Process a HV/MV substation use limit (Smax) request

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***
	Transmission System, Distribution System, Operational planning, Long-term planning, Distribution Management, Energy Markets, Users, Real-Time Operation, Energy systems	Process a HV/MV substation use limit (Smax) request

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	2018-07-30	Belen Goncer Jérôme Cantenot Hugo Morais		Approved Version

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Coordination between TSO and DSO in congestion management through the MV distribution system reconfiguration, changing the limiting the load in a specific transmission network bus. This congestion can be originated by the operation conditions or anticipated due to some works programmes.
Objective(s)	Validate the process of HV/MV power transformer use limit
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
This System Use Case describes how to process a request to limit the use of a HV/MV substation (define a different Smax) received through a data exchange platform. In this SUC it is considered that only the lever network reconfiguration is used to assure the request. The presented SUC is considerers that the information arrives to DSO thought the data exchange platform.
Complete description
This SUC intends to describe the process describing the coordination between the TSO and the DSO to solve congestion constraints in the transmission network. Three situations can be considered: 1 a) The TSO informs the DSO about some power limits at the substations for its work planning: The TSO can ask the DSO in operational planning to limit the power consumption/injection at the planned substations. To do so, the DSO may need to make a network configuration which can involve

operation in loop for a short period (Operational Planning). 1 b) TSO reports to the DSO some power limits at the substations for the security system in case of incident in the TSO network. The TSO can request, in real time, the DSO to limit the power consumption/injection at some substations. To do this, the DSO can proceed to a network configuration which may involve operation in loop for a short period (Real-time). 1 c) The TSO can anticipate in operational planning or verify in real-time some congestions in transmission network and coordinate with the DSO some actions to solve this congestions through the MV voltage network reconfiguration (Operational Planning and Real-Time). This SUC is much related with the SUC Distribution network reconfiguration because is the only lever available at the moment to assure this limit. In the future, other levers can be considered.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Number of requests attended.		Validate the process of HV/MV power transformer use limit
2	Number of reconfigurations validated.		Validate the process of HV/MV power transformer use limit

1.6. Use case conditions

Use case conditions	
Assumptions	
1	The limits in power transformer use is only imposed when the power flow is from HV to MV (consumption).
Prerequisites	
1	The platform can provide necessary information in observability area

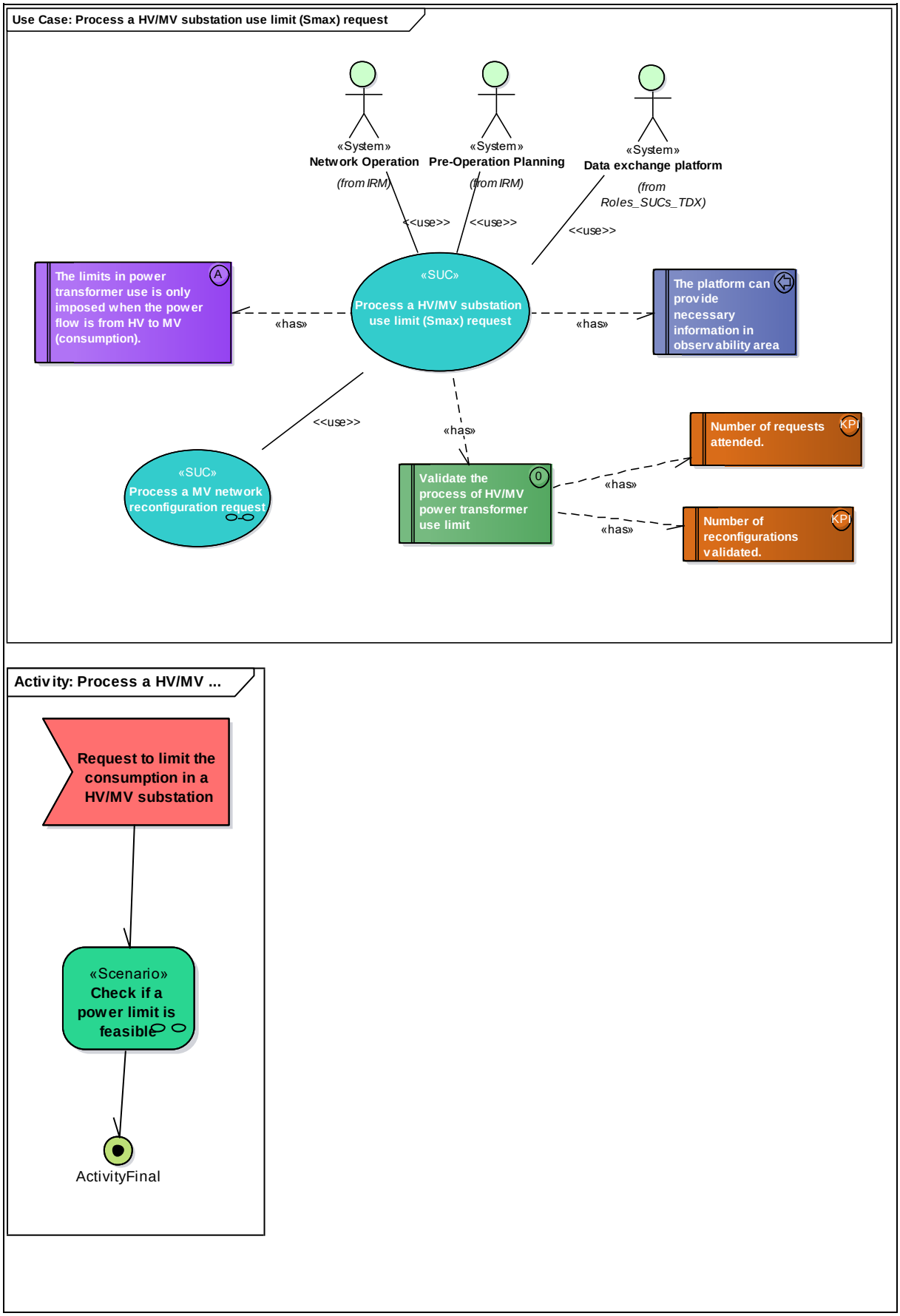
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
<<BUC>> Coordination between TSO and DSO for distribution network reconfiguration <<BUC>> Improve system real-time supervision and control through better coordination (TSO and DSO) <<SUC>> Process a MV network reconfiguration request <<SUC>> Disaggregated consumption and generation forecast for operational planning purposes
Level of depth
Medium
Prioritisation
High
Generic, regional or national relation
Generic
Nature of the use case
SUC
Further keywords for classification
Network reconfiguration, Congestion Management

