

Use Case Task 1-7: Network Equivalents between EMS & Planning

1 Summary:

Export Network Equivalents from the EMS or another application for use by the planning application(s). This would allow correct conversion between the models used by operations and transmission planning as well as generation planning.

2 Actor(s):

Describe the primary and secondary actors involved in the use case. This might include all the people (their job), systems, databases, organizations, and devices involved in or affected by the role performed (e.g. operators, system administrators, customer, end users, service personnel, executives, meter, real-time database, ISO, power system). Actors listed for this use case should be copied from the global actors list to ensure consistency across all use cases.

Actor Name	Actor Type (person, system, device, etc.)	Role description for this use case
Network Planning Engineer	Person	Develop a base planning model to examine an operations event or to establish a new planning base case for future planning.
EMS Operator	Person	Attends the EMS and is familiar with its capabilities to export network models
EMS System	System	System for monitoring/controlling the real-time system and includes a bus-breaker network operations model for real-time network calculations and includes switches/breakers in the model (bus-breaker model). Includes a State Estimator and usually a load flow solution package.
External System	System	System or database that contains information on how to handle equivalents and network extents between EMS and Planning, mapping of equipment ID if they are different in EMS and Planning. As well, it will store external network information if EMS case needs to be extended to a larger geographic territory.
Planning Software	System	Software for detailed study of network performance, usually representing a larger geographical territory than the network model in the EMS. Generally based on a bus-branch model (no switches/breakers). Planning software includes power flow, short-circuit, dynamics, etc.
CIM XML	Method	A protocol defined by a NERC profile that establishes the content, naming, relationships, etc. of network data and the file format for a file exchange from one EMS to another such that sufficient data is exchanged to perform a similar load flow solution on the receiving EMS system
Model Converter & Topology Processor	Analysis	A software analysis used to remove switches/breakers from an operations model (bus-breaker model) to a planning model (bus-branch model). Uses the switch positions (open/closed) in the operations model to connect/disconnect equipment terminals together in the planning model. Load equivalents and network extension with a reference to a dictionary (the external system). The bus-breaker model can be developed from base EMS data or from an actual operations mode.
Base Case	Network planning model from which network alternatives are studied	A data set that represents the network at a specific point in time either as a past point in time or a significant point in time in the future (e.g. 2008 Summer heavy case). The Network Planning Engineer builds alternatives on this case for transmission expansion scenarios or "what-ifs" if the case is a case representing a historical operating point.

3 Assumptions / Design Considerations:

Network Equivalents and Extension is based the understanding that the EMS model and Planning model are different in the following aspects:

- the planning model may contain details down to the 13.8 kV network, but the EMS model rolls the lower voltages up to a 69 kV bus, using an “equivalent” load at the 69 kV level to represent the lower voltages;
- a generator plant may be represented in the EMS as a single equivalent machine but in planning as multiple individual machines;
- vice versa where planning equivalences a machine but the EMS represents them in detail;
- generally after topology processing in an EMS, only connected elements are preserved in the CIM XML or planning export; it is important to transport planning data for equipment that may be out of service – therefore, the CIM will need a spot to flag in and out of service for each planning element;
- EMS model may break 3-winding transformer into 3 2-winding transformers;
- Naming and equipment IDs can be different in EMS and Planning model;

4 Pre-conditions:

There must be a consensus on what the actual network is supposed to be, and whether the equivalents make sense.

5 Normal Sequence:

Use Case Step	Event/ Input to this step	Actor activity and tools used	Description Of Processing	Information Producer	Information Receiver	Output Information to be Exchanged	Notes or Comments
#	<i>Event that triggers this step and/or inputs</i>	<i>Name of actor(s), activity description, and tools/ applications used</i>	<i>Describe the processing that takes place in this step.</i>	<i>Actors/tools responsible for producing information.</i>	<i>Actors responsible for receiving information</i>	<i>Description of information produced in this step to be exchanged with Information Receiver</i>	
1	Request from planning for an EMS model	Network Planning Engineer notifies target EMS system of the need for an EMS model.	Network Planning Engineer specifies what model is being used and/or whether model contains normal load or real time load.	EMS system	A file	The file is a CIM XML file	File consists of a network model with a particular timestamp, as specified by planning engineer
2	CIM XML file	Network Planning Engineer - Data model converter	Extends network model using load equivalents, convert bus-breaker to the bus-branch planning model.	Manually by the Network Planning Engineer or automatic using a software application related to a topology	Network Planning Engineer	A model suitable for use in the target planning model	

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				processor			
3	An EMS model matching the planning model	Network Planning Engineer	Open EMS model in the planning application	Network Planning Engineer	Planning Application	Network Study of EMS model and/or use EMS mode as starting point for future base case.	Process Complete

6 Exceptions / Alternate Sequences:

Describe any alternative actions that may be required that deviate from the normal course of activities. Should the alternate sequence require detailed descriptions, consider creating a new Use Case.

None

7 Post Conditions

Describe conditions that must exist at the conclusion of the use case.

8 Activity Diagrams

Typically an activity diagram with swim lanes for each participating system or actor to graphically describe the step-by-step interactions between actors/systems and the messages exchanged between them. Additionally, sequence diagrams may be developed to help describe complex event flows.

9 References:

Use Cases referenced by this use case, or other documentation that clarifies the requirements or activities described. Also any prior work (intellectual property of companies or individuals) used in the preparation of this use case.

10 Issues:

List of outstanding issues that must be addressed to complete the use case.

ID	Description	Status
1	A set of rules required in the network equivalency	Not started

11 Revision History:

No	Date	Author	Description
0	01/29/07	J Y Li	Initial version

12 Use Case Diagram

