distribution network

  - **Local Market**
    Description: Local market to solve to provide services for the DSO. The information concerning the cleared offers should be transmitted to DSO. The offers not procured and validated (will not have impact in the distribution system) should be sent to the National market

    - Needs and margins acknowledged
      Description:

    - Offers Validation
      Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

    - Offers Pre-validation
      Description: Based on offers provided by the Flexibility Operator and on the

validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operators can change the offer according the market operator demand.

- Offers acknowledged
  Description:

- Local Market Clearance
  Description:

- Publication of Market Results
  Description:

- **Local Market**
  Description: Local market to solve to provide services for the DSO. The information concerning the cleared offers should be transmitted to DSO. The offers not procured and validated (will not have impact in the distribution system) should be sent to the National market

  - Offers Validation
    Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

  - Offers Pre-validation
    Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
    The changes can be of 3 types:
    - Change the power of the flexibility offers
    - Change the timeframe of activation of the offers
    - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

    The price of the offers should remain the same

  - Offers redefinition
    Description: The Flexibility Operators can change the offer according the market operator demand.

  - Offers acknowledged
    Description:

  - Local Market Clearance
    Description:

- Publication of Market Results
  Description:

- Needs and margins acknowledged
  Description:

- Offers Validation
  Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

- Offers Pre-validation
  Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operators can change the offer according the market operator demand.

- Offers acknowledged
  Description:

- Local Market Clearance
  Description:

- Needs and margins acknowledged
  Description:

- Offers Validation
  Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

- Offers Pre-validation
  Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operators can change the offer according the market operator demand.

- Offers acknowledged
  Description:

- Needs and margins acknowledged
  Description:

- Offers Validation
  Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

- Offers Pre-validation
  Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operators can change the offer according the market operator demand.

- Needs and margins acknowledged
  Description:

- Offers Validation
  Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

- Offers Pre-validation
  Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same

- Needs and margins acknowledged
  Description:

- Offers Validation
  Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

- Needs and margins acknowledged
  Description:

- Needs and margins acknowledged
  Description:

- Offers Validation
  Description: The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)

- Offers Pre-validation
  Description: Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operators can change the offer according the market operator demand.

- Offers acknowledged
  Description:

- Local Market Clearance
  Description:

- Publication of Market Results
  Description:

- Definition of the consumption profiles of each primary substation
  Description: The DSO should inform the TSO concerning the forecasted consumption and or generation of each primary substation. Beyond the forecasted values the DSO should include the procured flexibility offers.

- Forecasted primary substations use profiles and flexibilities acknowledged
  Description:

- Send the Flexibility offers
  Description: The Flexibility Operator connected to distribution network should send the offers to the market

- Offers acknowledged
  Description:

- National Market Gate Closure
  Description:

- Determine the needs to assure the operation of transmission system (balancing and congestions)
  Description: The TSO should identify the flexibility needs to avoid constraints in transmission network

- National Market Clearance
  Description:

- Publication of Market Results
  Description:

- **Scenario4: National market to provide services both for TSO and DSO**
  Description: The Flexibility Operator provides services for the both for TSO and DSO in a single procurement platform (single market). The activation of the offers should be agreed both by TSO and DSO

  - Send the Flexibility offers
    Description: The Flexibility Operator should send the offers to the market

  - Offers acknowledged
    Description:

  - Gate Closure
    Description: Market gate closure

  - Determine the needs and the margins by zone (group of nodes HV/MV)
    Description: The TSO should identify the margin of activation of flexibility offers taking into account the impact of these offers in transmission network. The margins can be imposed by the operation of some transmission lines near by their limits. The use of margins should avoid the activation of offers to solve the DSO needs but originating congestions in transmission system.

  - Determine the needs and the margins in each node HV/MV
    Description: The DSO should identify the margin of activation of flexibility offers taking into account the impact of these offers in distribution network. The margins can be imposed by the possible congestion in power transformers in primary substations or some lines or even due to some voltage problems. The use of margins should avoid the activation of offers to solve the TSO needs but originating congestions in distribution system.

  - Needs and margins acknowledged
    Description:

  - Offers Pre-validation
    Description: Based on offers provided by the Flexibility Operators and on the margins provided by the TSO and DSO. The market operator should pre-validate the offers and propose some changes to the Flexibility Operators.
    The changes can be of 3 types:
    - Change the power of the flexibility offers
    - Change the timeframe of activation of the offers
    - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same

- Offers redefinition
  Description: The Flexibility Operator can change the offer according the market operator demand.
- Offers acknowledged
  Description:
- Single Market clearance
  Description:
- Publication of Market Results
  Description:

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Number of expected constraints solved by flexibilities procurement		Improve the system security.Take advantage of increasing amount of flexibility resources connected in the distribution grid for providing services for the benefits of the overall power.
2	Power of procured offers	Power of procured offers in the different scenarios	Improve the system security.Take advantage of increasing amount of flexibility resources connected in the distribution grid for providing services for the benefits of the overall power.Achieve competitiveness of flexibility resources in a common pool and obtain market liquidity.Investigate different strategies for TSO-DSO coordination that will maximise usage of flexibility services.
3	Number of procured offers	Evaluation of the number of constraints solved by the markets	Achieve competitiveness of flexibility resources in a common pool and obtain market liquidity.Investigate different strategies for TSO-DSO coordination that will maximise usage of flexibility services.
4	Cost of procured offers for TSO and DSO	Analysis of the costs of the procured offers in the different markets	Achieve competitiveness of flexibility resources in a common pool and obtain market liquidity.Investigate different strategies for TSO-DSO coordination that will maximise usage of flexibility services.
5	Number of tested solutions	Quantity of tested scenarios	Test different solutions to validate the flexibility offers both by TSO and DSO.Investigate different strategies for TSO-DSO coordination that will maximise usage of flexibility services.

1.6. Use case conditions

Use case conditions	
Assumptions	
1	In the presented BUC is considered that the markets are performed in day-ahead or in intraday timeframes.
2	Distributed Flexibility Resources (DFR) operated by Flexible Operators can be provided by aggregators or by significant grid users (SGU).: Distributed Flexibility Resources (DFR) can be provided by aggregators or by significant grid users (SGU). The DFR can integrate different type of

	resources like producers, consumers, storage systems, and electric vehicles. The DSO and the TSO are not able to provide this kind of flexibility.
3	The management of the markets can be done in a national level or in local level.: The management of the markets can be done in a national level (Scenario 1, Scenario 3 and Scenario 4) or in local level (Scenario 2 and Scenario 3) providing services to the TSO (Scenario 1, Scenario 3 and Case 4) and for the DSO (Scenario 2, Scenario 3 and Scenario 4). In all cases, the solutions should be validated both for TSO and DSO.
Prerequisites	
1	The Distributed Flexibility Resources (DFR) operated by Flexible Operators should be already pre-qualified
2	The offers should include the location of the activation of the flexibility

