Definition of historical and forecasted profiles disaggregated by type of consumption and generation for planning purposes

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***
	Long-term planning	Definition of historical and forecasted profiles disaggregated by type of consumption and generation for planning purposes

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	2018-09-06	Nejc Petrovic		Draft

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	TSO requires the prognosis of peak demand for the upcoming years from the DSO as well as certain load profiles of demand and generation for the previous year(s).
Objective(s)	Obtain more detailed insight into network conditions at responsibility area borders
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
This use case intends to describe the information exchange process from the DSO to the TSO concerning the historical and forecasted peak demand evolution for long-term purposes. The DSO provides profiles of consumption and generation with a 15-minute resolution based in historical profiles based in the measurements. Profiles should be aggregated to the primary substation and divided according to type of load or generation (Wind, PV, etc.). For example, that means all profiles of PV units connected to a particular primary substation on a 15 minute resolution. The assessment of connection capacity should be coordinated among TSOs and DSOs in order to contribute to an effective deployment of generation – particularly RES and/or loads. This information should be exchanged on a yearly basis for the previous year and for the next 3 years (forecasted information).
Complete description
This system use cases describes the necessary steps in the process of defining historical load and generation profiles with a 15 minute resolution as well as the necessary steps in the definition of the peak demand growth prognosis at a feeder level. This information is exchanged between the TSO and DSO inside an observability area. The exchange of information is usually one-directional meaning

that only the DSO sends the information to the TSO.

The DSO as part of its regulatory activity already has to obtain metering information about its customers. These are now collected with different time resolutions ranging from 15 minutes to 24 hours and more. The DSO collects metering information from both producers as well as different types of consumer (i.e. industrial, residential, etc.). It is required for this use case that the DSO establishes metering information with a 15 minute resolution for all customers in the future.

For this system use case it is assumed that the observability area between the DSO and the TSO is already defined. In that case the DSO has to aggregate metering information to the highest level of detail specified in the observability area (e.g. to the level of feeders if feeders are defined in the observability area. If feeders are not defined in the observability area then to the next level of detail, which is usually power transformers).

Aggregation of metering information with a 15 minute resolution is done by generation technology type and consumption type. Meaning all metering information corresponding to a particular feeder or transformer and corresponding to only one type of consumption or generation has to be aggregated together. The end result gives us aggregated metering information with a 15 minute resolution corresponding to a particular feeder or power transformer for residential consumption, industrial consumption, PV generation, hydro generation, CHP generation, wind generation, etc...

This information is then exchanged with the TSO as the TSO need this information for planning studies.

It should be noted that this exchange takes place every year for the previous year. For example, this would mean that the DSO sends these aggregated measurement to the TSO at the beginning of 2018 for the year 2017.

Additionally the DSO also sends forecasted peak demand growth information to the TSO, also aggregated to the highest level of detail defined in the observability area.

The DSO usually performs an analysis of predicted peak demand growth at a microlocation level (residential consumption, industrial consumption, PV generation, hydro generation, CHP generation, wind generation) every couple of years. This can vary from DSO to DSO. The results are usually in a relative form, i.e. 3% predicted peak demand growth per year for a particular microlocation. This information should then be aggregated to the highest level of detail defined in the observability area (e.g. feeder level, power transformer level).

This information should also be exchange on a yearly level together with the load and generation profiles. The information should be exchanged for the current and following year. For example, at the beginning of 2018 the predicted peak demand growth for 2018 and 2019.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Deviation of growth of actual peak demand from prognosis		Obtain more detailed insight into network conditions at responsibility area borders

1.6. Use case conditions

Use case conditions	
Assumptions	
1	Refresh-Rate for load and generation profiles: Every year
2	Load and generation profiles have a granularity of 15 minutes
3	DSO renews the prognosis of growth of peak demand every 5 years
Prerequisites	
1	Representative network equivalent in observability area already defined
2	The DSO is able to provide the historical profiles of load and production disaggregated by technology type (wind, PV, hydro, CHP, etc.) and location at a node level within observability area.
3	The observability area is defined and agreed between TSO and DSO