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


Use Case: Process a HV/MV substation use limit (Smax) request
«System»
Network Operation
(from IRM)
«System»
Pre-Operation Planning
(from IRM)
«System»
Data exchange platform
(from Roles_SUCs_TDX)
<<use>>
<<use>>
<<use>>
The limits in power transformer use is only imposed when the power flow is from HV to MV (consumption).
A
«has»
«SUC»
Process a HV/MV substation use limit (Smax) request
«has»
The platform can provide necessary information in observability area
<<use>>
«has»
«SUC»
Process a MV network reconfiguration request
Validate the process of HV/MV power transformer use limit
0
«has»
Number of requests attended.
KPI
«has»
Number of reconfigurations validated.
KPI
Activity: Process a HV/MV ...
Request to limit the consumption in a HV/MV substation
«Scenario»
Check if a power limit is feasible
ActivityFinal

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***
Data exchange platform	System	Platform used by several entities to exchange information for different proposes. The 3 type of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in real-time type. The exchange of information related with the markets are included in the scheduled data. Data-agnostic ICT infrastructure that enables secured and reliable information exchange for different purposes and within different time scales.	
Network Operation	System	The Network Operation function includes business activity directly involved with monitoring and operating the power grid as a whole system. • The phrase 'directly involved' indicates that the covered activities are limited to a hands-on focus on keeping the power grid running successfully, and more indirect influences on grid operation, such as energy markets, will be covered by other business functions. • The phrase 'as a whole system' indicates that local activity, such as operating a generating plant or substation, is excluded, and here the concern is a system perspective, such as is typical in transmission or distribution control centres.	
Pre-Operation Planning	System	The Predictive Operation Planning (POP) business function involved in forecasting future operation situation with an acceptable level of reliability, the inclusion of what-if scenarios and risk assessment. This include the management of adequate that requires system operators and planners to take into account scheduled and reasonably expected unscheduled availability of equipment, while maintaining a constant balance between supply and demand.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