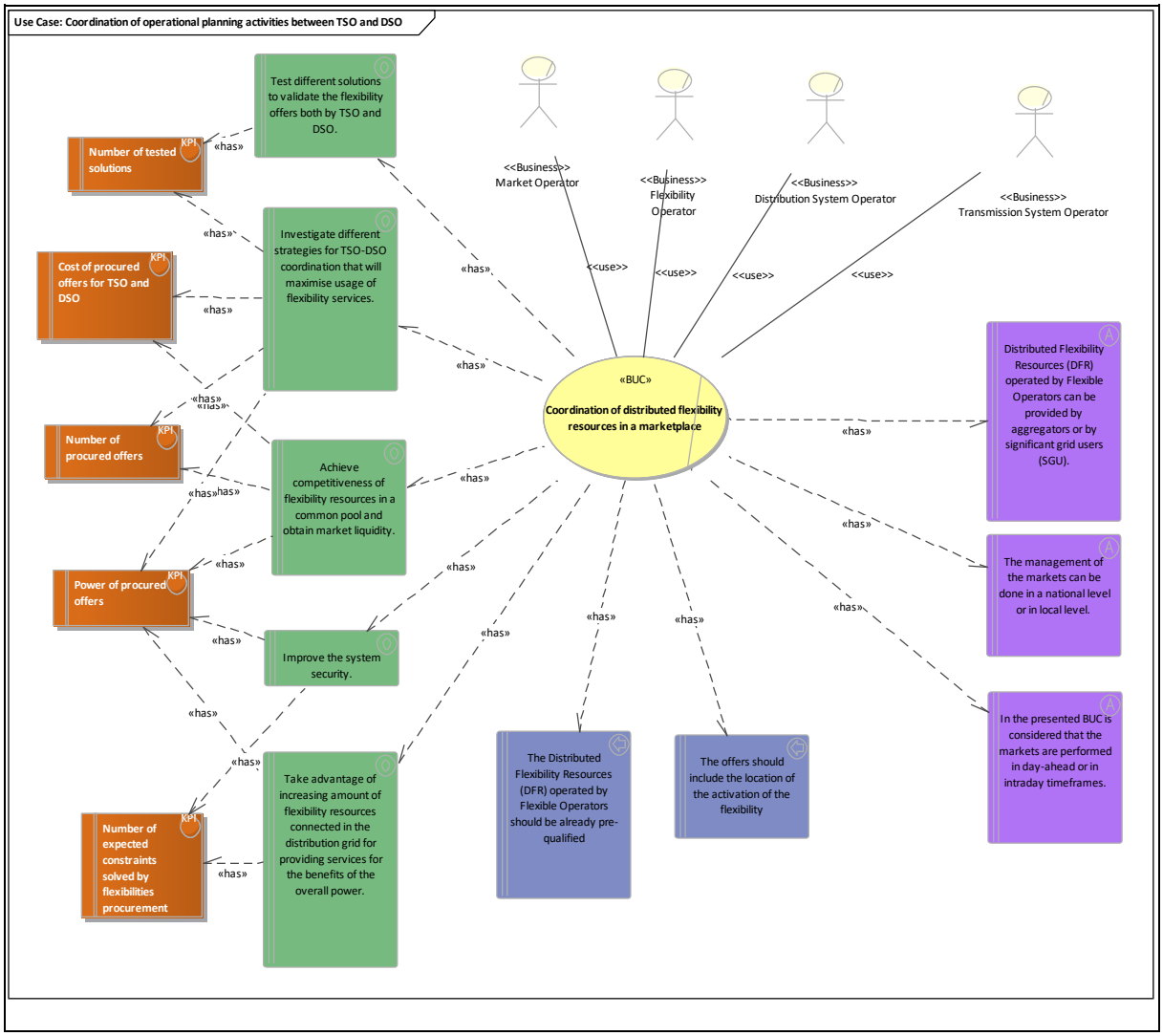
1.7. Further information to the use case for classification/mapping

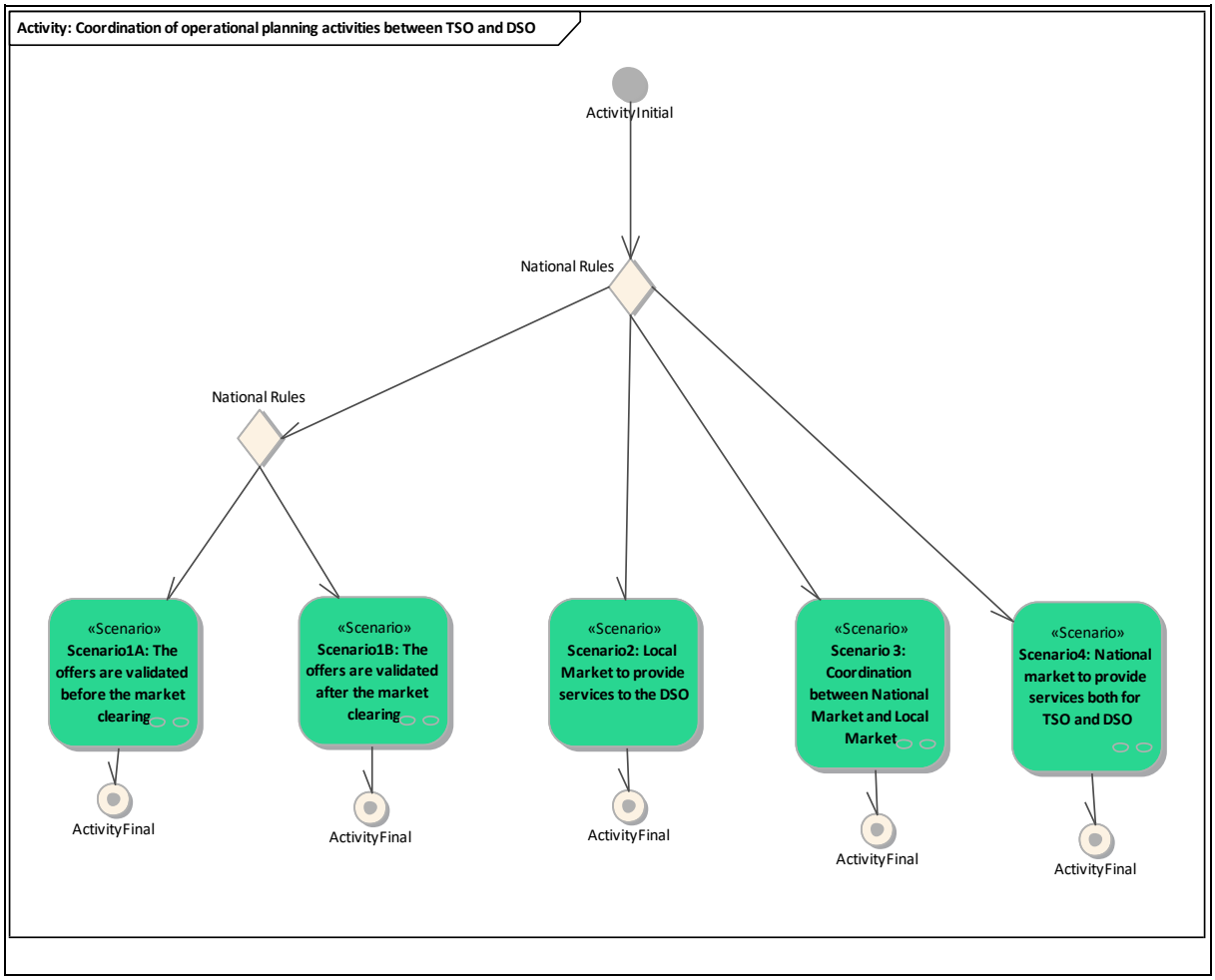
Classification information
Relation to other use cases
<<SUC>> Market Offering
Level of depth
Generic use case
Prioritisation
Generic, regional or national relation
Generic use-case with application in different national contexts considering different scenarios
Nature of the use case
BUC
Further keywords for classification
TSO-DSO coordination, data exchange, operational planning, flexibility markets

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


Use Case: Coordination of operational planning activities between TSO and DSO
Test different solutions to validate the flexibility offers both by TSO and DSO.
Number of tested solutions
KPI
Investigate different strategies for TSO-DSO coordination that will maximise usage of flexibility services.
Cost of procured offers for TSO and DSO
Number of procured offers
Achieve competitiveness of flexibility resources in a common pool and obtain market liquidity.
Power of procured offers
Improve the system security.
Number of expected constraints solved by flexibilities procurement
Take advantage of increasing amount of flexibility resources connected in the distribution grid for providing services for the benefits of the overall power.
«has»
<<Business>> Market Operator
<<Business>> Flexibility Operator
<<Business>> Distribution System Operator
<<Business>> Transmission System Operator
<<use>>
«BUC» Coordination of distributed flexibility resources in a marketplace
Distributed Flexibility Resources (DFR) operated by Flexible Operators can be provided by aggregators or by significant grid users (SGU).
The management of the markets can be done in a national level or in local level.
In the presented BUC is considered that the markets are performed in day-ahead or in intraday timeframes.
The Distributed Flexibility Resources (DFR) operated by Flexible Operators should be already pre-qualified
The offers should include the location of the activation of the flexibility



3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Market Operator	Business	The unique power exchange of trades for the actual delivery of energy that receives the bids from the parties that have a contract to bid. The market operator determines the market energy price for the market balance area after applying technical constraints from the system operator. It may also establish the price for the reconciliation within a metering grid area.	
Flexibility Operator	Business	Role which links through contractual agreements (flexibility requests, notices etc.) the role customer and its possibility to provide flexibilities to the roles market and grid; generic role that could be taken by many stakeholders. This entity can activate all or part of the flexibility resources during a period and regarding a specific location or geographical area.	

