



European Network of  
Transmission System Operators  
for Electricity

---

# INTEROPERABILITY TEST “CIM FOR SYSTEM DEVELOPMENT AND OPERATIONS” 2013

## **APPENDIX B: TEST PROCEDURES**

---

4 JULY 2013

---

VERSION 3 - IOP VERSION

## CONTENTS

<b>7</b>	<b>APPENDIX B: TEST PROCEDURES .....</b>	<b>5</b>
7.1	TEST RULES .....	5
7.1.1	ON-SITE RULES.....	5
7.1.1.1	PROFILE 1 (UML14v02, 2009) .....	5
7.1.1.2	CGMES (COMMON GRID MODEL EXCHANGE STANDARD) v2.4 (CIM 16).....	5
7.1.2	TEST SCORING RULES .....	6
7.1.3	IOP AGENDA .....	6
7.1.4	VALIDATION TOOLS.....	8
7.1.5	FILE NAMING DURING THE IOP .....	8
7.1.6	FILE TRANSFER.....	8
7.1.7	TEST LOGISTICS.....	8
7.1.8	TEST RECORD FORMS .....	9
7.1.8.1	TOOL SUMMARY FORM FOR PROFILE 1 (UML14v02, 2009).....	9
7.1.8.2	TOOL SUMMARY FORM FOR CGMES (CIM16) .....	10
7.2	TEST PROCEDURES DESCRIPTION - PROFILE 1 .....	10
7.2.1	<b>TEST No A: MY TSO MODEL EXPORT .....</b>	<b>10</b>
7.2.1.1	OBJECTIVE .....	10
7.2.1.2	TASKS AND SCORES .....	10
7.2.2	<b>TEST No B: TSO SUBMITS ITS MODEL IN NMD .....</b>	<b>11</b>
7.2.2.1	OBJECTIVE .....	11
7.2.2.2	TASKS AND SCORES.....	11
7.2.3	<b>TEST No C: TSO DOWNLOADS ITS MODEL FROM NMD .....</b>	<b>11</b>
7.2.3.1	OBJECTIVE .....	11
7.2.3.2	TASKS AND SCORES .....	11
7.2.4	<b>TEST No D: TSO SUBMITS ITS PARTIAL MODEL IN NMD .....</b>	<b>12</b>
7.2.4.1	OBJECTIVE .....	12
7.2.4.2	TASKS AND SCORES.....	12
7.2.5	<b>TEST No E: TSO DOWNLOADS ITS PARTIAL MODEL FROM NMD .....</b>	<b>12</b>
7.2.5.1	OBJECTIVE .....	12
7.2.5.2	TASKS AND SCORES .....	12
7.2.6	<b>TEST No F: TSO DOWNLOADS OTHER TSOs MODELS FROM NMD .....</b>	<b>12</b>
7.2.6.1	OBJECTIVE .....	12
7.2.6.2	TASKS AND SCORES .....	13
7.2.7	<b>TEST No G: TSO USES NMD ASSEMBLED MODEL.....</b>	<b>13</b>
7.2.7.1	OBJECTIVE .....	13
7.2.7.2	TASKS AND SCORES .....	13
7.2.8	<b>TEST No H: TSO USES ITS TOOL TO ASSEMBLE MODELS.....</b>	<b>13</b>
7.2.8.1	OBJECTIVE .....	13
7.2.8.2	TASKS AND SCORES .....	13
7.3	TEST PROCEDURES DESCRIPTION - CGMES.....	14
7.3.1	<b>TEST No 1: IMPORT OF A COMPLETE LOAD FLOW MODEL .....</b>	<b>14</b>
7.3.1.1	OBJECTIVE .....	14
7.3.1.2	DESCRIPTION .....	15
7.3.1.3	TEST RECORD.....	15
7.3.2	<b>TEST No 2: EXPORT OF A COMPLETE LOAD FLOW MODEL .....</b>	<b>15</b>
7.3.2.1	OBJECTIVE .....	15
7.3.2.2	DESCRIPTION .....	15
7.3.2.3	TEST RECORD.....	16
7.3.3	<b>TEST No 3: COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS.....</b>	<b>16</b>
7.3.3.1	OBJECTIVE .....	16
7.3.3.2	DESCRIPTION .....	16
7.3.3.3	TEST RECORD.....	16
7.3.4	<b>TEST No 4: APPLY TOPOLOGY CHANGES AND EXPORT TOPOLOGY AND STATE VARIABLES FILES ONLY..</b>	<b>17</b>
7.3.4.1	OBJECTIVE .....	17
7.3.4.2	DESCRIPTION .....	17
7.3.4.3	TEST RECORD.....	17

7.3.5	<b>TEST No 5: APPLY SOLUTION CHANGES (GENERATION, LOAD, VOLTAGE REFERENCES) AND EXPORT STATE VARIABLES FILE ONLY</b> .....	18
7.3.5.1	OBJECTIVE .....	18
7.3.5.2	DESCRIPTION .....	18
7.3.5.3	TEST RECORD.....	18
7.3.6	<b>TEST No 6: IMPORT OF TOPOLOGY AND STATE VARIABLES FILES ONLY AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS</b> .....	19
7.3.6.1	OBJECTIVE .....	19
7.3.6.2	DESCRIPTION .....	19
7.3.6.3	TEST RECORD.....	19
7.3.7	<b>TEST No 7: IMPORT OF A STATE VARIABLES FILE ONLY AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS</b> .....	20
7.3.7.1	OBJECTIVE .....	20
7.3.7.2	DESCRIPTION .....	20
7.3.7.3	TEST RECORD.....	20
7.3.8	<b>TEST No 8: COMPARISON OF THE SHORT-CIRCUIT RESULTS BETWEEN TOOLS</b> .....	21
7.3.8.1	OBJECTIVE .....	21
7.3.8.2	DESCRIPTION .....	21
7.3.8.3	TEST RECORD.....	21
7.3.9	<b>TEST No 9: IMPORT OF COMPLETE LOAD FLOW MODELS FROM DIFFERENT MODEL AUTHORITY SETS, ASSEMBLE THESE MODELS AND EXPORT OF AN ASSEMBLED MODEL (EQUIPMENT+SSH FILES, TOPOLOGY FILES, A STATE VARIABLES FILE AND BOUNDARY FILES)</b> .....	22
7.3.9.1	OBJECTIVE .....	22
7.3.9.2	DESCRIPTION .....	22
7.3.9.3	TEST RECORD.....	22
7.3.10	<b>TEST No 10: IMPORT OF AN ASSEMBLED MODEL (EQUIPMENT+SSH FILES, TOPOLOGY FILES, A STATE VARIABLES FILE AND BOUNDARY FILES). COMPARISON OF THE LOAD FLOW RESULTS OF AN ASSEMBLED MODEL BETWEEN TOOLS</b> .....	23
7.3.10.1	OBJECTIVE .....	23
7.3.10.2	DESCRIPTION .....	23
7.3.10.3	TEST RECORD.....	23
7.3.11	<b>TEST No 11: APPLY EQUIPMENT CHANGES AND EXPORT EQUIPMENT DIFFERENCE FILE AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES</b> .....	24
7.3.11.1	OBJECTIVE .....	24
7.3.11.2	DESCRIPTION .....	24
7.3.11.3	TEST RECORD.....	24
7.3.12	<b>TEST No 12: IMPORT OF DIFFERENCE FILES (EQUIPMENT+SSH) AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES. COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS</b> .....	25
7.3.12.1	OBJECTIVE .....	25
7.3.12.2	DESCRIPTION .....	25
7.3.12.3	TEST RECORD.....	25
7.3.13	<b>TEST No 13: APPLY EQUIPMENT CHANGES ON AN ASSEMBLED MODEL AND EXPORT DIFFERENCE FILE (EQUIPMENT+SSH) AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES</b> .....	25
7.3.14	<b>TEST No 14: IMPORT OF DIFFERENCE FILE (EQUIPMENT+SSH) AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES FOR AN ASSEMBLED MODEL AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS</b> .....	25
7.3.15	<b>TEST No 15: IMPORT OF COMPLETE DYNAMIC MODEL THAT CONTAINS STANDARD MODELS ONLY</b> .....	26
7.3.15.1	OBJECTIVE .....	26
7.3.15.2	DESCRIPTION .....	26
7.3.15.3	TEST RECORD.....	26
7.3.16	<b>TEST No 16: EXPORT OF COMPLETE DYNAMIC MODEL THAT CONTAINS STANDARD MODELS ONLY</b> .....	27
7.3.16.1	OBJECTIVE .....	27
7.3.16.2	DESCRIPTION .....	27
7.3.16.3	TEST RECORD.....	27
7.3.17	<b>TEST No 17: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING STANDARD MODELS)</b> .....	27
7.3.17.1	OBJECTIVE .....	27
7.3.17.2	DESCRIPTION .....	28
7.3.17.3	TEST RECORD.....	28