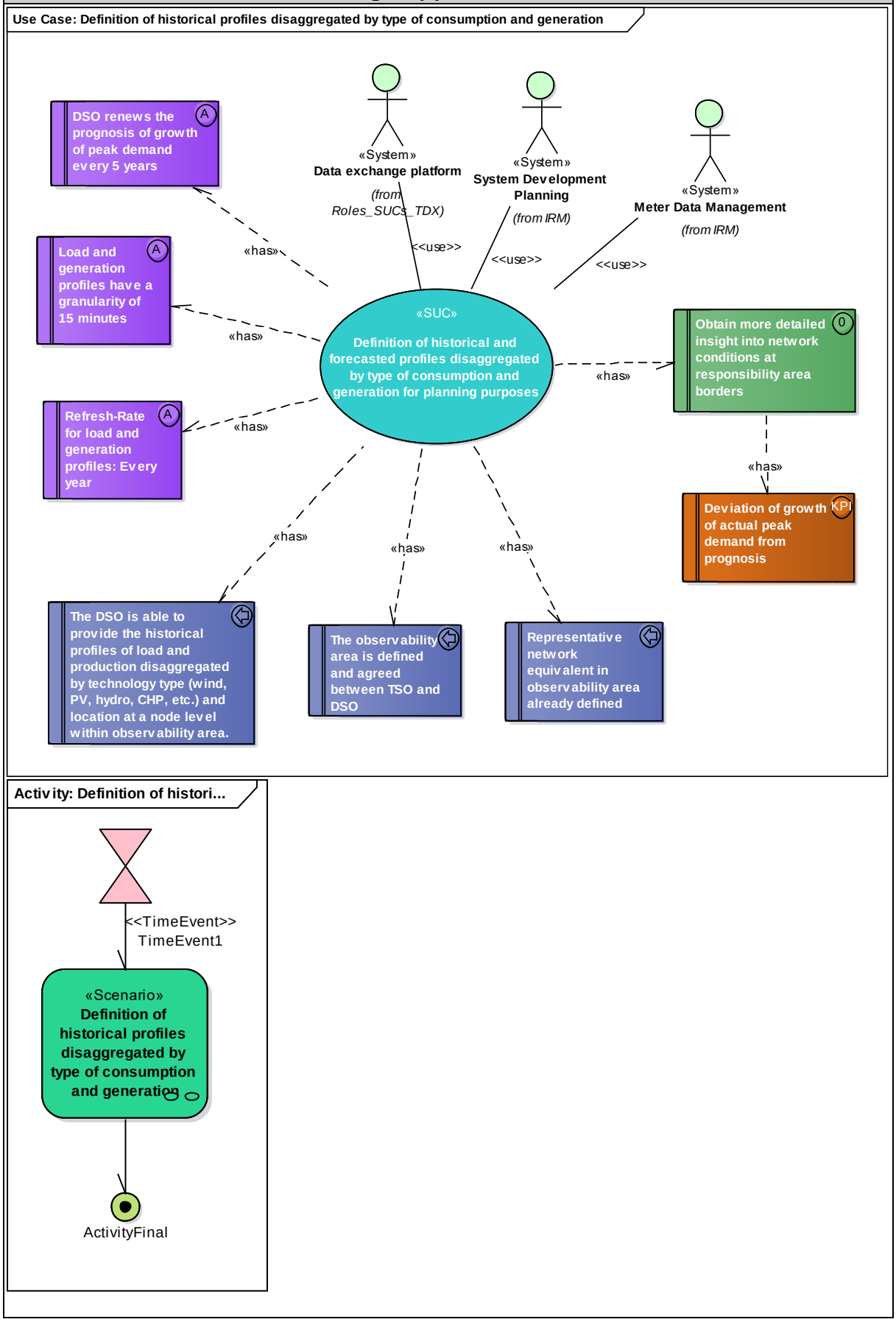
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
<<BUC>> Coordination of long-term network planning between TSO and DSO. <<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
Long-term planning, Consumption and production profiles

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***
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.	
System Development Planning	System	The System Development Planning (SDP) business function involves network development and long term planning. The business function support cooperation and coordination to develop of a secure, environmentally sustainable and economic network system aimed at an adequate grid for the purpose of a well-functioning network operation and market operation. This is done through good planning with focus on future infrastructure characteristics, efficient asset management, critical infrastructure protection and system operability perspective.	
Meter Data Management	System	This business function collects, validates, stores and distributes readings and event-related data from meters and other end devices to other enterprise functions and systems. The meter data management function supports diverse end-use applications including but not limited to billing, load management, load forecasting, demand response, outage management, asset management and distribution network planning and maintenance. The function may perform validating, editing, and estimating (VEE) according to rules established by the appropriate supervising regulatory agency.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