Distribution System Operator	Business	A natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long term ability of the system to meet reasonable demands for the distribution of electricity or gas. That definition is provided for by art. 2 n. 6 Dir 2007/72/EC with regards to electricity and by art. 2 (6) Dir 2007/73/EC with regards to gas. In the electricity sector distribution means the transport of electricity on high-voltage, medium-voltage and low-voltage distribution systems with a view to its delivery to customers, but does not include supply according to art. 2 (5) Dir, 2007/72/EC. Accordingly, distribution in the gas sector means the transport of natural gas through regional pipeline networks with a view to its delivery to customers, but not including supply. DSOs have to act according to art. 25, 26, 27 Dir. 2007/72/EC (with regards to electricity) and to art. 25, 26, 27 Dir. 2007/73/EC (with regards to gas). The aforementioned provisions provide the tasks and duties of DSOs. One of the main characteristics of the DSO is that it shall be independent at least in terms of its legal form, organisation and decision making from other activities not relating to distribution within a vertically integrated undertaking. Unlike the transmission system operator, the DSO is not affected by ownership unbundling.	
Transmission System Operator	Business	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area. Source : EU Commission Task Force for Smart Grids, EG3	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

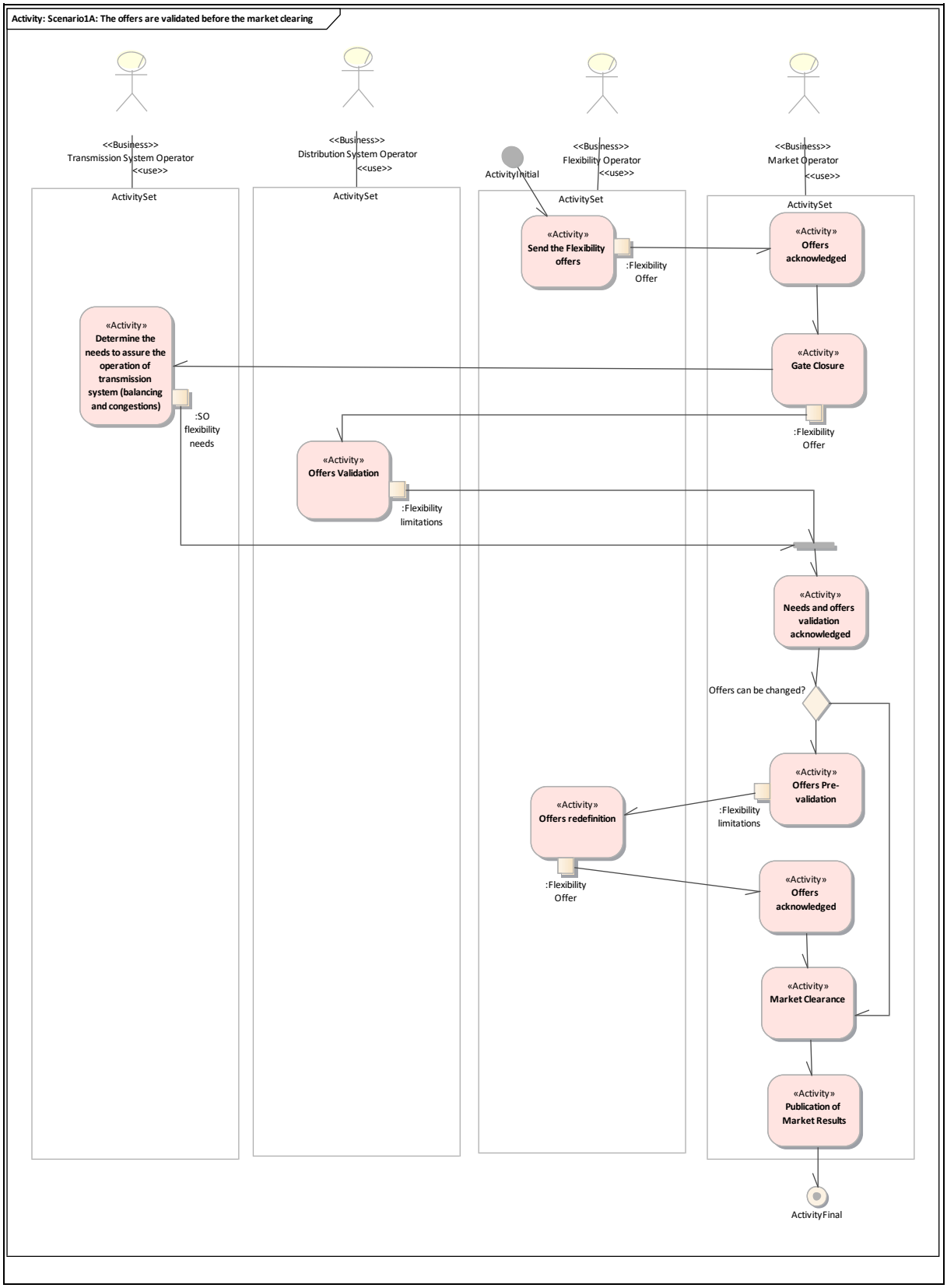
Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Scenario1A: The offers are validated before the market clearing	The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of				

		these flexibilities (for the resources connected in distribution network)				
2	Scenario1B: The offers are validated after the market clearing	The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (for the resources connected in distribution network)				
3	Scenario2: Local Market to provide services to the DSO	The Flexibility Operator provides services for the DSO (local flexibility market) and the TSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (Consider the impact in the transmission system)				
4	Scenario 3: Coordination between National Market and Local Market	The Flexibility Operators connected in distribution network should place their offer in a local market and the Flexible Operators connected in the transmission network should place their orders in a national market. The clearing mechanism in local market should provide services for the DSO to solve the distribution network constraints. The offers that are not used in the local market should be technically validated by the DSO and be transferred for the National market. After the clearing process both in local and national markets, the TSO should coordinate the activation of the flexibilities connected in the transmission system and the DSO should coordinate the activation of the flexibilities connected in the distribution network				
5	Scenario4: National market to provide services both for TSO and DSO	The Flexibility Operator provides services for the both for TSO and DSO in a single procurement platform (single market). The activation of the offers should be agreed both by TSO and DSO				

4.2. Steps - Scenarios

4.2.1. Scenario1A: The offers are validated before the market clearing

The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (for the resources connected in distribution network)



Scenario step by step analysis

Scenario	
Scenario name	Scenario1A: The offers are validated before the market clearing

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1.1		Send the Flexibility offers	The Flexibility Operator should send the offers to the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
1.2		Offers acknowledged			Market Operator			
1.3		Gate Closure	Market gate closure		Market Operator	Distribution System Operator	Info1-Flexibility Offer	
1.4		Determine the needs to assure the operation of transmission system (balancing and congestions)	The TSO should identify the flexibility needs to avoid constraints in transmission network		Transmission System Operator	Market Operator	Info2-TSO Margins, Info3-SO flexibility needs	
1.5		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Distribution System Operator	Market Operator	Info4-Flexibility limitations	
1.6		Needs and offers validation acknowledged			Market Operator			
1.7		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same					
1.8		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
1.9		Offers acknowledged			Market Operator			
1.10		Market Clearance			Market Operator			
1.11		Publication of Market Results			Market Operator			

- 1.1. Send the Flexibility offers

Business section: Scenario1A: The offers are validated before the market clearing/Send the Flexibility offers
The Flexibility Operator should send the offers to the market
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		

- 1.3. Gate Closure

Business section: Scenario1A: The offers are validated before the market clearing/Gate Closure
Market gate closure
Information sent:

Business object	*Instance name*	*Instance description*

Flexibility Offer		All the offers received before the Gate Closure

- 1.4. Determine the needs to assure the operation of transmission system (balancing and congestions)

  Business section: Scenario1A: The offers are validated before the market clearing/Determine the needs to assure the operation of transmission system (balancing and congestions)
  The TSO should identify the flexibility needs to avoid constraints in transmission network
  Information sent:

Business object	*Instance name*	*Instance description*
TSO Margins		Margin to activatE the regulation up offers for Margin to activatE the regulation down offers
SO flexibility needs		

- 1.5. Offers Validation

  Business section: Scenario1A: The offers are validated before the market clearing/Offers Validation
  The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)
  Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 1.7. Offers Pre-validation

  Business section: Scenario1A: The offers are validated before the market clearing/Offers Pre-validation
  Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same
  Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 1.8. Offers redefinition

