# Exchange short circuit levels at bay level for the next 24hours

Based on IEC 62559-2 edition 1
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## 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, Real-Time Operation, Energy systems, Distribution System, Users, Operational planning, Long-term planning, Energy Markets, Distribution Management | Exchange short circuit levels at bay level for the next 24hours |

### 1.2. Version management

| *Version management* | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2018-08-08 | Francisco Reis & Gonçalo Glória [R&D Nester] | | Approved Version |

### 1.3. Scope and objectives of use case

| *Scope and objectives of use case* | |
|---|---|
| ***Scope*** | Exchange of the short circuit levels at a bay level in the observability area. |
| ***Objective(s)*** | Enhancement of the exchange of information about short circuit level at bay level.<br>Impact in the project phase with the improvement of equivalent models of TSO's network by the DSO's. |
| ***Related business case(s)*** | |

### 1.4. Narrative of Use Case

| *Narrative of use case* |
|---|
| ***Short description*** |
| The exchange of the short circuit power in operational planning at node level (HV bay level in the physical border of the TSO/DSO interface - EHV/HV substations) with a granularity of 30 minutes. For this calculation will be considered only the contribution of power plants connected to the EHV/HV in a first phase and complemented with the contribution of the DSO part, if exist, in a second phase. |
| ***Complete description*** |
| In this system use case is proposed the exchange of the equivalent short-circuit power at TSO-DSO interface in the observability area, distinguishing between the contribution of distribution and transmission connected resources.<br>The process starts from the TSO side after the day-ahead market closure (market results publication). The TSO will use the market results and the forecasting of consumption and generation (provided by the operational planning) in the TSO-DSO interface to calculate the short circuit power at bay level in the observability area.<br>The information about the forecast of the short circuit power should be presented for the next 24 hours with a granularity of 30 minutes. Then, the TSO should send the short circuit level to the data exchange platform, for the DSO do the completion of the Ssc with the contribution of the distribution resources, if it exists. |

## 1.5. Key performance indicators (KPI)

| Key performance indicators | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Reduction of the deviation between the forecasts and the real measurements. | | Enhancement of the exchange of information about short circuit level at bay level.<br>Impact in the project phase with the improvement of equivalent models of TSO's network by the DSO's. |

## 1.6. Use case conditions

| Use case conditions | |
|---|---|
| ***Assumptions*** | |
| 1 | Granularity of 30 minutes |
| 2 | Only 3 phase symmetric short circuits will be analysed: It is proposed only the analysis of 3 phase symmetric short circuits as a first approach to the study. In a next phase, it's possible to improve the analysis for phase-ground short circuits and consider the major one. |
| 3 | Time-span: 24 hours |
| 4 | Refresh-rate: 24 hours |
| 5 | The calculation of Ssc only consider the contribution of power plants connected to the EHV/HV level in first phase and then is completed with the DSO part. |
| ***Prerequisites*** | |
| 1 | Automatic structure and method for short circuit power calculation should be used: An automatic structure and method for short circuit power calculation should be developed and integrated in the TSO pre-operation planning to increase the efficiency of the process. In a second phase, the DSO should develop a similar method. |