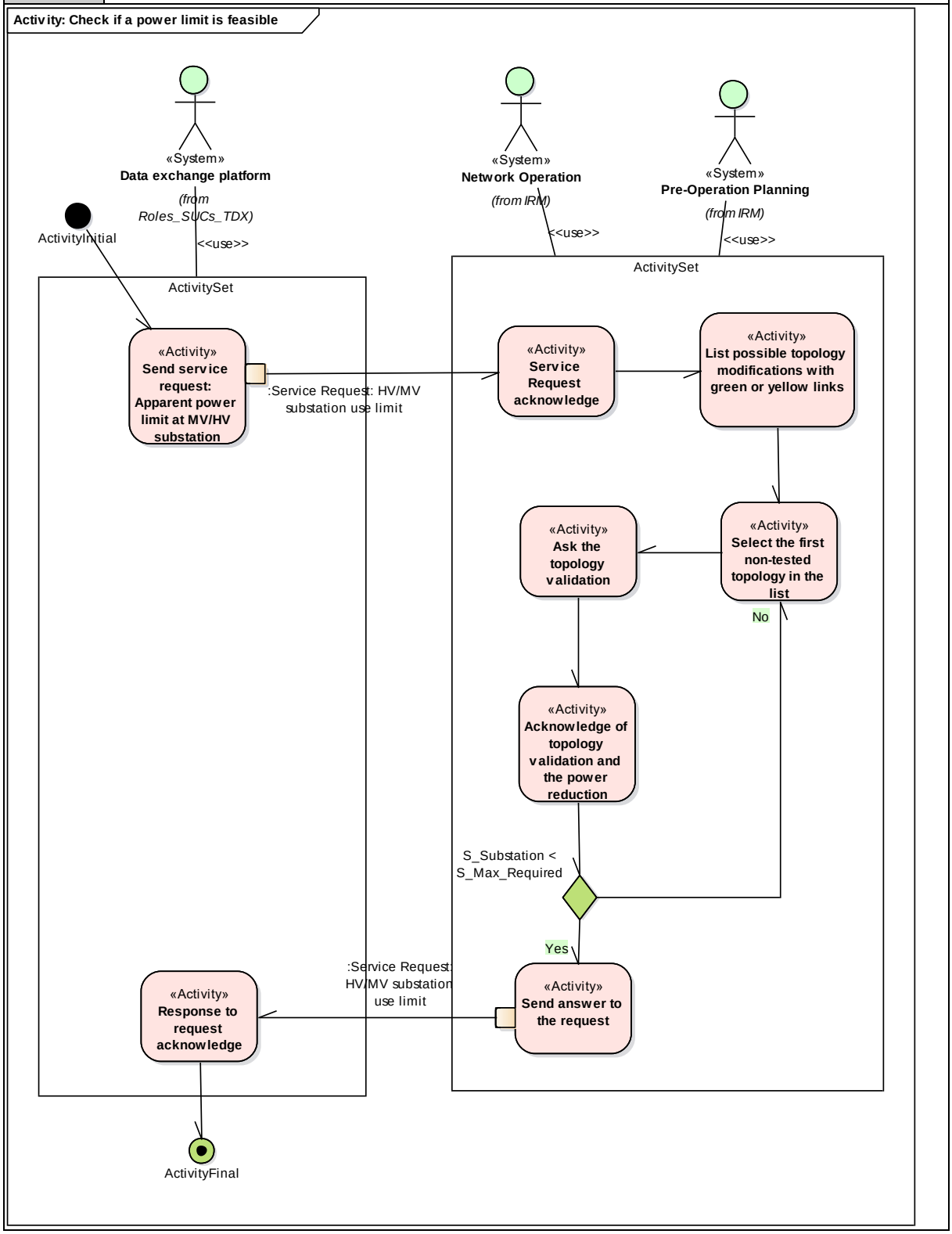
Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Check if a power limit is feasible	In the presented scenario, the system operator should validate if some MV network reconfiguration is possible to reduce the power consumption in a substation required by the TSO.		Request to limit the consumption in a HV/MV substation: From himself or another system operator through le data exchange platform.		

4.2. Steps - Scenarios

4.2.1. Check if a power limit is feasible

Scenario step by step analysis

Scenario	
Scenario name	Check if a power limit is feasible



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 service request: Apparent power limit at MV/HV substation	The platform should identify the concerned DSO and transmit the request. The request processing in the data exchange platform is described in SUC 'Information exchange using a collaborative platform' in the scenario 'Service or information request'.		Data exchange platform	Network Operation, Pre-Operation Planning	Info1-Service Request: HV/MV substation use limit	
1.2		Service Request acknowledge			Network Operation, Pre-Operation Planning			
1.3		List possible topology modifications with green or yellow links	The network operation system should evaluate the network reconfiguration possibilities and organize a list with the mentioned information.		Network Operation, Pre-Operation Planning			
1.4		Select the first non-tested topology in the list			Network Operation, Pre-Operation Planning			
1.5		Ask the topology validation	The goal of the presented activity is to validate if the network reconfiguration is possible. In this activity it is necessary to ask the SUC Process a MV network reconfiguration		Network Operation, Pre-Operation Planning			

			request to validate the topology.					
1.6		Send answer to the request			Network Operation, Pre-Operation Planning	Data exchange platform	Info1-Service Request: HV/MV substation use limit	
1.7		Acknowledge of topology validation and the power reduction	In this activity the result of the network reconfiguration is acknowledge and evaluated. If the proposed network reconfiguration was possible, the system should evaluate if the consumption reduction is sufficient to attend the needs of the TSO. If S_Substation was higher than S_Max_Required the system should try other possible reconfiguration in the list. If S_Substation was lower or equal than S_Max_Required the DSO can inform the platform the obtained value. If any other reconfiguration possibility exists, the DSO should send the best value obtained (S_Substation).		Network Operation, Pre-Operation Planning			
1.8		Response to request acknowledge			Data exchange platform		Info2-Topology reconfiguration request	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Service Request: HV/MV substation use limit	Request of HV/MV substation use limit (S_Max) - Request ID - User ID (the user that request the service) - Start Time (day,hour,minute) - Stop Time (day,hour,minute) - Substation ID - S_Max requested/obtained	
Info2	Topology reconfiguration request	Substation list (ordered) Feeder list Switch list S_Max	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)