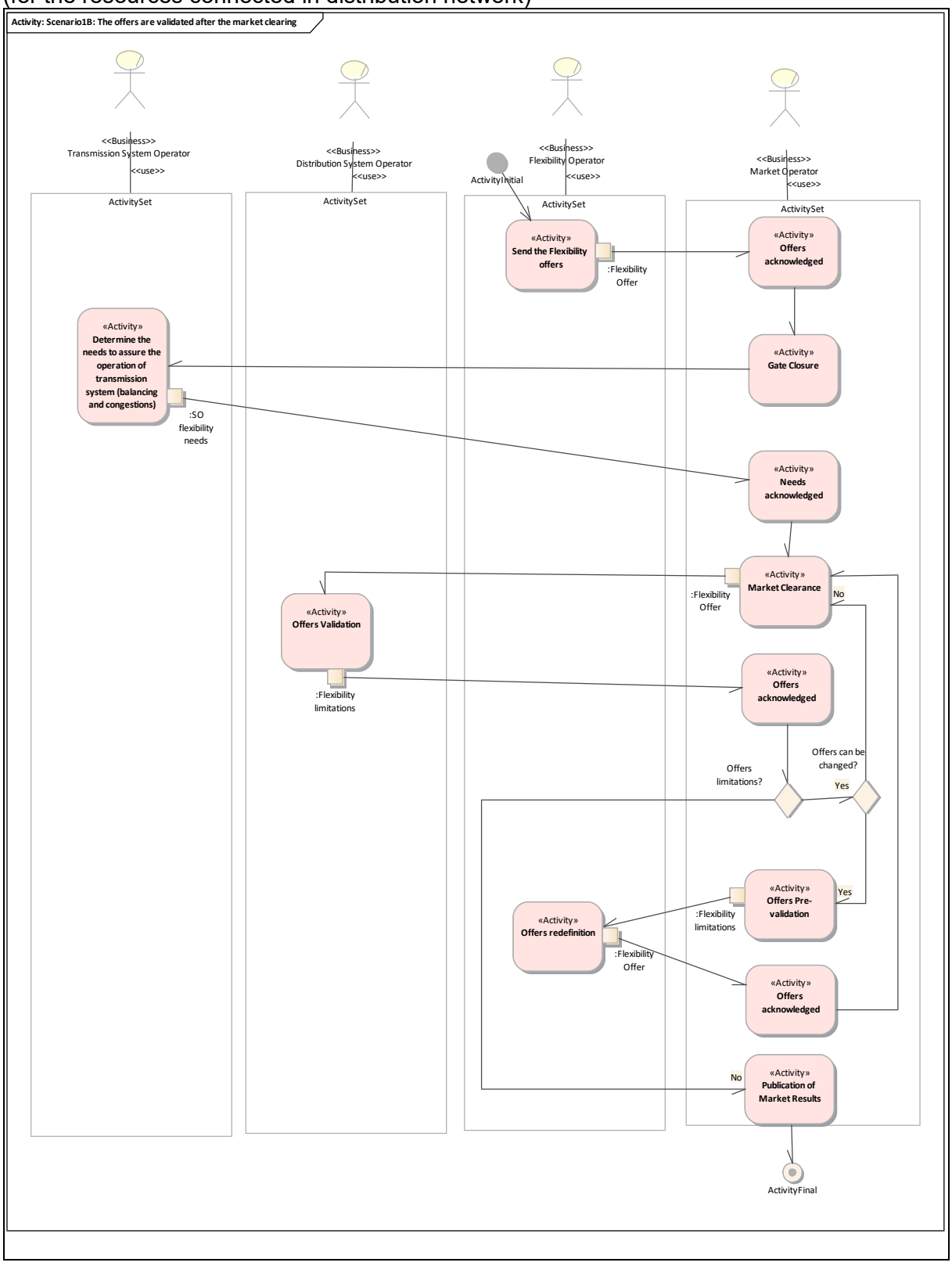
  Business section: Scenario1A: The offers are validated before the market clearing/Offers redefinition
  The Flexibility Operators can change the offer according the market operator demand.
  Information sent:

Business object	*Instance name*	*Instance description*

Flexibility Offer		The price should remain the same of the initial offer

4.2.2. Scenario1B: The offers are validated after the market clearing

The Flexibility Operator provides services for the TSO (national flexibility market) and the DSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (for the resources connected in distribution network)



Scenario step by step analysis

Scenario								
Scenario name		Scenario1B: The offers are validated after the market clearing						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
2.1		Offers acknowledged			Market Operator			
2.2		Send the Flexibility offers	The Flexibility Operator should send the offers to the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
2.3		Offers acknowledged			Market Operator			
2.4		Gate Closure	Market gate closure		Market Operator			
2.5		Determine the needs to assure the operation of transmission system (balancing and congestions)	The TSO should identify the flexibility needs to avoid constraints in transmission network		Transmission System Operator	Market Operator	Info3-SO flexibility needs	
2.6		Needs acknowledged			Market Operator			
2.7		Market Clearance			Market Operator	Distribution System Operator	Info1-Flexibility Offer	
2.8		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Distribution System Operator	Market Operator	Info4-Flexibility limitations	

2.9		Offers Pre-validation	Based on offers provided by the Flexibility Operators and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same		Market Operator	Flexibility Operator	Info4-Flexibility limitations	
2.10		Offers acknowledged			Market Operator			
2.11		Offers redefinition	The Flexibility Operator can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
2.12		Publication of Market Results			Market Operator			

- 2.2. Send the Flexibility offers

Business section: Scenario1B: The offers are validated after the market clearing/Send the Flexibility offers
The Flexibility Operator should send the offers to the market
Information sent:

Business object	***Instance name***	***Instance description***
Flexibility Offer		

- 2.5. Determine the needs to assure the operation of transmission system (balancing and congestions)

  Business section: Scenario1B: The offers are validated after the market clearing/Determine the needs to assure the operation of transmission system (balancing and congestions)
  The TSO should identify the flexibility needs to avoid constraints in transmission network
  Information sent:

Business object	*Instance name*	*Instance description*
SO flexibility needs		

- 2.7. Market Clearance

  Business section: Scenario1B: The offers are validated after the market clearing/Market Clearance

  Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		Only the offers accepted in the Market Clearing

- 2.8. Offers Validation

  Business section: Scenario1B: The offers are validated after the market clearing/Offers Validation
  The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)
  Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 2.9. Offers Pre-validation

  Business section: Scenario1B: The offers are validated after the market clearing/Offers Pre-validation
  Based on offers provided by the Flexibility Operators and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
  The changes can be of 3 types:
  - Change the power of the flexibility offers
  - Change the timeframe of activation of the offers
  - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

  The price of the offers should remain the same
  Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