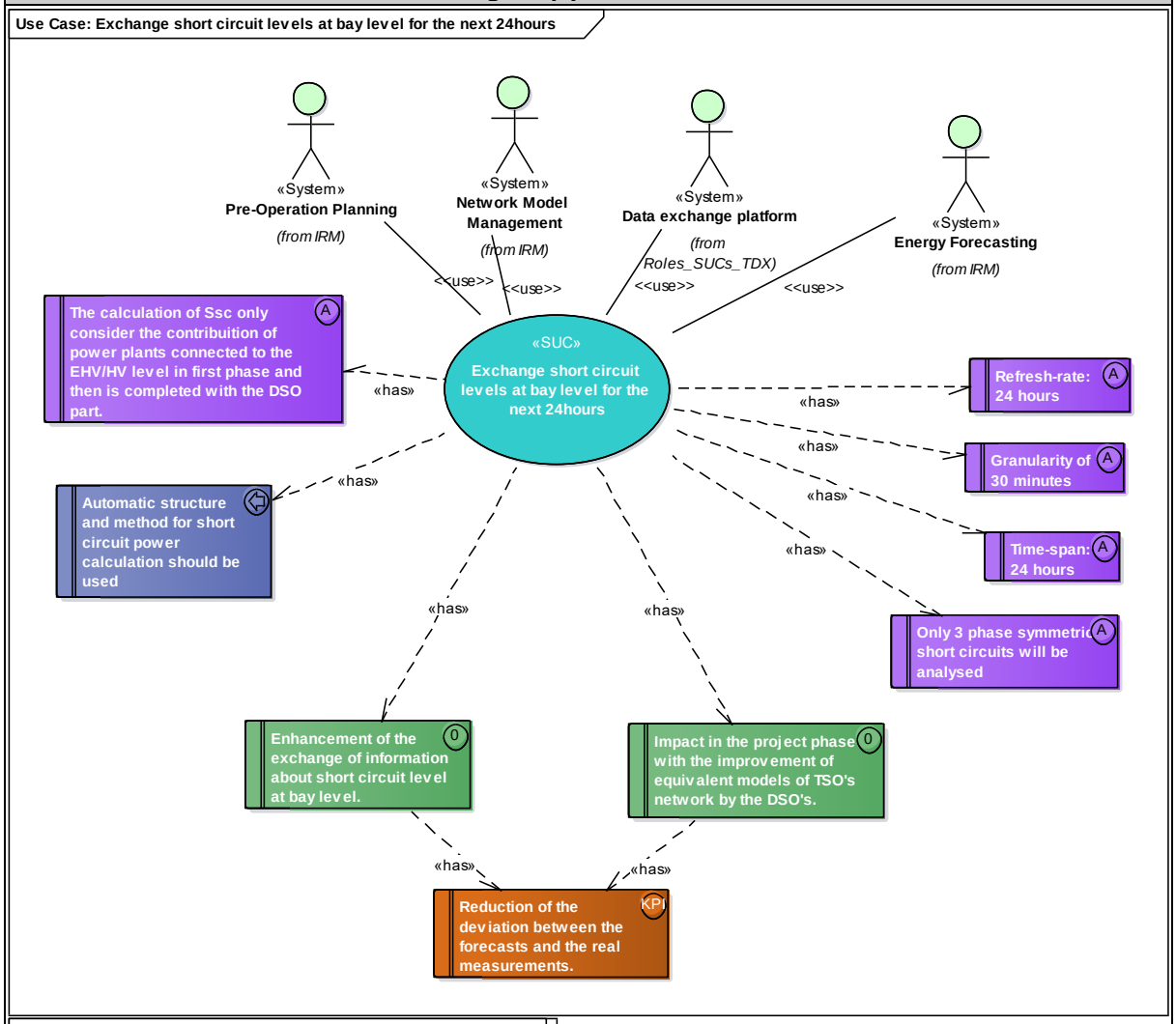
## 1.7. Further information to the use case for classification/mapping

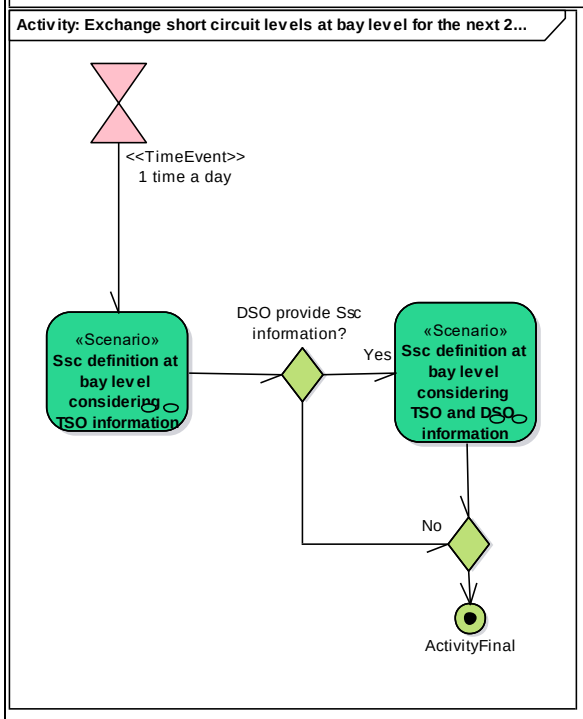
| Classification information |
|---|
| ***Relation to other use cases*** |
| <<BUC>> Improve fault location close to the TSO-DSO interface<br><<BUC>> Coordination of operational planning activities between TSO and DSO<br><<BUC>> Coordination between TSO and DSO for distribution network reconfiguration<br><<SUC>> Information exchange using a collaborative platform |
| ***Level of depth*** |
| ***Prioritisation*** |
| *High* |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| SUC |
| ***Further keywords for classification*** |
| Operational Planning, Short-Circuit Power |