7.3.18	<b>TEST No 18: IMPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITH STANDARD CONNECTIONS</b> .....	28
7.3.19	<b>TEST No 19: EXPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITH STANDARD CONNECTIONS</b> .....	28
7.3.20	<b>TEST No 20: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING USER-DEFINED MODEL WITH STANDARD CONNECTIONS)</b> .....	29
7.3.21	<b>TEST No 21: IMPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITHOUT STANDARD CONNECTIONS</b> .....	29
7.3.22	<b>TEST No 22: EXPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITHOUT STANDARD CONNECTIONS</b> .....	29
7.3.23	<b>TEST No 23: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING USER-DEFINED MODEL WITHOUT STANDARD CONNECTIONS)</b> .....	29
7.3.24	<b>TEST No 24: IMPORT OF A DYNAMIC FILE THAT CONTAINS PROPRIETARY MODEL</b> .....	29
7.3.25	<b>TEST No 25: EXPORT OF A DYNAMIC FILE THAT CONTAINS PROPRIETARY MODEL</b> .....	30
7.3.26	<b>TEST No 26: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING A PROPRIETARY MODEL)</b> .....	30
7.3.27	<b>TEST No 27: EXPORT OF A "PLANNING" MODEL USING AN "OPERATIONAL" MODEL</b> .....	30
7.3.27.1	OBJECTIVE .....	30
7.3.27.2	DESCRIPTION .....	30
7.3.27.3	TEST RECORD.....	30
7.3.28	<b>TEST No 28: IMPORT OF A "PLANNING" MODEL RESULTED FROM AN "OPERATIONAL" MODEL AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS</b> .....	31
7.3.28.1	OBJECTIVE .....	31
7.3.28.2	DESCRIPTION .....	31
7.3.28.3	TEST RECORD.....	31
7.3.29	<b>TEST No 29: IMPORT OF AN "OPERATIONAL" MODEL BY "PLANNING" VENDORS AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS</b> .....	32
7.3.29.1	OBJECTIVE .....	32
7.3.29.2	DESCRIPTION .....	32
7.3.29.3	TEST RECORD.....	32
7.3.30	<b>TEST No 30: MODEL AUTHORITY SETS EXCHANGE TEST</b> .....	32
7.3.30.1	OBJECTIVE .....	32
7.3.30.2	DESCRIPTION .....	32
7.3.30.3	TEST RECORD.....	33
7.3.31	<b>TEST No 31: FILE HEADER TEST</b> .....	33
7.3.31.1	OBJECTIVE .....	33
7.3.31.2	DESCRIPTION .....	33
7.3.31.3	TEST RECORD.....	34
7.3.32	<b>TEST No 32: EXCHANGE OF DIAGRAM DATA TEST</b> .....	34
7.3.32.1	OBJECTIVE .....	34
7.3.32.2	DESCRIPTION .....	34
7.3.32.3	TEST RECORD.....	34
7.3.33	<b>TEST No 33: EXCHANGE OF GEOGRAPHICAL DATA TEST</b> .....	35
7.3.33.1	OBJECTIVE .....	35
7.3.33.2	DESCRIPTION .....	35
7.3.33.3	TEST RECORD.....	35
7.4	TEST RECORD FORM TEMPLATES.....	36
7.4.1	TOOL SUMMARY FORM (PER TOOL, PER TSO) - PROFILE 1 (UML14v02, 2009) .....	36
7.4.2	TOOL SUMMARY FORM (PER TOOL) - CGMES.....	37

## 7 APPENDIX B: TEST PROCEDURES

### 7.1 TEST RULES

#### 7.1.1 ON-SITE RULES

On-site test starts on 8 July 2013 and finishes on 12 July 2013. Test participants should be present in the ENTSO-E premises between 8:30h and 18:00h.

The following ground rules to be followed during the ENTSO-E Interoperability test:

- Vendors must submit the product release (version ID) for the software under test.

##### 7.1.1.1 PROFILE 1 (UML14v02, 2009)

- TSO experts will be performing all tests related to the ENTSO-E profile 1 (UML14v02, 2009). In case of issues vendors' support is expected and all issues should be documented. All tests which involve profile 1 will be performed using the ENTSO-E Network Modelling Database to which only TSO experts will have access.
- Profile 1 tests by vendors:
  - Vendors will not have access to Network Modelling Database.
  - If the vendor's tool is used by a TSO the vendor should support the TSO if there are issues when TSOs submit to or use models from Network Modelling Database.
  - If the vendor's tool is not used by a TSO, but the vendor would like to test profile 1 - only small fictitious models will be used for a test exchange.

##### 7.1.1.2 CGMES (COMMON GRID MODEL EXCHANGE STANDARD) v2.4 (CIM 16)

- Test witness role is only applicable for tests related to CGMES v2.4 (UML CIM 16)
- Test witnesses need to familiarize themselves with the test models and be able to witness the correct implementation of the ENTSO-E CGMES. The test witnesses move between test participants in order to cover all vendors and ensure that each test witness witnesses each vendor. The test participants (vendors) execute all tests related to CGMES (UML CIM 16) and complete the internal validation as well as execute the validation tools for the external file validation. The test witness ensures that all steps are executed and all issues are noted.
- The test participant (vendor) downloads the model files to be imported from the file storage location and the model files produced by the test participant are then uploaded to the agreed file server for use by other participants. The test participants (vendors) are responsible for the CIM/XML file validation and for ensuring that the

files produced during the test are loaded onto the file server. However, the test witness should assist the test participant with these tasks as much as possible. At a minimum, the test witness should ensure the files are included on the file server. The test director ensures the contents of the file server are backed-up to a memory stick each day and makes the contents available to all test attendees upon request prior to the end of the IOP.

- Unstructured tests may be performed if there is time and the test participant wishes to complete these tests. Any unstructured test must be documented on the test record form by the test witness for inclusion into the IOP report. Each step of the procedure followed must be fully documented.
- The test participants may select what test cases and test procedure they wish to execute depending on the functionalities of their tools. The IOP report presents the results for all files used and all procedures executed.

## 7.1.2 TEST SCORING RULES

The tests in which CGMES is involved are not scored as the main objective is to confirm the correctness of the CGMES.

Tests for profile 1 (CIM14) include instructions on how to score the tests. The goal of the scores is to provide information on the compliance of the tools with the ENTSO-E CIM profile 1 and to identify implementation gaps to be covered in order to ensure smooth data exchanges among ENTSO-E TSOs.