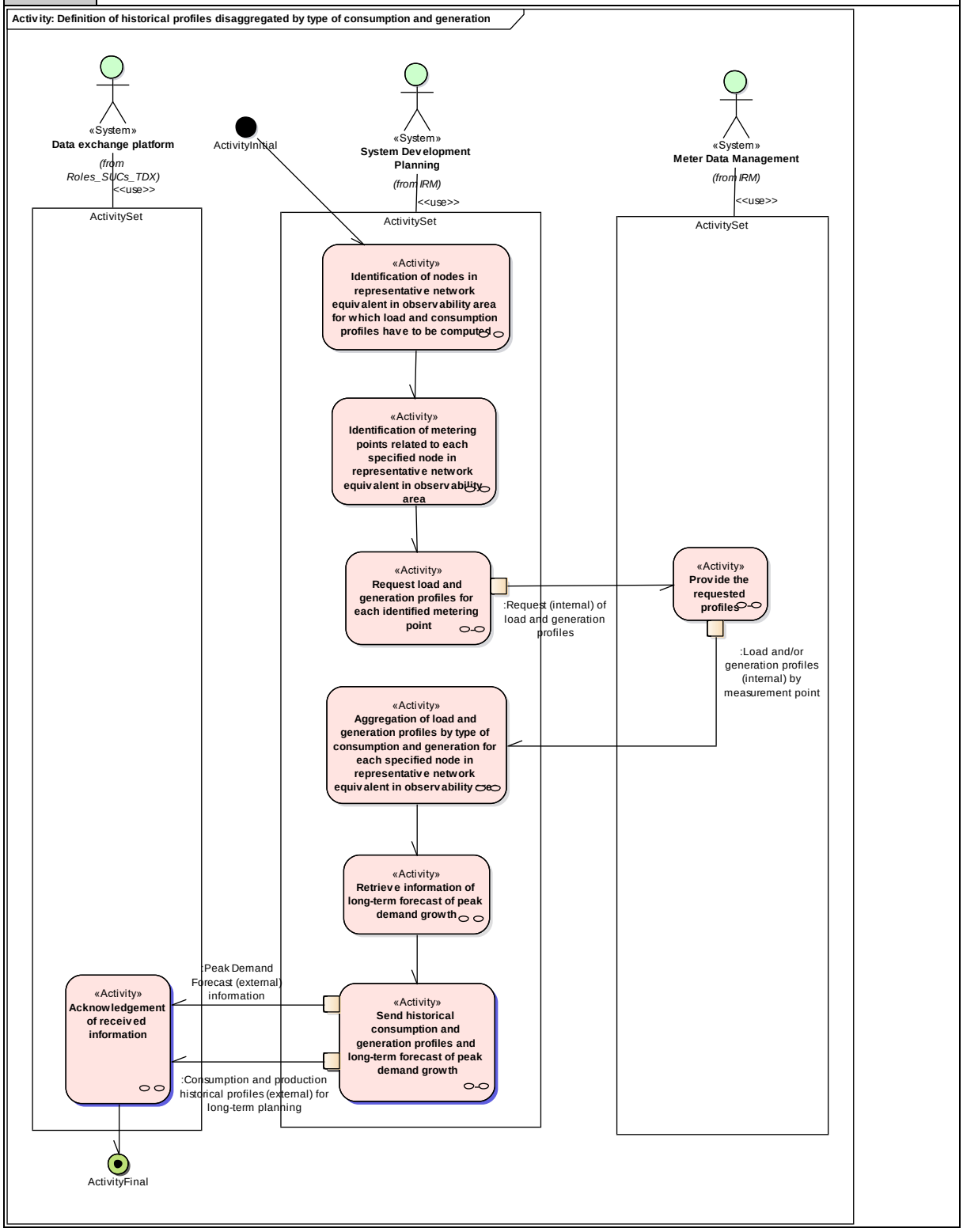
Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Definition of historical profiles disaggregated by type of consumption and generation			TimeEvent1: One time a year. The time should be defined between TSO and DSO.		