## 1.8. General remarks

# 2. Diagrams of use case

## *Diagram(s) of use case*



# 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*** |
| Network Model Management | System | The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the network grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model).<br>The focus is to provide a mathematical model of the network grid that can be used in different analysis of the grid, including but not limited to steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis.<br>It maintains master representations of the power system for network analysis functions, so that all analysis shares the same source information.<br>Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. | |
| Energy Forecasting | System | The Energy Forecasting business (EF) function involves the forecasting of one or more of the items consumption (load), production (primarily intermittent or price inelastic production), direct current and area inter-exchange. This also include energy forecast for intermittent or price inelastic production that is part of Distributed Energy Resources (DER). | |
| 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.<br>Data-agnostic ICT infrastructure that enables secured and reliable information exchange for different purposes and within different time scales.<br><br>***<br>**@HUGO: WE SHOULD VALIDATE THIS DESCRIPTION AND TRY TO USE A NORMALIZED ONE** | |
| 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

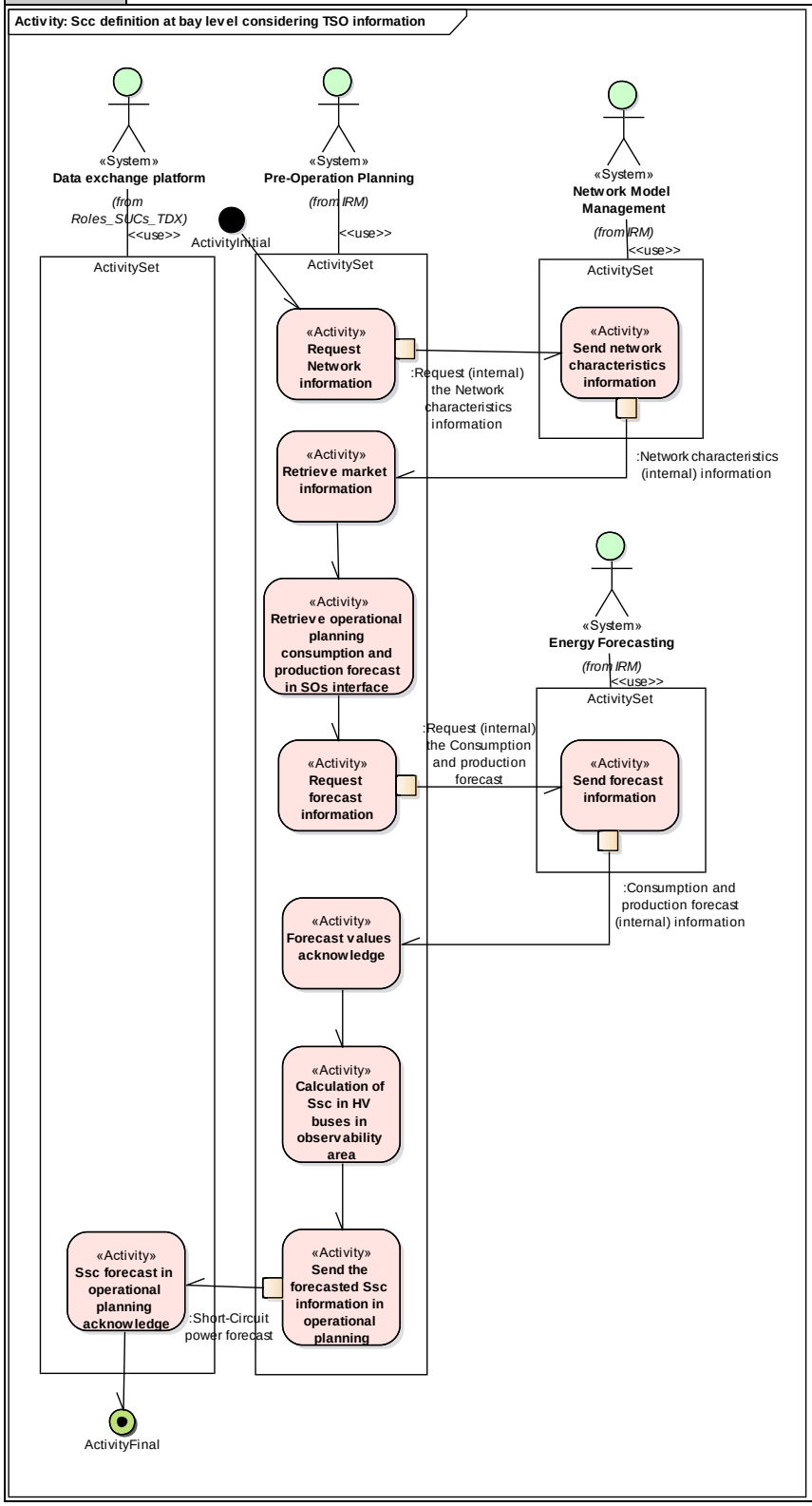
| Scenario conditions | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Ssc definition at bay level considering TSO information | In this scenario only the information provided by the TSO is used to determine the Ssc at bay level. This information is obtained based in the EHV/HV transmission system and in the producers connected to these networks. | | 1 time a day | | |
| 2 | Ssc definition at bay level considering TSO and DSO information | In this scenario the information provided by the TSO and by DSO is used to determine the Ssc at bay level.<br>In a first step the TSO provide the Ssc information based in the EHV/HV transmission system and in the producers connected to these networks.<br>Using the TSO information, the DSO compute the Ssc also considering the impact of the SGU connected to distribution network. | | | | |