## 7.1.3 IOP AGENDA

- 8 July – objective to identify as many issues as possible to be discussed in the next days. Some vendors may work to improve test models or tools.
  - ENTSO-E office available from 8:30h; vendors could start their setup and testing
  - 15:00h – testing finishes
  - 15:00h -18:00h – workshop discussion – web conference arranged (WG13 and TSOs are welcomed to join)
    - SSH discussion (part 1) and ConnectivityNode/TopologicalNode issue
- 9 July
  - 8:30h – testing starts
  - 12:30h – testing finishes
  - 13:30h -16:00h – workshop discussion – web conference arranged (WG13 and TSOs are welcomed to join)
    - SSH long term optimal solution (part 2)
  - 16:00h-18:00h – Join discussion with WG13 - web conference arranged (WG13 and TSOs are welcomed to join)
    - Location reference to PSR – issues related to Diagram Layout and Geographical Location profiles
      - Reference Line for boundary nodes
      - Change to IdentifiedObject
    - Validate SSH long term solution

- Small/Big issues to clean up (from the spreadsheet or discovered during the IOP)
- 10 July
  - 8:30h – testing starts with summary of Day 2
  - 12:30h – testing finishes
  - 13:30h -16:00h – workshop discussion – web conference arranged (WG13 and TSOs are welcomed to join)
    - Future development of CIM for Dynamics
      - Necessary extensions in the UML model to allow extensions without changing model interconnections
    - The process to implement CIM for dynamics. Synchronized vendor's implementation and testing once the CGMES is approved.
      - Related templates and procedures
  - 16:00h-18:00h – Join discussion with WG13 - web conference arranged (WG13 and TSOs are welcomed to join)
    - Recap discussion on CIM for Dynamics if additional WG13 members join
    - Issue: Optional and required attributes for the HVDC model
    - Small/Big issues to clean up (from the spreadsheet or discovered during the IOP)
    - Further development of the HVDC model – agree on direction without changing HVDC structure; Estimate dependencies from other IEC work and ENTSO-E HVDC NC development
- 11 July
  - 8:30h – testing starts with summary of Day 3
  - 12:30h – testing finishes
  - 13:30h -16:00h – workshop discussion – web conference arranged (WG13 and TSOs are welcomed to join)
    - Discussion on CIM tools certification against CGMES (when approved)
      - The process to extend the CGMES and its profiles; suggestions for versioning; what changes when
      - Vendors' opinion on an implementation process following CGMES extensions and modification of business processes. How to implement in a dynamic environment.
  - 16:00h-18:00h – Join discussion with WG13 - web conference arranged
    - Small/Big issues to clean up (from the spreadsheet or discovered during the IOP)
    - Power system project support
    - Brainstorm on future CIM development – issues to be prioritized for CIM17
- 12 July
  - 8:30h – testing starts with summary of Day 4
  - 10:30h – testing finishes
  - 10:30h -11:30h – package official test models from the IOP. A single set selected as a good reference for modelling of particular feature
  - 11:30h-12:30h – review summary of issues and action plan
  - 13:30h -15:00h – collection of final reports

All webinar sessions will be recorded to be able to improve summary. Recording will be available in the CIMug site – IOP site and ENTSO-E Extranet for TSOs.

## 7.1.4 VALIDATION TOOLS

During the IOP the ENTSO-E CGMES is supported by CIMSpy validation tool.

Test witnesses from ENTSO-E TSOs should have CIMdesk installed and ready to use by them during the IOP. CIMdesk is used by test witnesses from ENTSO-E TSOs to validate against ENTSO-E naming convention – for profile 1.

Additional validations of models are applied in the ENTSO-E Network Modelling Database for profile 1 during model submission.

## 7.1.5 FILE NAMING DURING THE IOP

Due to the usage of file headers, vendors should not count on file names to identify information about file types (equipment, topology, steady state hypothesis, state variables, dynamics, diagram and geographical) when exchanging using CGMES. This information has to be obtained using file header.

When exchanging with profile 1 naming conventions defined in the profile and rules in the Network Modelling Database are used (hierarchy of Scenario/Case/Situations and versions are used to identify the sequence of the actions).

## 7.1.6 FILE TRANSFER

ENTSO-E IOP will use local file server to support file exchange among vendors for CGMES. The test director will create the folder structure in the server. All vendors will have a folder where they must save all files that are exchanged in the IOP. All files (import, export and supporting documents) are stored in this directory.

60 GB HDD is accessible on the following address is \\172.16.12.4\Public. Login: Guest;  
Password: nas

Access to the HDD and the Internet is provided via a Wi-Fi and a LAN (2 switches, 24 ports each) connection.

Wi-Fi user name is: ENTSO-E\_GUESTS, password: 3nts03\_guest

Memory sticks can be used to backup data. All files produced during the ENTSO-E IOP must be uploaded by vendors in the CIMug site ([www.cimug.org](http://www.cimug.org)) at the end of each test day.

Data exchange for profile 1 will use ENTSO-E Network Modelling Database or the file server in case of fictitious test models.

## 7.1.7 TEST LOGISTICS

The test is held in Brussels, ENTSO-E premises (Avenue de Cortenbergh 100, 1000 Brussels, Belgium) - ground floor.



Webinar are organized to facilitate discussions planned on (see also the IOP agenda):

- 8 July 2013 at **15:00h-18:00h CET**
- 9 July 2013 at **13:30h-18:00h CET**
- 10 July 2013 at **13:30h-18:00h CET**
- 11 July 2013 at **13:30h-18:00h CET**

The link to the webinars is the following:

<https://www1.gotomeeting.com/register/445651705>

Once registered you will receive an email confirming your registration with information you need to join the Webinar.

## 7.1.8 TEST RECORD FORMS

All issues identified for the tests related to profile 1 will be recorded in the NMD - JIRA environment. An xls spreadsheet with issues will be kept updated.

For CGMES vendors will record all issues in an xls spreadsheet. Additional documentation for issues can be provided (if necessary) and referenced in the spreadsheet.

### 7.1.8.1 TOOL SUMMARY FORM FOR PROFILE 1 (UML14v02, 2009)

- The form is completed by TSOs
- The form is completed electronically in a single Word document and printed in three copies (one original for the vendor, one for the TSO, one original for ENTSO-E). The form is signed by the vendor, the TSO using the tool and the ENTSO-E. A scanned version of the form is included in the final IOP report (Appendix)
- The form provides information on the vendor and on which tool is tested
- Summarizes the results from all tests that are performed
- Comments are included in „Comments“ section. Comments can be: CIM issues, references to documents that provide additional information on particular issues, etc. Comments section must include a list of other tools with which this tool demonstrates interoperability. Comments section must include a list of tests that have not been performed. All tests that are not performed should be grouped according to the reason why they have not been performed and short information on the reason must be provided (e.g. time constrain, limitation in tool's functionalities/this is not supported by the tool, require additional development time). The comments must also include short information on the vendor's intention to cover this functionality in next releases.
- The form can be extended (additional lines created) in case of need to add additional comments or lines for tests that were performed

- The vendor updates this table on daily basis and submits it to the test director from ENTSO-E (at the end of the IOP) for inclusion in the final IOP report.

#### **7.1.8.2 TOOL SUMMARY FORM FOR CGMES (CIM16)**

- The form is completed by vendors
- The form is completed electronically in a single Word document and printed in two copies (one original for the vendor, one original for ENTSO-E). The form is signed by the vendor, the test witnesses and the ENTSO-E. A scanned version of the form is included in the final IOP report (Appendix)
- The form provides information on the vendor and on which tool is tested
- The form lists all test witnesses that witnessed that particular tool.
- Summarizes the results from all tests that are performed
- Comments are included in „Comments“ section. Comments can be: CIM issues, references to documents that provide additional information on particular issues, etc. Comments section must include a list of other tools with which this tool demonstrates interoperability. Comments section must include a list of tests that have not been performed. All tests that are not performed should be grouped according to the reason why they have not been performed and short information on the reason must be provided (e.g. time constrain, limitation in tool's functionalities/this is not supported by the tool, require additional development time). The comments must also include short information on the vendor's intention to cover this functionality in next releases.
- The form can be extended (additional lines created) in case of need to add additional comments or lines for tests that were performed
- The vendor updates this table on daily basis and submits it to the test director from ENTSO-E (at the end of the IOP) for inclusion in the final IOP report.