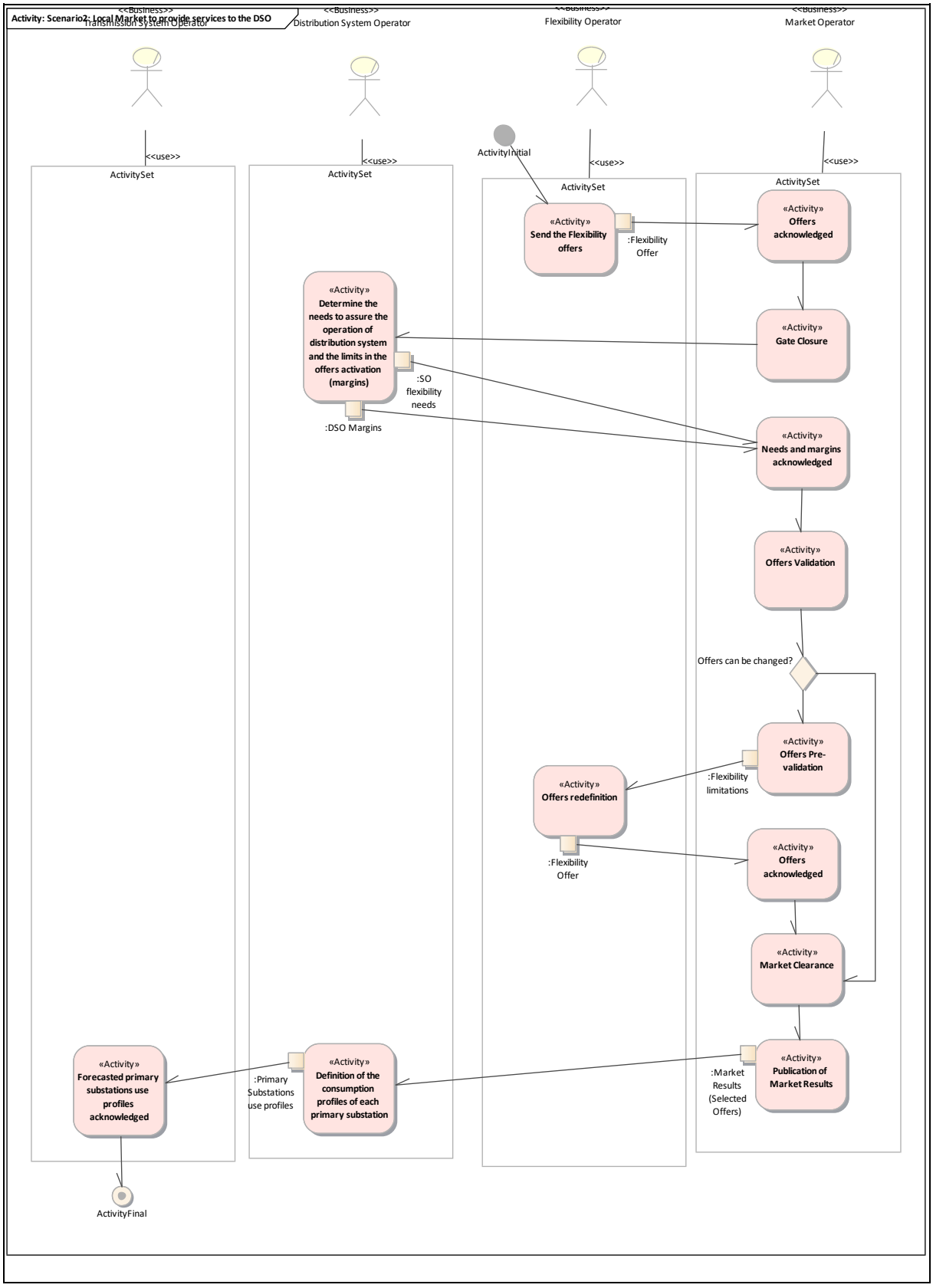
- 2.11. Offers redefinition

Business section: Scenario1B: The offers are validated after the market clearing/Offers redefinition
The Flexibility Operator can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

4.2.3. Scenario2: Local Market to provide services to the DSO

The Flexibility Operator provides services for the DSO (local flexibility market) and the TSO should validate, in day-ahead or intraday timeframes, the activation of these flexibilities (Consider the impact in the transmission system)



Scenario step by step analysis

Scenario

Scenario name		Scenario2: Local Market to provide services to the DSO						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
3.1		Send the Flexibility offers	The Flexibility Operator should send the offers to the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
3.2		Offers acknowledged			Market Operator			
3.3		Gate Closure	Market gate closure		Market Operator		Info1-Flexibility Offer	
3.4		Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)	The DSO should identify the flexibility needs to avoid constraints (congestions and voltage profiles) in distribution network		Distribution System Operator	Market Operator	Info5-DSO Margins, Info3-SO flexibility needs	
3.5		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Market Operator		Info4-Flexibility limitations	
3.6		Needs and margins acknowledged			Market Operator			
3.7		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same					
3.8		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
3.9		Offers acknowledged			Market Operator			
3.10		Market Clearance			Market Operator			
3.11		Publication of Market Results			Market Operator	Distribution System Operator	Info6-Market Results (Selected Offers)	
3.12		Definition of the consumption profiles of each primary substation	The DSO should inform the TSO concerning the forecasted consumption and or generation of each primary substation. Beyond the forecasted values the DSO should include		Distribution System Operator	Transmission System Operator	Info7-Primary Substations use profiles	

			the procured flexibility offers.					
3.13		Forecasted primary substations use profiles acknowledged			Transmission System Operator			

- 3.1. Send the Flexibility offers

Business section: Scenario2: Local Market to provide services to the DSO/Send the Flexibility offers
The Flexibility Operator should send the offers to the market

Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		

- 3.3. Gate Closure

Business section: Scenario2: Local Market to provide services to the DSO/Gate Closure
Market gate closure
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		All the offers received before the Gate Closure

- 3.4. Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)

Business section: Scenario2: Local Market to provide services to the DSO/Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)
The DSO should identify the flexibility needs to avoid constraints (congestions and voltage profiles) in distribution network
Information sent:

Business object	*Instance name*	*Instance description*
SO flexibility needs		
DSO Margins		

- 3.5. Offers Validation

Business section: Scenario2: Local Market to provide services to the DSO/Offers Validation
The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 3.7. Offers Pre-validation

Business section: Scenario2: Local Market to provide services to the DSO/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 3.8. Offers redefinition

Business section: Scenario2: Local Market to provide services to the DSO/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 3.11. Publication of Market Results

Business section: Scenario2: Local Market to provide services to the DSO/Publication of Market Results

Information sent:

Business object	*Instance name*	*Instance description*
Market Results (Selected Offers)		

- 3.12. Definition of the consumption profiles of each primary substation

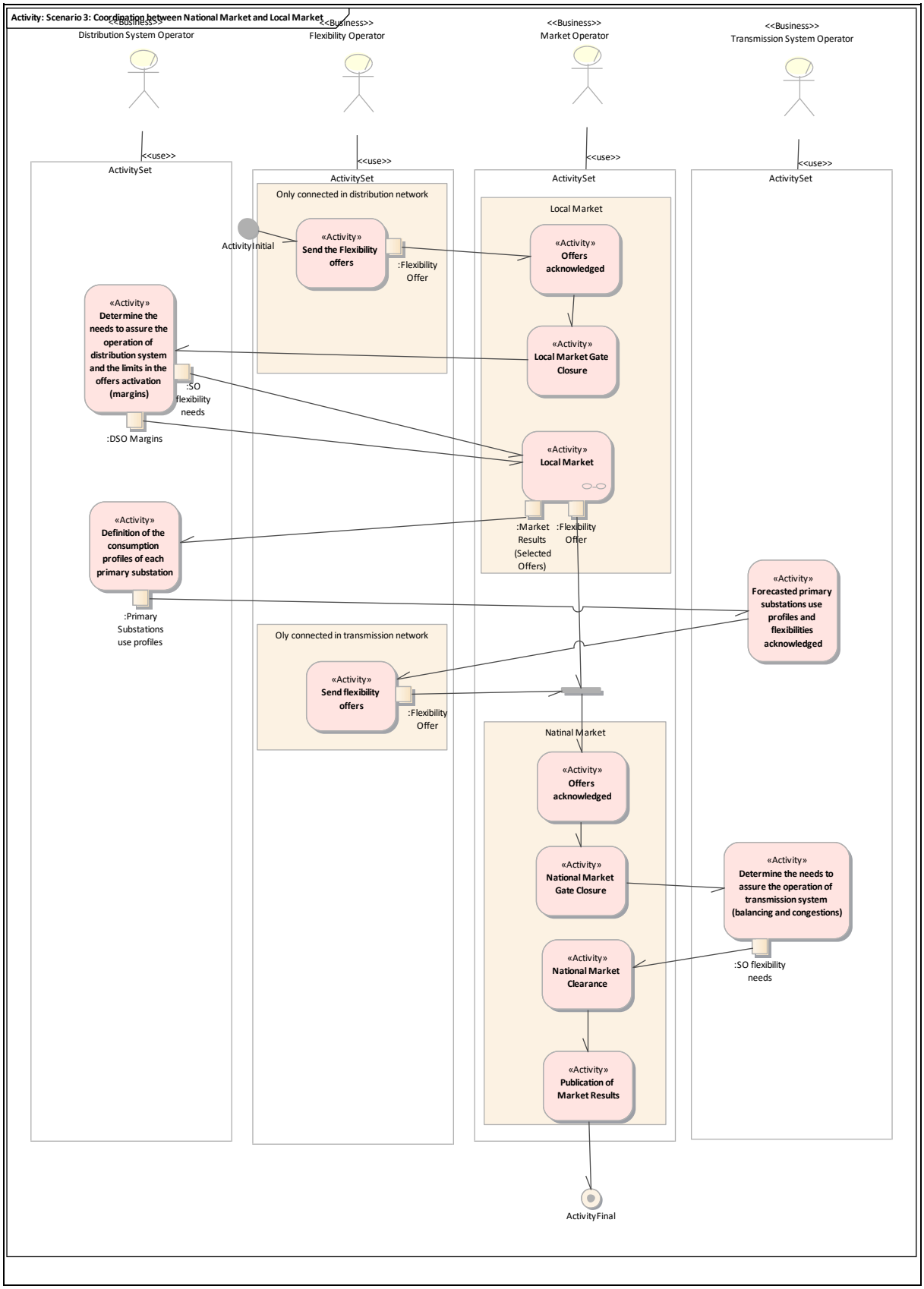
Business section: Scenario2: Local Market to provide services to the DSO/Definition of the consumption profiles of each primary substation
The DSO should inform the TSO concerning the forecasted consumption and or generation of each primary substation. Beyond the forecasted values the DSO should include the procured flexibility offers.
Information sent:

Business object	*Instance name*	*Instance description*
Primary Substations use profiles		

4.2.4. Scenario 3: Coordination between National Market and Local Market

The Flexibility Operators connected in distribution network should place their offer in a local market and the Flexible Operators connected in the transmission network should place their orders in a national market. The clearing mechanism in local market should provide services

for the DSO to solve the distribution network constraints. The offers that are not used in the local market should be technically validated by the DSO and be transferred for the National market. After the clearing process both in local and national markets, the TSO should coordinate the activation of the flexibilities connected in the transmission system and the DSO should coordinate the activation of the flexibilities connected in the distribution network



Scenario step by step analysis

Scenario								
Scenario name	Scenario 3: Coordination between National Market and Local Market							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
4.1		Send flexibility offers	The Flexibility Operator connected to transmission network should send the offers to the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.2		Offers acknowledged			Market Operator			
4.3		Local Market Gate Closure	Market Gate closure		Market Operator			
4.4		Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)	The DSO should identify the flexibility needs to avoid constraints (congestions and voltage profiles) in distribution network		Distribution System Operator	Market Operator	Info3-SO flexibility needs, Info5-DSO Margins	
4.5		Local Market	Local market to solve to provide services for the DSO. The information concerning the cleared offers should be transmitted to DSO. The offers not procured and validated (will not have impact in the distribution system) should be sent to the National market		Market Operator	Market Operator	Info1-Flexibility Offer	
4.6		Local Market	Local market to solve to provide services for the DSO. The information concerning the cleared offers should be transmitted to		Market Operator	Distribution System Operator	Info6-Market Results (Selected Offers)	

			DSO. The offers not procured and validated (will not have impact in the distribution system) should be sent to the National market					
4.7		Definition of the consumption profiles of each primary substation	The DSO should inform the TSO concerning the forecasted consumption and or generation of each primary substation. Beyond the forecasted values the DSO should include the procured flexibility offers.		Distribution System Operator	Transmission System Operator	Info7-Primary Substations use profiles	
4.8		Forecasted primary substations use profiles and flexibilities acknowledged			Transmission System Operator			
4.9		Send the Flexibility offers	The Flexibility Operator connected to distribution network should send the offers to the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.10		Offers acknowledged			Market Operator			
4.11		National Market Gate Closure			Market Operator			
4.12		Determine the needs to assure the operation of transmission system (balancing and congestions)	The TSO should identify the flexibility needs to avoid constraints in transmission network		Transmission System Operator	Market Operator	Info3-SO flexibility needs	
4.13		National Market Clearance			Market Operator			
4.14		Publication of Market Results			Market Operator			

- 4.1. Send flexibility offers

Business section: Scenario 3: Coordination between National Market and Local Market/Send flexibility offers
The Flexibility Operator connected to transmission network should send the offers to the market
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		

- 4.4. Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)

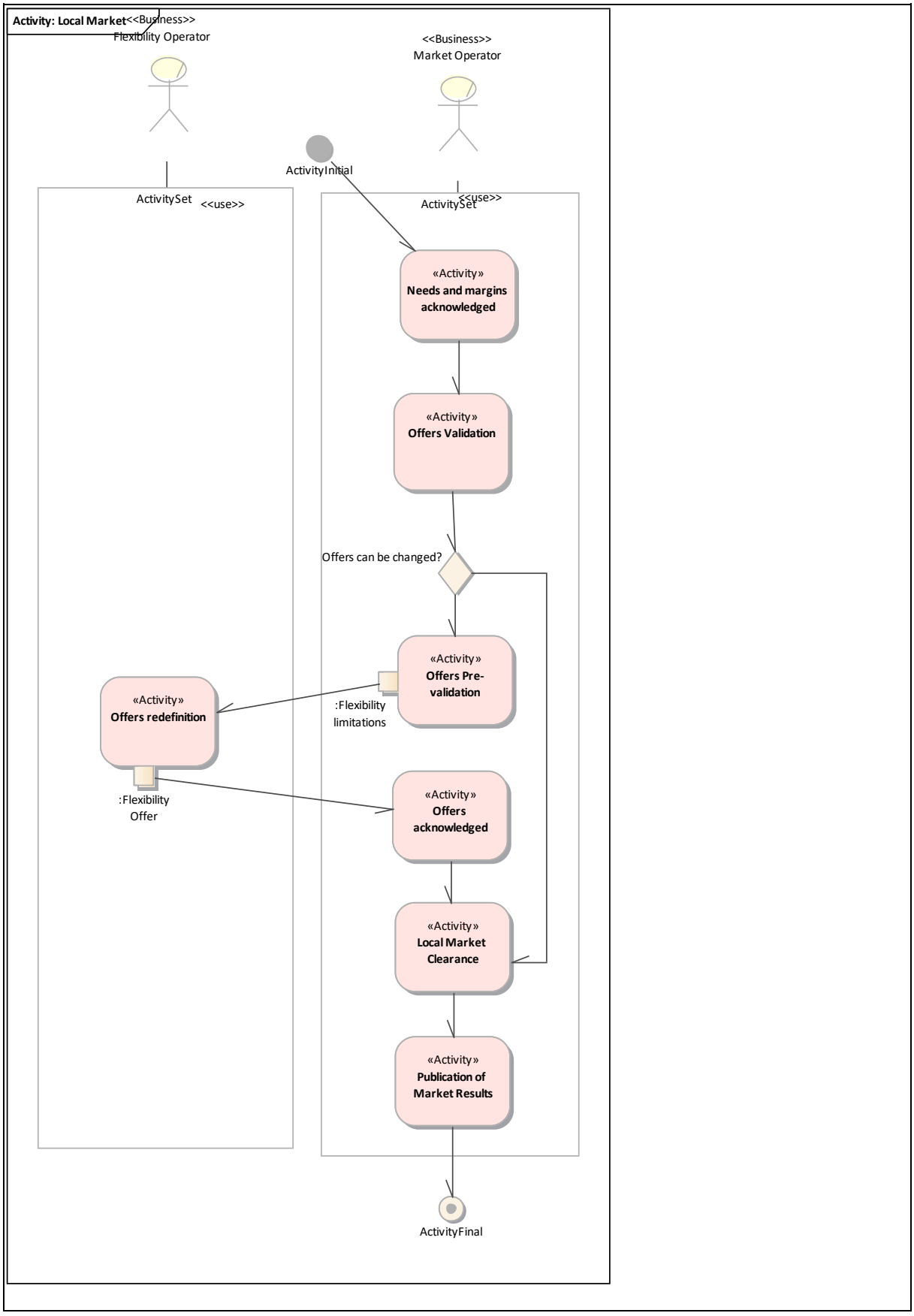
Business section: Scenario 3: Coordination between National Market and Local Market/Determine the needs to assure the operation of distribution system and the limits in the offers activation (margins)
The DSO should identify the flexibility needs to avoid constraints (congestions and voltage profiles) in distribution network
Information sent:

Business object	*Instance name*	*Instance description*
SO flexibility needs		
DSO Margins		

- 4.5. Local Market

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market
Local market to solve to provide services for the DSO. The information concerning the cleared offers should be transmitted to DSO. The offers not procured and validated (will not have impact in the distribution system) should be sent to the National market
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		Only the validated offers not procured in the local market



Activity step by step analysis

Scenario								
Scenario name		Scenario 3: Coordination between National Market and Local Market						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Market Operator			
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			if the Flexibility Operator was an aggregator) The price of the offers should remain the same					
4.6.3		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.6.4		Offers acknowledged			Market Operator			
4.6.5		Local Market Clearance			Market Operator			
4.6.6		Publication of Market Results			Market Operator			

- 4.5.3. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.5.4. Offers redefinition