## 4.2. Steps - Scenarios

### 4.2.1. Ssc definition at bay level considering TSO information

Scenario step by step analysis

| Scenario | |
|---|---|
| **Scenario name** | Ssc definition at bay level considering TSO information |



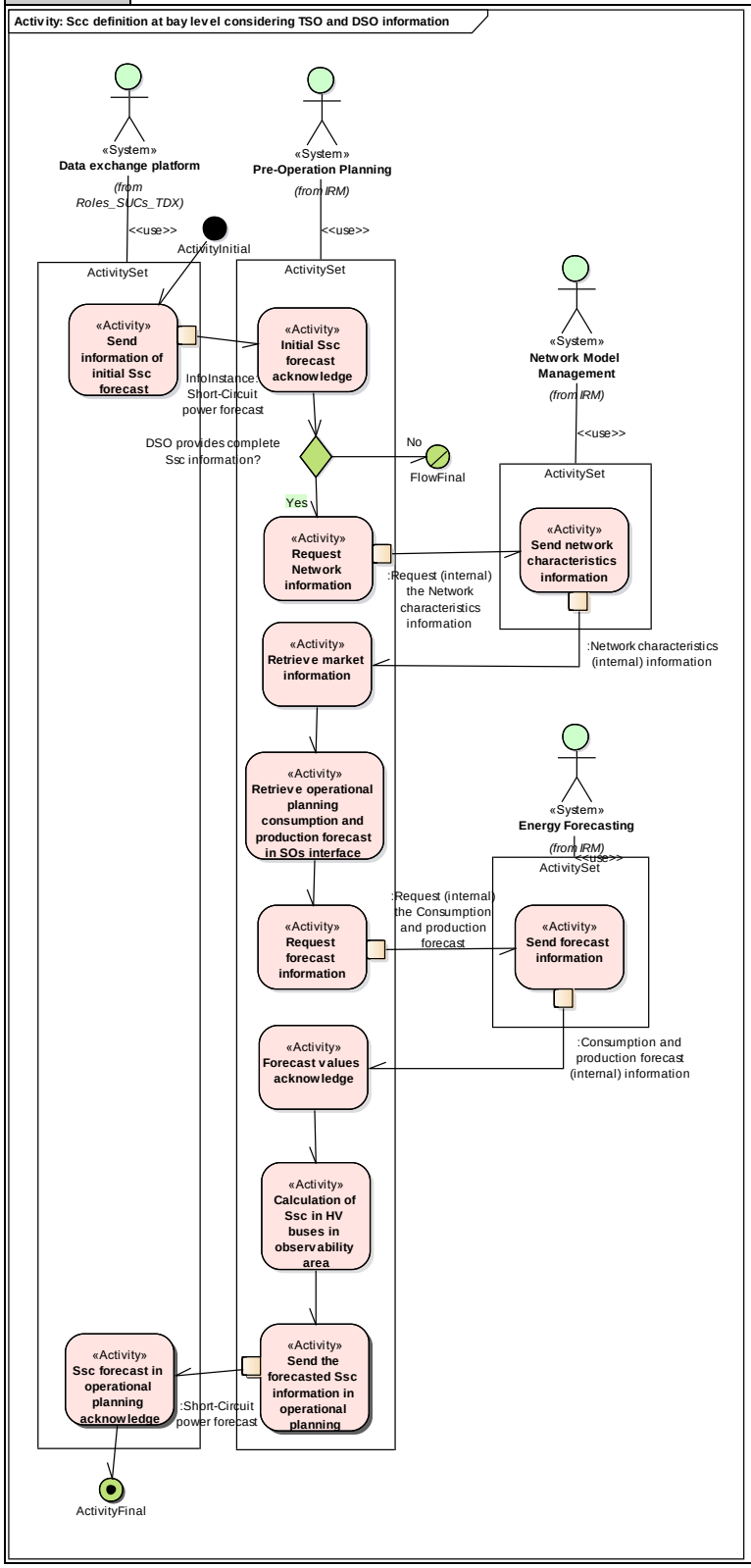
| Step No | Event | Name of process/activity | Description of process/activity | Service | Information producer (actor) | Information receiver (actor) | Information exchanged (IDs) | Requirement, R-IDs |
|---|---|---|---|---|---|---|---|---|
| 1.1 | | Request Network information | Request the network characteristics | | Pre-Operation Planning | Network Model Management | Info1-Request (internal) the Network characteristics information | |
| 1.2 | | Send network characteristics information | | | Network Model Management | Pre-Operation Planning | Info2-Network characteristics (internal) information | |
| 1.3 | | Retrieve market information | This process should be executed after the day-ahead market. The market results should be available and use in this process. | | Pre-Operation Planning | | | |
| 1.4 | | Retrieve operational planning consumption and production forecast in SOs interface | The consumption and production forecast information provided in operational planning by the SO (TSOs and DSOs) should be take into account in the method.<br><br>The exchange of information in TSO-DSO interface is described in the SUC "Disaggregated consumption and generation forecast for operational planning purposes" | | Pre-Operation Planning | | | |
| 1.5 | | Request forecast information | The production and consumption forecast is needed to execute the method. | | Pre-Operation Planning | Energy Forecasting | Info3-Request (internal) the Consumption and production forecast | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | The information should be provided by technology. Some quantiles can be provided if stochastic methods are used | | | | | |
| 1.6 | | Send forecast information | Send requested information | | Energy Forecasting | Pre-Operation Planning | Info4-Consumption and production forecast (internal) information | |
| 1.7 | | Forecast values acknowledge | | | Pre-Operation Planning | | | |
| 1.8 | | Calculation of Ssc in HV buses in observability area | | | Pre-Operation Planning | | | |
| 1.9 | | Send the forecasted Ssc information in operational planning | The SO should send the information of the forecast Ssc for the 24 of the next day in periods of 30 minutes. | | Pre-Operation Planning | Data exchange platform | Info5-Short-Circuit power forecast | |
| 1.10 | | Ssc forecast in operational planning acknowledge | | | Data exchange platform | | | |

### 4.2.2. Ssc definition at bay level considering TSO and DSO information

## Scenario step by step analysis

| Scenario | |
|---|---|
| **Scenario name** | Ssc definition at bay level considering TSO and DSO information |