## **7.2 TEST PROCEDURES DESCRIPTION - PROFILE 1**

The following tests are performed by TSOs using their real models.

### **7.2.1 TEST No A: MY TSO MODEL EXPORT**

#### **7.2.1.1 OBJECTIVE**

The aim of this test is to prove that the TSO expert can export the real TSO model and re-import it again and obtain the same load flow results.

#### **7.2.1.2 TASKS AND SCORES**

A complete set of TSO model is used: equipment, topology and state variables files.

Task	Score
Step 1 not possible	0
1. Export TSO model which is compliant with ENTSO-E Boundary	1
2. Validate the export in CIMdesk	2
3. Re-import the exported model using TSO tool. The model remains without changes / no errors on import and the same load flow is obtained.	3

## 7.2.2 TEST No B: TSO SUBMITS ITS MODEL IN NMD

### 7.2.2.1 OBJECTIVE

The aim of this test is to prove that the TSO expert can submit its real TSO model in NMD.

### 7.2.2.2 TASKS AND SCORES

A complete set of TSO model is used: equipment, topology and state variables files. The model is submitted in the NMD as zipped file.

Task	Score
1. TSO submits its model in the NMD. The model is rejected by syntax validation	0
2. The model is rejected by business validation.	1
3. The model is accepted by NMD. Warnings reported	2
4. The model is accepted by NMD. No warnings.	3

## 7.2.3 TEST No C: TSO DOWNLOADS ITS MODEL FROM NMD

### 7.2.3.1 OBJECTIVE

The aim of this test is to prove that the TSO expert can download its real TSO model from NMD.

### 7.2.3.2 TASKS AND SCORES

Task	Score
1. The model is downloaded	0
2. The model is validated in CIMdesk and additional errors (errors due to NMD) are present	1
3. Import the exported model using TSO tool. The model remains without changes / no errors on import and the same load flow is obtained.	2

## 7.2.4 **TEST No D**: TSO SUBMITS ITS PARTIAL MODEL IN NMD

### 7.2.4.1 OBJECTIVE

The aim of this test is to prove that the TSO expert can submit its real TSO model in NMD using partial submission.

### 7.2.4.2 TASKS AND SCORES

Test D can be performed in case there is already a TSO model in the NMD. Only Topology and State Variables files or only State variable file are submitted.

Task	Score
1. TSO exports its partial model.	0
2. TSO submits its model in the NMD. The model is rejected by syntax validation	1
3. The model is rejected by business validation.	2
4. The model is accepted by NMD. Warnings reported	3
5. The model is accepted by NMD. No warnings.	4

## 7.2.5 **TEST No E**: TSO DOWNLOADS ITS PARTIAL MODEL FROM NMD

### 7.2.5.1 OBJECTIVE

The aim of this test is to prove that the TSO expert can download its real partial TSO model from NMD.

### 7.2.5.2 TASKS AND SCORES

Task	Score
1. The model is downloaded	0
2. The model is validated in CIMdesk and additional errors (errors due to NMD) are present	1
3. Import the exported model using TSO tool. The model remains without changes / no errors on import and the same load flow is obtained.	2

## 7.2.6 **TEST No F**: TSO DOWNLOADS OTHER TSOs MODELS FROM NMD

### 7.2.6.1 OBJECTIVE

The aim of this test is to prove that the TSO expert can download and use other TSO models from NMD.

**7.2.6.2 TASKS AND SCORES**

Task	Score
1. The model is downloaded	-
2. The model is validated in CIMdesk and additional errors (errors due to NMD) are present	0
3. Import the exported model using TSO tool. There are errors during the import. The import is not possible	1
4. The import is successful. There are issues which are documented.	2
5. The import is successful. There are no issues	3
6. Load flow is performed. There are issues which are documented.	4
7. Load flow is performed. There are no issues.	5
8. Load flow results match within engineering tolerance.	6

**7.2.7 TEST No G: TSO USES NMD ASSEMBLED MODEL****7.2.7.1 OBJECTIVE**

The aim of this test is to prove that the TSO expert can use assembled models from NMD.

**7.2.7.2 TASKS AND SCORES**

Task	Score
1. The model is assembled in the NMD	-
2. The model is validated in CIMdesk and additional errors (errors due to NMD) are present	0
3. Import the exported model using TSO tool. There are errors during the import. The import is not possible	1
4. The import is successful. There are issues which are documented.	2
5. The import is successful. There are no issues	3
6. Load flow is performed. There are issues which are documented.	4
7. Load flow is performed. There are no issues.	5
8. Load flow results match within engineering tolerance.	6
9. A solution of the assembled model is submitted in the NMD	7

**7.2.8 TEST No H: TSO USES ITS TOOL TO ASSEMBLE MODELS****7.2.8.1 OBJECTIVE**

The aim of this test is to prove that the TSO expert can assemble models using its tool.

**7.2.8.2 TASKS AND SCORES**

Task	Score
------	-------

1. Download models from test F with score 6	0
2. Assemble the model. There are no errors.	1
3. Load flow is performed. There are issues which are documented.	2
4. Load flow is performed. There are no issues.	3
5. Load flow results match within engineering tolerance.	4

### 7.3 TEST PROCEDURES DESCRIPTION - CGMES

The following table indicates which tests could be performed using 1st edition of the profile (marked with 1st) and which - CGMES (marked with 2nd). All tests marked as 1st are mainly available for vendors that do not have access to the Network Modelling Database but would like to perform tests on profile 1 with fictitious test models.

Tests from 18 to 23 will not be performed as the profile is not ready to support user defined dynamics models.

With the inclusion of the Steady State Hypothesis (SSH) profile all test procedures include EQ+SSH if only EQ is mentioned. It is was agreed that for the propose of IOP EQ and SSH is exchanged in one instance file.

Test No	Performed using profile No	Test No	Performed using profile No	Test No	Performed using profile No
1	1st, 2nd	12	2nd	23	2nd (DY)
2	1st, 2nd	13	2nd	24	2nd (DY)
3	1st, 2nd	14	2nd	25	2nd (DY)
4	1st, 2nd	15	2nd (DY)	26	2nd (DY)
5	1st, 2nd	16	2nd (DY)	27	1st, 2nd
6	1st, 2nd	17	2nd (DY)	28	1st, 2nd
7	1st, 2nd	18	2nd (DY)	29	2nd
8	2nd -short circuit	19	2nd (DY)	30	2nd
9	1st, 2nd	20	2nd (DY)	31	2nd
10	1st, 2nd	21	2nd (DY)	32	2nd
11	2nd	22	2nd (DY)	33	2nd

#### 7.3.1 TEST No 1: IMPORT OF A COMPLETE LOAD FLOW MODEL

##### 7.3.1.1 OBJECTIVE

The aim of this test is to prove that a complete load flow model is properly imported in the tool.

### 7.3.1.2 DESCRIPTION

A complete set of test model is used: equipment+SSH, topology and state variables files. A single MAS (a TSO model) model is imported together with boundary MAS or boundary MAS is imported before the "TSO model". The following procedure is applied:

- Vendor A imports all three files (equipment+SSH, topology and state variables). The import considers the rule for importing boundary MAS. Imported files can be official test files or exported files from other tests. For the tests using CGMES - Vendor A imports single \*.zip file with equipment, topology and state variables and \*.zip file of boundary set
- Vendor A executes a load flow to demonstrate that the models can be solved.
- Test witnesses check instance data, naming convention rules and load flow results;

### 7.3.1.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files or \*.zip file(s);
- Which instance data (types of instance data) was checked;
- At least one screenshot that show imported instance data has to be referenced as a supplementary document.

## 7.3.2 TEST No 2: EXPORT OF A COMPLETE LOAD FLOW MODEL

### 7.3.2.1 OBJECTIVE

The aim of this test is to prove that a complete load flow model is properly exported from the tool. Exported files are used to demonstrate interoperability among vendors.