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

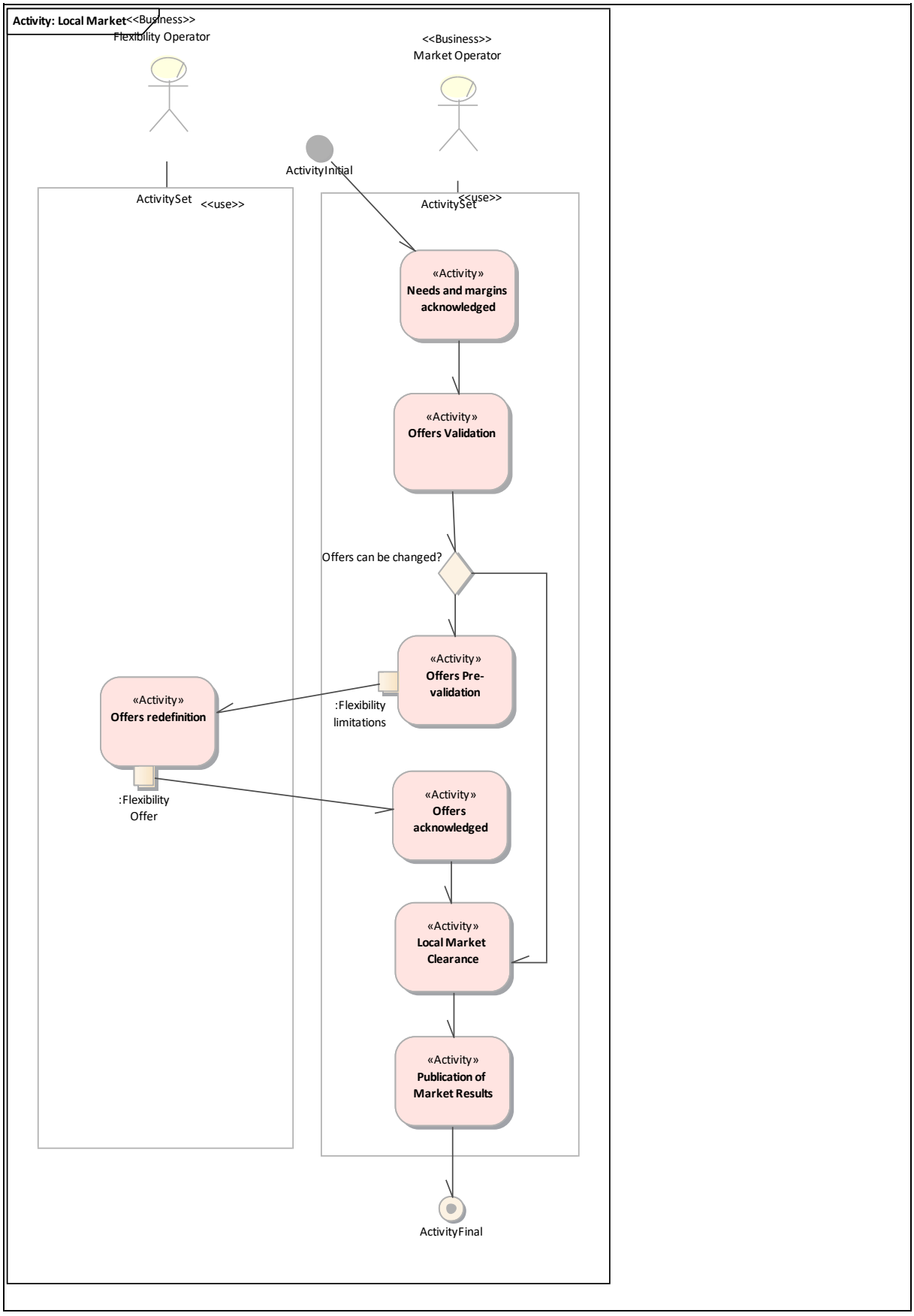
Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 4.6. Local Market

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market
Local market to solve to provide services for the DSO. The information concerning the cleared offers should be transmitted to DSO. The offers not procured and validated (will not have

impact in the distribution system) should be sent to the National market
Information sent:

Business object	*Instance name*	*Instance description*
Market Results (Selected Offers)		



Activity step by step analysis

Scenario								
Scenario name		Scenario 3: Coordination between National Market and Local Market						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Market Operator			
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			The price of the offers should remain the same					
4.6.3		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.6.4		Offers acknowledged			Market Operator			
4.6.5		Local Market Clearance			Market Operator			
4.6.6		Publication of Market Results			Market Operator			
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Market Operator			
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types:		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			- Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same					
4.6.3		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.6.4		Offers acknowledged			Market Operator			
4.6.5		Local Market Clearance			Market Operator			
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Market Operator			
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same					
4.6.3		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.6.4		Offers acknowledged			Market Operator			
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the		Market Operator			

			DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)					
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same		Market Operator	Flexibility Operator	Info4-Flexibility limitations	
4.6.3		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and		Market Operator			

			the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)					
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same		Market Operator	Flexibility Operator	Info4-Flexibility limitations	
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and		Market Operator			

			the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)					
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.7		Needs and margins acknowledged			Market Operator			
4.6.1		Offers Validation	The DSO should perform the load flows taking into account the forecasted operation conditions and the activation of the offers. If the offers activation can originate some constraints in the distribution network, the DSO can refuse the offers or propose some limits in the use of the offers (depends of the market rules)		Market Operator			
4.6.2		Offers Pre-validation	Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator. The changes can be of 3 types:		Market Operator	Flexibility Operator	Info4-Flexibility limitations	

			- Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same					
4.6.3		Offers redefinition	The Flexibility Operators can change the offer according the market operator demand.		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
4.6.4		Offers acknowledged			Market Operator			
4.6.5		Local Market Clearance			Market Operator			
4.6.6		Publication of Market Results			Market Operator			

- 4.6.2. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.6.3. Offers redefinition

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 4.6.9. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.6.10. Offers redefinition

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 4.6.15. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.6.16. Offers redefinition

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 4.6.20. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.6.21. Offers redefinition

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 4.6.24. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.6.30. Offers Pre-validation

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers Pre-validation
Based on offers provided by the Flexibility Operator and on the validation did by the DSO, the market operator can propose some changes to the Flexibility Operator.

The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 4.6.31. Offers redefinition

Business section: Scenario 3: Coordination between National Market and Local Market/Local Market/Offers redefinition
The Flexibility Operators can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

- 4.7. Definition of the consumption profiles of each primary substation

Business section: Scenario 3: Coordination between National Market and Local Market/Definition of the consumption profiles of each primary substation
The DSO should inform the TSO concerning the forecasted consumption and or generation of each primary substation. Beyond the forecasted values the DSO should include the procured flexibility offers.
Information sent:

Business object	*Instance name*	*Instance description*
Primary Substations use profiles		

- 4.9. Send the Flexibility offers

Business section: Scenario 3: Coordination between National Market and Local Market/Send the Flexibility offers
The Flexibility Operator connected to distribution network should send the offers to the market
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		

- 4.12. Determine the needs to assure the operation of transmission system (balancing and congestions)