4.2. Steps - Scenarios

4.2.1. Definition of historical profiles disaggregated by type of consumption and generation

Scenario step by step analysis

Scenario	
Scenario name	Definition of historical profiles disaggregated by type of consumption and generation



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		Acknowledgement of received information	The interconnected partner send acknowledgement of the received information.		Data exchange platform			
1.2		Aggregation of load and generation profiles by type of consumption and generation for each specified node in representative network equivalent in observability area	The received load and generation profiles for each identified metering point should now be aggregated to the specified nodes in the bus-branch representation of the representative network equivalent in observability area. The load and generation profiles should be disaggregated by type of consumption (e.g. residential, industrial) and by generation technology type (e.g. solar, wind, hydro, CHP, etc...).		System Development Planning			
1.3		Identification of metering points related to each specified node in representative network equivalent in observability area	Each identified node encompasses multiple metering points that extend all the way to the low voltage level. For each identified node all corresponding metering points should be identified in order to submit a request to the Metering department for historical load and generation profiles for each of the identified metering points.		System Development Planning			
1.4		Identification of nodes in representative network equivalent in observability area for which load and consumption	In the bus-branch network representation, which is generally used for planning studies, certain nodes have to be identified. These are the nodes that load		System Development Planning			

		profiles have to be computed	and generation profiles will be aggregated to. These nodes may vary as different interconnected parties may have different levels of detail defined for observability areas. In most common cases these nodes can represent either individual power transformers, busbar sections, feeders, substations by voltage level, etc...					
1.5		Provide the requested profiles	The request for load and generation profiles from the System Development Planning department is received by the Metering department. The metering department provides the required load and generation profiles by measurement point.		Meter Data Management	System Development Planning	Info1-Load and/or generation profiles (internal) by measurement point	
1.6		Request load and generation profiles for each identified metering point	A request for load and generation profiles for each identified metering point is submitted to the Metering department. The load and generation profiles should have a granularity of 15 minutes and should represent the complete previous year (e.g. from 01-01-2017 to 31-12-2017 at the beginning of 2018)		System Development Planning	Meter Data Management	Info2-Request (internal) of load and generation profiles	
1.7		Retrieve information of long-term forecast of peak demand growth	Information about forecasted long-term peak demand growth should be added to the package which will be exchanged with the interconnected partners. There are long-term peak demand forecasts. These forecasts are		System Development Planning			

			usually performed every 5 years. The results of these forecast are usually in the sense that a certain area will have an expected peak demand growth (or decline) of e.g. 3% per year.					
1.8		Send historical consumption and generation profiles and long-term forecast of peak demand growth	Both the requested load and generation profiles aggregated to specified nodes but disaggregated by consumption/generation type as well as the long-term forecast of peak demand growth are exchanged with the interconnected partner.		System Development Planning	Data exchange platform	Info3-Consumption and production historical profiles (external) for long-term planning, Info4-Peak Demand Forecast (external) information	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Load and/or generation profiles (internal) by measurement point	For each measurement point: Characteristics: - Observability area ID - Substation ID - Transformer ID - Feeder ID - Measurement Point ID Measurements: - P,P1,P2,P3 - Q,Q1,Q2,Q3 - U,U1,U2,U3,U*,U12,U23,U31 - I1,I2,I3 - f	
Info2	Request (internal) of load and generation profiles	Request of the measurements profiles in each measurement point. The measurements can be of consumption or production. The request can be done by zones or by a specific equipment. The request can be done for Equipment identification: - All - Observability area - Substation - Transformer - Feeder	

		- Measurement Point Measurements needs: - P,P1,P2,P3 - Q,Q1,Q2,Q3 - U,U1,U2,U3,U*,U12,U23,U31 - I1,I2,I3 - f Type: Interval (15min, 1 hour, 1 day) Instantaneous Average Maximum Minimum	
Info3	Consumption and production historical profiles (external) for long-term planning	The consumption and production historical profiles should be provided by several SUCs. Observability area ID Substation ID Start Time (day;hour;minute) End Time (day;hour;minute) Conso_type (Residential, Industrial, Services) Pconso_Substation_Type_time Qconso_Substation_Type_time Produ_Type (In the market, Feed-in tariffs) Produ_Tech (Wind, PV, CSP, CHP, small-hydro) Pprod_Substation_Type_Tech_Time Qprod_Substation_Type_Tech_Time The time should be done in intervals of 15 minutes.	
Info4	Peak Demand Forecast (external) information	The peak demand forecast can be provided with different levels of details according the needs and the rules in each system. In the future the peak injection can also be useful for planning purposes. Time (year) System Operation_ID Peak_DemandSO Peak_InjectionSO Observability Area_ID Peak_DemandOA Peak_InjectionOA Substation ID Peak_DemandSub Peak_InjectionSub Transformer ID Peak_DemandTransf Peak_InjectionTransf	