### 7.3.2.2 DESCRIPTION

A complete set of test model is used: equipment+SSH, topology and state variables files. A single MAS (a TSO model) model is used. The following procedure is applied:

- Vendor A uses imported files from the Test No 1 (7.2.1);
- Vendor A exports all three files (equipment+SSH, topology and state variables) as a single model authority set (a TSO model). Export of boundary MAS is not required. For the tests using CGMES – single \*.zip file is exported.
- Vendor A validates exported set of files using validation tools
- Test witnesses check instance data/validation report using validation tools. Test witness also verifies that RDFids are the same in comparison with the original files;

### 7.3.2.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported\*.xml files or \*.zip file;
- File names of the exported\*.xml files or \*.zip file;
- Which instance data (types of instance data) was checked;
- At least one screenshot that shows imported instance data has to be referenced as a supplementary document;
- One screenshot that shows validation report has to be referenced as a supplementary document.

## 7.3.3 TEST No 3: COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS

### 7.3.3.1 OBJECTIVE

The aim of this test is to demonstrate interoperability among vendors. Load flow results should match in an engineering tolerance (max 5%).

There are two options of this test:

- comparison of flat start results (for some tools there might be some dependency on solution methods). This means that SV is not imported (the exchange is EQ+SSH and TP)
- comparison of results considering SV

### 7.3.3.2 DESCRIPTION

A complete set of test models are used: equipment+SSH, topology and state variables files (only for 2<sup>nd</sup> option when SV is used). The models that will be compared have a single model authority set (TSO models). This test can be performed using both official test files and exported files from Test No 2 (7.2.2). The following procedure is applied:

- Vendor A (Tool A) and vendor B (Tool B) can use already imported files from the test 7.2.1 or import new \*.xml files;
- Vendor A (Tool A) and vendor B (Tool B) execute a load flow.
- Test witnesses compare load flow results between Tools;

### 7.3.3.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files or \*.zip files;



- Which solution parameters were checked;
- At least one screenshot (from Tool A) that shows solution results has to be referenced as a supplementary document;
- At least one screenshot (from Tool B) that shows solution results has to be referenced as a supplementary document;

### **7.3.4 TEST No 4: APPLY TOPOLOGY CHANGES AND EXPORT TOPOLOGY AND STATE VARIABLES FILES ONLY**

#### **7.3.4.1 OBJECTIVE**

The aim of this test is to demonstrate the ability of the tool to export topology and state variables files only.

#### **7.3.4.2 DESCRIPTION**

A complete set of test model (a single MAS - TSO model) model is used: equipment+SSH, topology and state variables files or a \*.zip file (CGMES). This test is performed using both official test files and exported files from Test No 2 (7.2.2). The following procedure is applied:

- Vendor A can use imported files from the Test No 1 (7.2.1) or import already exported files from Test No 2 (7.2.2);
- Vendor A applies topology changes suggested by test witness.
- Vendor A executes a load flow
- Vendor A exports topology and state variable files and validates those using CIM validation tools. In case of CGMES - topology and state variables files are \*.zipped together.

#### **7.3.4.3 TEST RECORD**

The following information should be recorded in the test form:

- File names of the imported \*.xml files or \*.zip file;
- File names of the exported \*.xml files (topology and state variables) or \*.zip file;
- Which topology changes were applied;
- At least one screenshot that shows new solution results has to be referenced as a supplementary document;
- At least one screenshot that shows validation results has to be referenced as a supplementary document;

### **7.3.5 TEST No 5: APPLY SOLUTION CHANGES (GENERATION, LOAD, VOLTAGE REFERENCES) AND EXPORT STATE VARIABLES FILE ONLY**

#### **7.3.5.1 OBJECTIVE**

The aim of this test is to demonstrate the ability of the tool to export state variables file only.

#### **7.3.5.2 DESCRIPTION**

A complete set of test model (a single MAS – TSO model) is used: equipment+SSH, topology and state variables files (one \*.zip file in case of CGMES). This test is performed using both official test files and exported files from Test No 2 (7.2.2). The following procedure is applied:

- Vendor A can use imported files from the Test No 1 (7.2.1) or import already exported files from Test No 2 (7.2.2);
- Vendor A applies changes (related to SV, i.e. generation, load, etc.) suggested by test witness.
- Vendor A executes a load flow
- Vendor A exports a state variable file (state variable files is \*.zipped in case of CGMES) and validates it using CIM validation tools;

#### **7.3.5.3 TEST RECORD**

The following information should be recorded in the test form:

- File names of the imported \*.xml files or \*.zip file;
- File names of the exported \*.xml file (state variables) or \*.zip file;
- Which state variables changes were applied;
- At least one screenshot that shows new solution results has to be referenced as a supplementary document;
- At least one screenshot that shows validation results has to be referenced as a supplementary document;

## 7.3.6 **TEST No 6**: IMPORT OF TOPOLOGY AND STATE VARIABLES FILES ONLY AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS

### 7.3.6.1 OBJECTIVE

The aim of this test is to demonstrate the ability of the tool to import topology and state variables files only (update of an imported project). The test also demonstrates interoperability between vendors. Load flow results should match in an engineering tolerance (max 5%).

### 7.3.6.2 DESCRIPTION

The model that have a single model authority set - TSO model is used. This test is performed using both official test files and exported files from Test No 2 (7.2.2). The following procedure is applied:

- Vendor A and vendor B import an equipment+SSH file from the official test files or from exported files (Test No 2 (7.2.2)). A \*.zipped version of the EQ file is imported in case of CGMES. Boundary MAS is imported in order to complete the TSO model.
- Vendor A and vendor B import topology and state variables files (or \*.zip in case of CGMES) exported in Test No 4 (7.2.4).
- Vendor A and vendor B executes a load flow;
- Test witnesses compare load flow results.

### 7.3.6.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml file (equipment+SSH) or \*.zip file;
- File names of the imported \*.xml files (boundary MAS) or \*.zip file;
- File names of the imported \*.xml files (topology and state variables) of \*.zip file;
- At least one screenshot that shows solution results (Tool A) has to be referenced as a supplementary document;
- At least one screenshot that shows solution results (Tool B) has to be referenced as a supplementary document;

## **7.3.7 TEST No 7: IMPORT OF A STATE VARIABLES FILE ONLY AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS**

### **7.3.7.1 OBJECTIVE**

The aim of this test is to demonstrate the ability of the tool to import state variables file only. The test also demonstrates interoperability between vendors. Load flow results should match in an engineering tolerance (max 5%).

### **7.3.7.2 DESCRIPTION**

The model that have a single model authority set - TSO model is used. This test is performed using both official test files and exported files from Test No 2 (7.2.2). The following procedure is applied:

- Vendor A and vendor B import equipment+SSH and topology files from the official test files or from exported files (Test No 2 (7.2.2)). \*.zipped file is imported in case of CGMES. Boundary MAS is imported in order to complete the TSO model.
- Vendor A and vendor B import a state variables file exported in Test No 5 (7.2.5).
- Vendor A and vendor B executes a load flow;
- Test witnesses compare load flow results.

### **7.3.7.3 TEST RECORD**

The following information should be recorded in the test form:

- File names of the imported \*.xml files (equipment+SSH and topology) or \*.zip file;
- File names of the imported \*.xml files (Boundary MAS) or \*.zip file;
- File names of the imported \*.xml file (state variables) or \*.zip file;
- At least one screenshot that shows solution results (Tool A) has to be referenced as a supplementary document;
- At least one screenshot that shows solution results (Tool B) has to be referenced as a supplementary document;

## 7.3.8 **TEST No 8**: COMPARISON OF THE SHORT-CIRCUIT RESULTS BETWEEN TOOLS

### 7.3.8.1 OBJECTIVE

The aim of this test is to demonstrate the ability of the tool to import short circuit data. The test also demonstrates interoperability between vendors. Short-circuit results should match in an engineering tolerance.