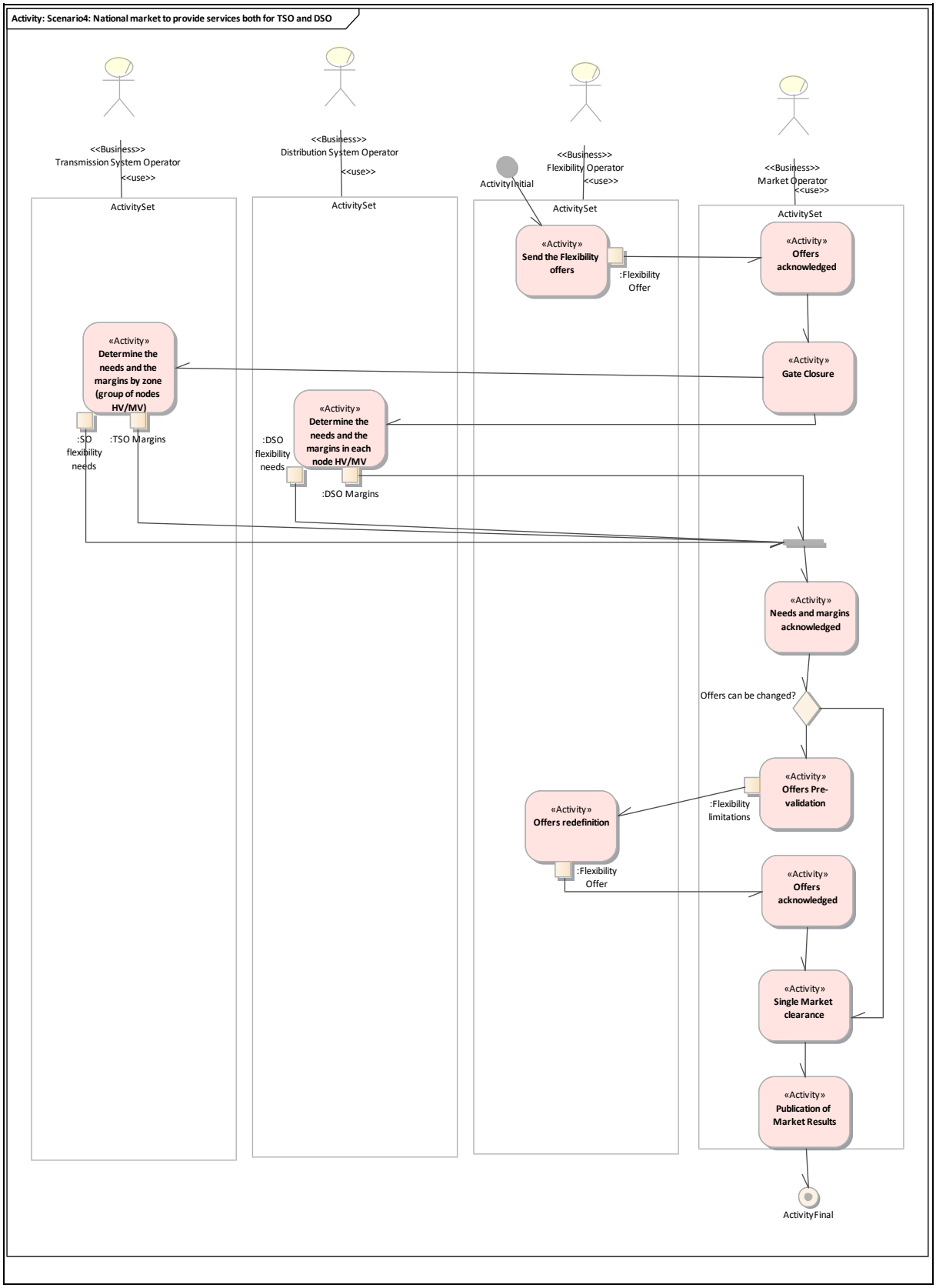
Business section: Scenario 3: Coordination between National Market and Local Market/Determine the needs to assure the operation of transmission system (balancing and congestions)
The TSO should identify the flexibility needs to avoid constraints in transmission network
Information sent:

Business object	*Instance name*	*Instance description*

SO flexibility needs		

4.2.5. Scenario4: National market to provide services both for TSO and DSO

The Flexibility Operator provides services for the both for TSO and DSO in a single procurement platform (single market). The activation of the offers should be agreed both by TSO and DSO



Scenario step by step analysis

Scenario

Scenario name		Scenario4: National market to provide services both for TSO and DSO						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
5.1		Send the Flexibility offers	The Flexibility Operator should send the offers to the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	
5.2		Offers acknowledged			Market Operator			
5.3		Gate Closure	Market gate closure		Market Operator			
5.4		Determine the needs and the margins by zone (group of nodes HV/MV)	The TSO should identify the margin of activation of flexibility offers taking into account the impact of these offers in transmission network. The margins can be imposed by the operation of some transmission lines near by their limits. The use of margins should avoid the activation of offers to solve the DSO needs but originating congestions in transmission system.		Transmission System Operator	Market Operator	Info3-SO flexibility needs, Info2-TSO Margins	
5.5		Determine the needs and the margins in each node HV/MV	The DSO should identify the margin of activation of flexibility offers taking into account the impact of these offers in distribution network. The margins can be imposed by the possible congestion in power transformers in		Distribution System Operator	Market Operator	Info8-DSO flexibility needs , Info5-DSO Margins	

			primary substations or some lines or even due to some voltage problems. The use of margins should avoid the activation of offers to solve the TSO needs but originating congestions in distribution system.					
5.6		Needs and margins acknowledged			Market Operator			
5.7		Offers Pre-validation	Based on offers provided by the Flexibility Operators and on the margins provided by the TSO and DSO. The market operator should pre-validate the offers and propose some changes to the Flexibility Operators. The changes can be of 3 types: - Change the power of the flexibility offers - Change the timeframe of activation of the offers - Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator) The price of the offers should remain the same		Market Operator	Flexibility Operator	Info4-Flexibility limitations	
5.8		Offers redefinition	The Flexibility Operator can change the offer according the market		Flexibility Operator	Market Operator	Info1-Flexibility Offer	

			operator demand.					
5.9		Offers acknowledged			Market Operator			
5.10		Single Market clearance			Market Operator			
5.11		Publication of Market Results			Market Operator			

- 5.1. Send the Flexibility offers

Business section: Scenario4: National market to provide services both for TSO and DSO/Send the Flexibility offers
The Flexibility Operator should send the offers to the market

Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		

- 5.4. Determine the needs and the margins by zone (group of nodes HV/MV)

Business section: Scenario4: National market to provide services both for TSO and DSO/Determine the needs and the margins by zone (group of nodes HV/MV)
The TSO should identify the margin of activation of flexibility offers taking into account the impact of these offers in transmission network. The margins can be imposed by the operation of some transmission lines near by their limits. The use of margins should avoid the activation of offers to solve the DSO needs but originating congestions in transmission system.
Information sent:

Business object	*Instance name*	*Instance description*
TSO Margins		
SO flexibility needs		

- 5.5. Determine the needs and the margins in each node HV/MV

Business section: Scenario4: National market to provide services both for TSO and DSO/Determine the needs and the margins in each node HV/MV
The DSO should identify the margin of activation of flexibility offers taking into account the impact of these offers in distribution network. The margins can be imposed by the possible congestion in power transformers in primary substations or some lines or even due to some voltage problems. The use of margins should avoid the activation of offers to solve the TSO needs but originating congestions in distribution system.
Information sent:

Business object	*Instance name*	*Instance description*
DSO Margins		
DSO flexibility needs		

- 5.7. Offers Pre-validation

Business section: Scenario4: National market to provide services both for TSO and DSO/Offers Pre-validation
Based on offers provided by the Flexibility Operators and on the margins provided by the TSO and DSO. The market operator should pre-validate the offers and propose some changes to

the Flexibility Operators.
The changes can be of 3 types:
- Change the power of the flexibility offers
- Change the timeframe of activation of the offers
- Change the point of activation of the flexibilities (only if the Flexibility Operator was an aggregator)

The price of the offers should remain the same
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility limitations		

- 5.8. Offers redefinition

Business section: Scenario4: National market to provide services both for TSO and DSO/Offers redefinition
The Flexibility Operator can change the offer according the market operator demand.
Information sent:

Business object	*Instance name*	*Instance description*
Flexibility Offer		The price should remain the same of the initial offer

5. Information exchanged

Information exchanged			
Information exchanged, ID	*Name of information*	*Description of information exchanged*	*Requirement, R-IDs*
Info1	Flexibility Offer	Power (Regulation up) Power (Regulation down) Time (Begin) Time (End) Time (Minimum duration) Time (Maximum duration) Point(s) of activation Price	
Info2	TSO Margins	Margin to activate the regulation up offers for a region (group of nodes HV/MV) and for each period Margin to activate the regulation down offers for a region (group of nodes HV/MV) and for each period	
Info3	SO flexibility needs	Power (Regulation up) Power (Regulation down) Time (Begin) Time (End) Activation points (group of nodes where the offers can be activated to solve the SO problems)	
Info4	Flexibility limitations	Redefinition of the flexibilities (or flexibility offers): Power (Regulation up) Power (Regulation down) Time (Begin) Time (End) Time (Minimum duration)	

		Time (Maximum duration) Point(s) of activation (Only for aggregators)	
Info5	DSO Margins	Margin to activate the regulation up offers for each node HV/MV and for each period Margin to activate the regulation down offers for each node HV/MV and for each period	
Info6	Market Results (Selected Offers)		
Info7	Primary Substations use profiles	Values of forecasted consumption/generation by period and primary substations for the next day	
Info8	DSO flexibility needs	Power (Regulation up) Power (Regulation down) Time (Begin) Time (End) Activation points (group of nodes where the offers can be activated to solve the TSO problems)	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)