| 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 | | Send information of initial Ssc forecast | The data information platform should transmit the information of initial short-circuit power provided by the amount SO (normally is a TSO but can be other DSO) | | Data exchange platform | Pre-Operation Planning | Info5-Short-Circuit power forecast | |
| 2.2 | | Initial Ssc forecast acknowledge | | | Pre-Operation Planning | | | |
| 2.3 | | Request Network information | Request the network characteristics | | Pre-Operation Planning | Network Model Management | Info1-Request (internal) the Network characteristics information | |
| 2.4 | | Send network characteristics information | | | Network Model Management | Pre-Operation Planning | Info2-Network characteristics (internal) information | |
| 2.5 | | Retrieve market information | This process should be executed after the day-ahead market. The market results should be available and use in this process. | | Pre-Operation Planning | | | |
| 2.6 | | Retrieve operational planning consumption and production forecast in SOs interface | The consumption and production forecast information provided in operational planning by the SO (TSOs and DSOs) should be take into account in the method.<br><br>The exchange of information in TSO-DSO interface is described in | | Pre-Operation Planning | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | the SUC "Disaggregated consumption and generation forecast for operational planning purposes". | | | | | |
| 2.7 | | Request forecast information | The production and consumption forecast is needed to execute the method.<br><br>The information should be provided by technology. Some quantiles can be provided if stochastic methods are used | | Pre-Operation Planning | Energy Forecasting | Info3-Request (internal) the Consumption and production forecast | |
| 2.8 | | Send forecast information | Send requested information | | Energy Forecasting | Pre-Operation Planning | Info4-Consumption and production forecast (internal) information | |
| 2.9 | | Forecast values acknowledge | | | Pre-Operation Planning | | | |
| 2.10 | | Calculation of Ssc in HV buses in observability area | | | Pre-Operation Planning | | | |
| 2.11 | | Send the forecasted Ssc information in operational planning | The SO should send the information of the forecast Ssc for the 24 of the next day in periods of 30 minutes. | | Pre-Operation Planning | Data exchange platform | Info5-Short-Circuit power forecast | |
| 2.12 | | Ssc forecast in operational planning acknowledge | | | Data exchange platform | | | |

# 5. Information exchanged

| Information exchanged | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info1 | Request (internal) the Network characteristics information | The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between the DSO owned systems<br><br>Structural network information request:<br>Int. Request ID<br>Type of request<br>Substation (All the information in downstream of substation)<br>Transformer (All the information in downstream of transformer)<br>Feeder (All the information in downstream of feeder) | |
| Info2 | Network characteristics (internal) information | The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between the DSO owned systems<br><br>Structural network information request:<br>Int. Request ID<br>Substation<br>Power Transformer<br>R<br>L<br><br>Feeder<br>Line<br>R<br>L<br>C<br><br>Each feeder is composed by several lines. | |
| Info3 | Request (internal) the Consumption and production forecast | The consumption and generation forecast (scheduled information) are needed by several SUCs. This BO request intends to be general for all the SUCs<br><br>Request ID<br>Type of Request<br>Substation<br>Transformer<br>Feeder<br><br>Start Time (day; hour; minute)<br>End Time (day; hour; minute)<br><br>The time should be done in intervals of 15 minutes. | |
| Info4 | Consumption and production forecast (internal) information | The consumption and generation forecast (scheduled information) should be provided by several SUCs.<br><br>Request ID<br>Type of Request | |

| | | | |
|---|---|---|---|
| | | Substation<br>Quantile<br>Pconso_Substation<br>Pprod_Substation<br>Qconso_Substation<br>Qprod_Substation<br><br>Transformer<br>Quantile<br>Pconso_Transformer<br>Pprod_Transformer<br>Qconso_Transformer<br>Qprod_Transformer<br><br>Feeder<br>Quantile<br>Pconso_Feeder<br>Pprod_Feeder<br>Qconso_Feeder<br>Qprod_Feeder<br><br>Start Time (day; hour; minute)<br>End Time (day; hour; minute)<br><br>The time should be done in intervals of 15 minutes. If necessary, several quantiles can be included in the forecast. With this information, more advanced algorithms leading with uncertainties can be adopted. | |
| Info5 | Short-Circuit power forecast | Exchange of Ssc in each node in the observability area.<br><br>Observability area ID<br>Bus ID<br>Type [Initial / Complete]<br>Ssc (TSO)<br>Ssc (DSO)<br>Ssc (total)<br><br>The information can be classified in two types. The Type 'Initial' means that is the first forecast information only taking into account one SO perspective (normally the TSO). The Type 'Complete' means that the value considers the contribution of the two SOs in the interface. Normally, this information should be provided by the DSO. | |

# 6. Requirements (optional)

# 7. Common terms and definitions

# 8. Custom information (optional)