The test can be fully performed using CGMES. In case of testing with 1st edition of the profile only limited amount of short circuit calculations could be performed.

### 7.3.8.2 DESCRIPTION

This test is performed using both official test files and exported files from Test No 2 (7.2.2). The following procedure is applied:

- Vendor A and vendor B import all three files (equipment+SSH, topology and state variables) from the official test files or from exported files (Test No 2 (7.2.2)). Boundary MAS is imported in order to complete the TSO model. In case of testing using CGMES - \*.zip files are imported.
- Vendor A and vendor B perform a short-circuit calculation (a three phase short-circuit and an unbalanced fault) according to IEC 60909.
- Test witnesses compare short-circuit results.

### 7.3.8.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files (equipment+SSH, topology, state variables and boundary MAS) or \*.zip files ;
- At least one screenshot that shows short-circuit results (Tool A) has to be referenced as a supplementary document;
- At least one screenshot that shows short-circuit results (Tool B) has to be referenced as a supplementary document;

### 7.3.9 **TEST No 9**: IMPORT OF COMPLETE LOAD FLOW MODELS FROM DIFFERENT MODEL AUTHORITY SETS, ASSEMBLE THESE MODELS AND EXPORT OF AN ASSEMBLED MODEL (EQUIPMENT+SSH FILES, TOPOLOGY FILES, A STATE VARIABLES FILE AND BOUNDARY FILES)

#### 7.3.9.1 OBJECTIVE

The aim of this test is to prove that tools can import complete load flow models from different model authority sets (MAS). This test simulates merging process and demonstrated the ability of the tool to update one of the MAS in the assembled model.

#### 7.3.9.2 DESCRIPTION

Models from different model authority sets are imported. This test is performed using both official test files (ENTSO-E 16 nodes – 2 areas) and exported files In case Area 1 and Area 2 are exported by one vendor this test should be repeated using exports from two different vendors. The following procedure is applied:

- Vendor A imports boundary files (equipment+SSH and topology) or one \*.zip file. Boundary MAS is imported first or together with other MAS (next two steps). Nevertheless the Vendor A should demonstrate that can import boundary MAS separately.
- Vendor A imports all required files (equipment+SSH, topology and state variables) - or one \*.zip file in case of CGMES- for MAS A (Area 1);
- Vendor A imports all required files (equipment+SSH, topology and state variables) - or one \*.zip file in case of CGMES- for MAS B (Area 2).
- Vendor A assembles Area 1 and Area 2 and performs load flow solution (Solution 1)
- Vendor A exports assembled model - 2 equipment+SSH files (one per each MAS), 2 topology files (one per each MAS), 2 boundary files (equipment+SSH and topology) and **1 state variables file**. This is exported in one \*.zip file in case of testing the CGMES.
- Vendor A validates exported set of files using validation tools
- Vendor A imports files resulted from Test No 4 (7.2.4) (topology and state variable files are combined with the right equipment+SSH file). Therefore the vendor updates one of the MAS (Area 1 or Area 2)
- Vendor A performs load flow solution (Solution 2)

#### 7.3.9.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files - 2 equipment+SSH, 2 topology, 2 state variables and 2 boundary files (equipment+SSH and topology) or \*.zip files;
- File names of the imported \*.xml files (1 equipment+SSH, 1 topology and 1 state variables) – updated MAS or \*.zip files;
- File names of the exported \*.xml files - 2 equipment+SSH, 2 topology, 1 state variables and 1 boundary files (equipment+SSH and topology) or \*.zip file;
- At least one screenshot that shows load flow results (Solution 1) of the assembled model has to be referenced as a supplementary document;
- At least one screenshot that shows load flow results (Solution 2) of the assembled model has to be referenced as a supplementary document;

### 7.3.10 **TEST No 10:** IMPORT OF AN ASSEMBLED MODEL (EQUIPMENT+SSH FILES, TOPOLOGY FILES, A STATE VARIABLES FILE AND BOUNDARY FILES). COMPARISON OF THE LOAD FLOW RESULTS OF AN ASSEMBLED MODEL BETWEEN TOOLS

#### 7.3.10.1 OBJECTIVE

The aim of this test is to prove that tools can import assembled model which contains different MAS. This test can also be used to compare Solution 2 from Test No 9 (7.2.9).

#### 7.3.10.2 DESCRIPTION

This test is performed using exported models from the Test No 9 (7.2.9). The following procedure is applied:

- Vendor A imports all files exported in Test No 9 - 2 equipment+SSH, 2 topology, 1 state variables and 2 boundary files (equipment+SSH and topology) or one \*.zip file in case of CGMES;
- Vendor A performs load flow solution
- Vendor A and Vendor B compare load flow results

#### 7.3.10.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files - 2 equipment+SSH, 2 topology, 1 state variables and 2 boundary files (equipment+SSH and topology) or a \*.zip file;
- At least one screenshot that shows load flow results from Tool A of the assembled model has to be referenced as a supplementary document;

- At least one screenshot that shows load flow results from Tool B of the assembled model has to be referenced as a supplementary document;

### 7.3.11 **TEST No 11:** APPLY EQUIPMENT CHANGES AND EXPORT EQUIPMENT DIFFERENCE FILE AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES

#### 7.3.11.1 OBJECTIVE

The aim of this test is to demonstrate exchange of difference files. The test is performed for testing of the CGMES.

#### 7.3.11.2 DESCRIPTION

This test is performed using exported models from previous tests. The following procedure is applied:

- Vendor A applies changes suggested by the test witness. These changes should be in the equipment part of the model;
- Vendor A performs load flow solution and records the results
- Vendor A exports difference models for equipment+SSH and complete topology and state variables files (all in a \*.zip file). In case the test model contains more than one MAS the complete topology and state variables are exported per MAS.
- Vendor A validates exported files

#### 7.3.11.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip file (equipment+SSH, topology, state variables);
- List all changes that have been applied
- At least one screenshot that shows load flow results has to be referenced as a supplementary document;
- At least one screenshot that shows validation results has to be referenced as a supplementary document;



### 7.3.12 **TEST No 12**: IMPORT OF DIFFERENCE FILES (EQUIPMENT+SSH) AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES. COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS

#### 7.3.12.1 OBJECTIVE

The aim of this test is to demonstrate interoperability when importing difference files. The test is performed for testing of the CGMES.

#### 7.3.12.2 DESCRIPTION

This test is performed using exported models from previous tests (e.g. Test No 11). The following procedure is applied:

- Vendor A and Vendor B apply importing procedure that takes into account that difference models of equipment needs to be imported as well as complete topology and state variable files which are imported. One \*.zip file is imported.
- Vendor A and Vendor B perform load flow solution and records the results
- Test witnesses compare load flow results.

#### 7.3.12.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip file (equipment+SSH, topology, state variables including difference models);
- At least one screenshot that shows load flow results (from Tool A) has to be referenced as a supplementary document;
- At least one screenshot that shows load flow results (from Tool B) has to be referenced as a supplementary document;

### 7.3.13 **TEST No 13**: APPLY EQUIPMENT CHANGES ON AN ASSEMBLED MODEL AND EXPORT DIFFERENCE FILE (EQUIPMENT+SSH) AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES

This test is the same as Test No 11 with the only difference that changes are applied in equipment+SSH file from different MAS. The same procedure as Test No 11 (7.2.11) is followed. The test is performed for testing of the CGMES.

### 7.3.14 **TEST No 14**: IMPORT OF DIFFERENCE FILE (EQUIPMENT+SSH) AND COMPLETE TOPOLOGY AND STATE VARIABLES FILES FOR AN

## ASSEMBLED MODEL AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS

This test is the same as Test No 12 (7.2.12). Difference file (equipment+SSH) coming from different MAS is imported. The same procedure as Test No 12 is followed. The test is performed for testing of the CGMES.

### 7.3.15 **TEST No 15**: IMPORT OF COMPLETE DYNAMIC MODEL THAT CONTAINS STANDARD MODELS ONLY

#### 7.3.15.1 **OBJECTIVE**

The aim of this test is to prove that vendors can import data for dynamics studies. The test is performed for testing of the CGMES only.

#### 7.3.15.2 **DESCRIPTION**

Five types of files are used in this test: equipment+SSH, topology, state variables, boundary and dynamics. Equipment+SSH, topology, state variables and boundary files can be official files or files exported during previous tests. All these files are imported as one \*.zip file. The following procedure is applied:

- Vendor A applies importing procedure that takes into account different model authority sets.
- Test witness checks instance data
- Vendor A runs load flow and initializes the model.

#### 7.3.15.3 **TEST RECORD**

The following information should be recorded in the test form:

- File names of the imported \*.zip file (the \*.zip includes: equipment+SSH, topology, state variables, boundary, dynamics);
- At least one screenshot that shows imported instance data has to be referenced as a supplementary document;
- At least one screenshot that shows load flow result and initialization conditions has to be referenced as a supplementary document;

### 7.3.16 **TEST No 16**: EXPORT OF COMPLETE DYNAMIC MODEL THAT CONTAINS STANDARD MODELS ONLY

#### 7.3.16.1 OBJECTIVE

The aim of this test is to prove that vendors can export data for dynamics studies. The test is performed for testing of the CGMES only.

#### 7.3.16.2 DESCRIPTION

The files imported in the test procedure Test No 15 (7.2.15) are used for this test. Equipment+SSH, topology, state variables and boundary files can be official files or files created during previous tests. The following procedure is applied:

- Vendor A exports all files taking into account different model authority sets.
- Vendor A validates exported files.
- Test witness checks instance data.

#### 7.3.16.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip file;
- File names of the exported \*.zip file;
- At least one screenshot that shows imported instance data has to be referenced as a supplementary document;
- At least one screenshot that shows exported instance data has to be referenced as a supplementary document;
- At least one screenshot that shows validation report has to be referenced as a supplementary document;

### 7.3.17 **TEST No 17**: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING STANDARD MODELS)

#### 7.3.17.1 OBJECTIVE

The aim of this test is to demonstrate the interoperability between vendors. Simulation results should match in an engineering tolerance. The test is performed for testing of the CGMES only.

### 7.3.17.2 DESCRIPTION

This test is performed using imported files in Test No 15 (7.2.15). The following procedure is applied:

- Vendor A and vendor B import all files required for dynamics simulation as a \*.zip file;
- Vendor A and vendor B perform apply a fault (a three phase short-circuit and an unbalanced fault) or step response ( $V_{ref}=\pm 5\% V_{ref}$ ). The simulation is run for at least 10 sec. The following signals are recorded during the simulations:  $V_{ref}$ ,  $P_{gen}$  (P flow),  $Q_{gen}$  (Q flow),  $V$ .
- Test witnesses compare simulation results.

### 7.3.17.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip file;
- At least one screenshot that shows simulation results (Tool A) has to be referenced as a supplementary document;
- At least one screenshot that shows simulation results (Tool B) has to be referenced as a supplementary document;

## 7.3.18 **TEST No 18**: IMPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITH STANDARD CONNECTIONS

The test is identical with Test No 15 (7.2.15). The focus is on importing a User-defined model (a model that is created by a user and consists of elementary control blocks) that will replace one or more standard models components. The same procedure as Test No 15 is followed. The test is performed for testing of the CGMES only.

## 7.3.19 **TEST No 19**: EXPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITH STANDARD CONNECTIONS

The test is identical with Test No 16 (7.2.16). The focus is on exporting a User-defined model that will replace one or more standard models components. The same procedure as Test No 16 is followed. The test is performed for testing of the CGMES only.

### 7.3.20 **TEST No 20**: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING USER-DEFINED MODEL WITH STANDARD CONNECTIONS)

The test is identical with Test No 17 (7.2.17). The same procedure as Test No 17 is followed. The test is performed for testing of the CGMES only.

### 7.3.21 **TEST No 21**: IMPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITHOUT STANDARD CONNECTIONS

The test is identical with Test No 15 (7.2.15). The focus is on importing a User-defined model that will replace one or more standard models components and applying changes in standard connections. The same procedure as Test No 15 is followed. The test is performed for testing of the CGMES only.

### 7.3.22 **TEST No 22**: EXPORT OF A DYNAMIC FILE THAT CONTAINS USER-DEFINED MODEL WITHOUT STANDARD CONNECTIONS

The test is identical with Test No 16 (7.2.16). The focus is on exporting a User-defined model that will replace one or more standard models components and applying changes in standard connections. The same procedure as Test No 16 is followed. The test is performed for testing of the CGMES only.

### 7.3.23 **TEST No 23**: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING USER-DEFINED MODEL WITHOUT STANDARD CONNECTIONS)

The test is identical with Test No 17 (7.2.17). The same procedure as Test No 17 is followed. The test is performed for testing of the CGMES only.

### 7.3.24 **TEST No 24**: IMPORT OF A DYNAMIC FILE THAT CONTAINS PROPRIETARY MODEL

The test is identical with Test No 15 (7.2.15). The focus is on importing a proprietary model (a dynamic model, representing of a network component, modelled implicitly - a "black box") that will replace one or more standard models. The same procedure as Test No 15 is followed. The test is performed for testing of the CGMES only.

### 7.3.25 **TEST No 25**: EXPORT OF A DYNAMIC FILE THAT CONTAINS PROPRIETARY MODEL

The test is identical with Test No 16 (7.2.16). The focus is on exporting a proprietary model that will replace one or more standard models. The same procedure as Test No 16 is followed. The test is performed for testing of the CGMES only.

### 7.3.26 **TEST No 26**: COMPARISON OF THE DYNAMIC SIMULATION RESULTS BETWEEN TOOLS (FOR MODEL USING A PROPRIETARY MODEL)

The test is identical with Test No 17 (7.2.17). The same procedure as Test No 17 is followed. The test is performed for testing of the CGMES only.

### 7.3.27 **TEST No 27**: EXPORT OF A "PLANNING" MODEL USING AN "OPERATIONAL" MODEL

#### 7.3.27.1 OBJECTIVE

The aim of this test is to prove the ability of SCADA/EMS vendors or a tool that could maintain "operational" model to export a "planning" model using an "operational" model.

#### 7.3.27.2 DESCRIPTION

This test is performed using \*.xml files (operational – detailed model). In case of CGMES - \*.zip file is imported. The following procedure is applied:

- Vendor A imports all files which have all required classes and attributes marked with stereotype operational in the ENTSO-E profile;
- Vendor A exports the same model but compliant with the ENTSO-E Profile, but bus-branch "planning" model (classes and attributes marked operational are not required).
- Vendor A validates exported files
- Test witness checks instance data and validation report.

#### 7.3.27.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files or a \*.zip file;
- File names of the exported \*.xml files or a \*.zip file;

- At least one screenshot that shows instance data of the imported model has to be referenced as a supplementary document;
- At least one screenshot that shows validation results has to be referenced as a supplementary document;

### 7.3.28 **TEST No 28**: IMPORT OF A "PLANNING" MODEL RESULTED FROM AN "OPERATIONAL" MODEL AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS

#### 7.3.28.1 OBJECTIVE

The aim of this test is to prove the ability of "Planning" vendors to import a "planning" model that results from an "operational" model and compare load flow results between planning and SCADA/EMS tools and well as among planning tools.

#### 7.3.28.2 DESCRIPTION

This test is performed using exported \*.xml files in Test No 27 (7.2.27). The following procedure is applied:

- Vendor A (Tool A) imports all files (or a \*.zip file in case of CGMES) exported in Test No 27;
- Vendor A (Tool A) runs load flow solution;
- Vendor B (Tool B) imports all files (or a \*.zip file in case of CGMES) exported in Test No 27;
- Vendor B (Tool B) runs load flow solution;
- Test witnesses check instance data and load flow results.

#### 7.3.28.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files or a \*.zip file;
- At least one screenshot (from Tool A) that shows solution results has to be referenced as a supplementary document;
- At least one screenshot (from Tool B) that shows solution results has to be referenced as a supplementary document;

### 7.3.29 **TEST No 29**: IMPORT OF AN "OPERATIONAL" MODEL BY "PLANNING" VENDORS AND COMPARISON OF THE LOAD FLOW RESULTS BETWEEN TOOLS

#### 7.3.29.1 OBJECTIVE

The aim of this test is to prove the ability of "Planning" vendors to import an "operational" model and compare load flow results between planning and SCADA/EMS tools.

#### 7.3.29.2 DESCRIPTION

This test is performed using \*.xml files "operational" models. The following procedure is applied:

- Vendor A (Tool A) imports all files necessary to produce planning case (bus-branch model);
- Vendor A (Tool A) runs load flow solution;
- Test witness checks instance data and load flow results.

#### 7.3.29.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.xml files or a \*.zip file;
- At least one screenshot (from Tool A – planning tool) that shows solution results has to be referenced as a supplementary document;
- At least one screenshot (from Tool B – SCADA/EMS tool or "operational" tool) that shows solution results has to be referenced as a supplementary document;

### 7.3.30 **TEST No 30**: MODEL AUTHORITY SETS EXCHANGE TEST

#### 7.3.30.1 OBJECTIVE

The MAS exchange test demonstrates that a boundary and regional set (TSO set) may be imported into a base model (any TSO MAS model or assembled model from previous tests), creating a single model that contains the original base and the new boundary and regional model segments. In case of assembled model some of the MAS files are replaced/updated based of the information provided in the header. This test is partly included in the Test No 9 (7.2.9). Here a special attention on MAS is paid.

#### 7.3.30.2 DESCRIPTION

The following procedure is applied:



- Vendor A imports the base model.
- Vendor A imports the boundary and regional sets and links them into the base model. Using internal validation, verify that the new model is complete and accurate. The MAS model is identified from the CIM/XML document file header (in case of CGMES). In this step the imported MAS updates the existing MAS in the base model.
- Export the new model and validate it using one or more of the CIM validation tools.
- Vendor B imports the file exported by Vendor A.
- Test witness validates that the new data from the boundary and regional sets are contained in the model.

### 7.3.30.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip files;
- At least one screenshot (from Vendor A) that shows validation results has to be referenced as a supplementary document;
- At least one screenshot (from Vendor B) that shows validation results has to be referenced as a supplementary document;

### 7.3.31 TEST No 31: FILE HEADER TEST

#### 7.3.31.1 OBJECTIVE

The file header test demonstrates the ability of vendors to use the information included in the file header. The test is performed for testing of the CGMES only.

#### 7.3.31.2 DESCRIPTION

The following procedure is applied:

- Test witness requests Vendor A to introduce a change in the file header information of the one or more of the \*.xml files of the base model. The change needs to be done outside the tool of Vendor A.
- Vendor A imports the \*.zip files to form base model. File header information of one or more \*.xml files is changed.
- Test witness checks the import procedure applied by Vendor A. The tool needs to produce error message and advise the user on the appropriate action to be performed to correct the error.

### 7.3.31.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip files;
- Description of introduced change in the file header;
- At least one screenshot that shows error message produced by Vendor A has to be referenced as a supplementary document;

### 7.3.32 TEST No 32: EXCHANGE OF DIAGRAM DATA TEST

#### 7.3.32.1 OBJECTIVE

This test demonstrates the ability of vendors to use the information included in the diagram data file. The test is performed for testing of the CGMES only.

#### 7.3.32.2 DESCRIPTION

Complete set of test models are used. The \*.zip file contains: equipment+SSH, topology, state variables and diagram files. This test can be performed using both official test files and exported files from a test participant. The following procedure is applied:

- Vendor A (Tool A) imports all necessary \*.zip files to form the model;
- Test witnesses compare the diagram shown by Tool A or compare x,y coordinates present in the diagram data file;
- Vendor A changes the coordinates of one element (or more) and exports only the diagram data file (as a \*.zip file)
- Vendor B (Tool B) imports the exported from Tool A diagram \*.zip file.
- Test witnesses the diagram shown by Tool B (compare screenshots) or compare x,y coordinates present in the diagram data file

#### 7.3.32.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip files;
- File name of the exported \*.zip diagram data file;
- Description of introduced change in the diagram data;
- At least one screenshot that shows data imported by Vendor A has to be referenced as a supplementary document;

- At least one screenshot that shows data imported by Vendor B has to be referenced as a supplementary document;

### 7.3.33 **TEST No 33**: EXCHANGE OF GEOGRAPHICAL DATA TEST

#### 7.3.33.1 OBJECTIVE

This test demonstrates the ability of vendors to use the information included in the geographical data (GIS) file. The test is performed for testing of the CGMES only.

#### 7.3.33.2 DESCRIPTION

Complete set of test models are used. The \*.zip file contains: equipment+SSH, topology, state variables and geographical files. This test can be performed using both official test files and exported files from a test participant. The following procedure is applied:

- Vendor A (Tool A) imports all necessary \*.zip files to form the model;
- Test witnesses compare the GIS data shown by Tool A with the geographical data file;
- Vendor A changes the coordinates of one element (or more) and exports only the geographical data file (as a \*.zip file);
- Vendor B (Tool B) imports the exported from Tool A geographical \*.zip file.
- Test witnesses the geographical data shown by Tool B or compare GIS coordinates present in the geographical data file

#### 7.3.33.3 TEST RECORD

The following information should be recorded in the test form:

- File names of the imported \*.zip file;
- File name of the exported \*.zip geographical data file;
- Description of introduced change in the geographical data;
- At least one screenshot that shows data imported by Vendor A has to be referenced as a supplementary document;
- At least one screenshot that shows data imported by Vendor B has to be referenced as a supplementary document;

## 7.4 TEST RECORD FORM TEMPLATES

### 7.4.1 TOOL SUMMARY FORM (PER TOOL, PER TSO) - PROFILE 1 (UML14v02, 2009)

<b>Vendor</b>		<b>TSO</b>		<b>Tool</b>		<b>Profile edition 1</b> <b>(UML14v02, 2009)</b>			
<b>Performed tests:</b>									
<b>Test No</b>	<b>Score</b>	<b>Test No</b>	<b>Score</b>	<b>Test No</b>	<b>Score</b>	<b>Test No</b>	<b>Score</b>		
A		B		C		D (TP+SV)	D (SV)		
E									
<b>Test F:</b>									
<b>TSO</b>	AT	BA	BE	BG	CH	CZ	DE	DK	EE
<b>Score</b>									
<b>TSO</b>	ES	FI	FR	GB-NG	GR	GB-SPT	HR	HU	IE
<b>Score</b>									
<b>TSO</b>	NI	IT	IS	LT	LU	GB-SHETL	LV	ME	MK
<b>Score</b>									
<b>TSO</b>	NL	NO	PL	PT	RO	RS	SI	SE	SK
<b>Score</b>									
<b>Test G:</b>									
<b>Test No</b>	G.1	G.2	G.3						
<b>Score</b>									
<b>Test H:</b>									
<b>Test No</b>	H.1	H.2	H.3						
<b>Score</b>									
<b>Comments/references to issues:</b>									
<b>Date</b>	<b>Tests performed by TSO</b>		<b>Vendor</b>		<b>ENTSO-E</b>				
	<b>Name</b>	<b>Signature</b>	<b>Name</b>	<b>Signature</b>	<b>Name</b>	<b>Signature</b>			

