European Network of
Transmission System Operators
for Electricity

Test Procedures and Conformity Categories

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Conformity Assessment Process on the CGMES

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1. Introduction

The document is describing test procedures applicable for the ENTSO-E Common Grid Model Exchange Standard (CGMES) Conformity Assessment Framework hereafter referred as “the Framework”.
The document also defines the CGMES Conformity Levels which are used in the Declaration of Conformity of an Application and in the Attestation of Conformity.

2. Test procedures

2.1. Validation tools

During the First party assessment the Supplier shall use available validation tools to validate the instance data during different test steps.
During the Second party assessment (evaluation process) the Reviewers shall use CIMdesk to validate instance data and score different tests steps. In case of doubt in the validation report provided by CIMdesk and other Supplier specific validation, the Review Team shall decide which validation report will be considered for the purpose of scoring a given test step. It shall be possible to store the information on the test results or validation reports by using screenshots or export reports as proof of correct validation.

2.2. File naming

Due to the usage of file headers, Suppliers shall not count on file names to identify information about file types (equipment, topology, steady state hypothesis, state variables, dynamics, diagram, geographical, etc.) when exchanging using CGMES. For documentation purposes the following naming convention shall be followed in the processes related to the CGMES conformity assessment:
[a]_[b]_[c]_[d]_[e]_[f]_v[g].[h] where the different elements are:

a. Date in the form YYMMDD, e.g. 140511 for 11 May 2014
b. Short name of the Application, e.g. PowerFactory
c. Short name of the Test Configuration, e.g. MGBC
d. Short name of the test use case, e.g. TUC1
e. Short name of the test step, e.g. TS1
f. Sequential number, e.g. 1
g. File version number, e.g. v1
h. File extension, e.g. doc/zip/pdf/xls/jpg

Complete file name example: 140511_PowerFactory_MGBC_TUC1_TS1_1_v1.zip

2.3. File transfer

Review sessions held in the ENTSO-E premises shall use local file server to support file exchange during the session. The Supplier shall have access to a folder where only data or documentation related to the review session shall be stored.
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
ENTSO-E shall ensure backup functions for the folder used for data exchange and documentation. However, ENTSO-E shall not be liable in case of loss of data during the review session. The Supplier can use memory sticks or other local functions to back up its data.

2.4. Review session logistics

The review session is held in Brussels, ENTSO-E premises (Avenue de Cortenbergh 100, 1000 Brussels, Belgium). The Contact Point in the Assessment Body shall inform the Supplier and Review Team on the

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details of the schedule and location of the review session. In general, a review session could last one working day; start at 8:00h and finish at 18:00h.
Review sessions can be organized remotely (with no physical presence on the Review Team and the Supplier). The Assessment Body and the Supplier can agree on this if there is technical possibility to organize the remote session and if the Application has already received an Attestation of Conformity.

2.5. Review session details and types of the tests

During the review session all tests are performed by the Supplier in case if it is not agreed otherwise with the Review Team and explicitly documented in the test report. The tests are run on the Supplier's hardware, but using compiled / binary / executable code. The Supplier is responsible to ensure that all equipment necessary for the Application during the tests is functioning properly. In case the Supplier has special requirements to the test environment, the Supplier shall inform and agree on these with the Assessment Body in advance, i.e. when the review session date is discussed and agreed.
The tests during the review session shall consist of:

- Scripted test cases including input and expected result: All these tests are defined per Test Use Cases which have a sequence of Test Steps. These scripted tests are performed on all available Test Configurations. During the review session the Review Team shall decide which are the most important and complete tests to be reviewed for the purpose of issuing an Attestation of Conformity.
- Error test cases or unstructured test cases: These are test cases which are not published in advance. Review Team shall provide to the Supplier instructions on the steps to be performed or provide additional Test Configurations which shall be used during the tests. The main reason for such tests is to assess how the Application handles Test Configurations that contain errors. The errors could be instance data syntax errors or usage of classes or associations not in the way specified by the CGMES. The objective is to assess the ability of the application to handle these errors by reporting to the user the necessary information. These error cases and also the unstructured tests aim at testing to ensure that the Application is not only designed to handle the provided Test Configurations but also requirements of the CGMES not covered in the provided Test Configurations but related to the profiles or functions against the Application is tested.

The reviewers assessing the application will consider the results from both scripted and error/unstructured tests when forming the recommendation to the ENTSO-E Opinion Body. There is no scoring methodology defined on how the results from the error/unstructured tests will be performed. However, it should be noted that if severe issues are observed ENTSO-E might not be in a position to issue an Attestation of Conformity for the functionalities that are affected by the severe issues. Recommendation to the Supplier shall be issued to facilitate further development of the Application.

3. Conformity categories

The conformity categories are a measure of the CGMES Conformity achieved by an Application. The chart below illustrates these categories.

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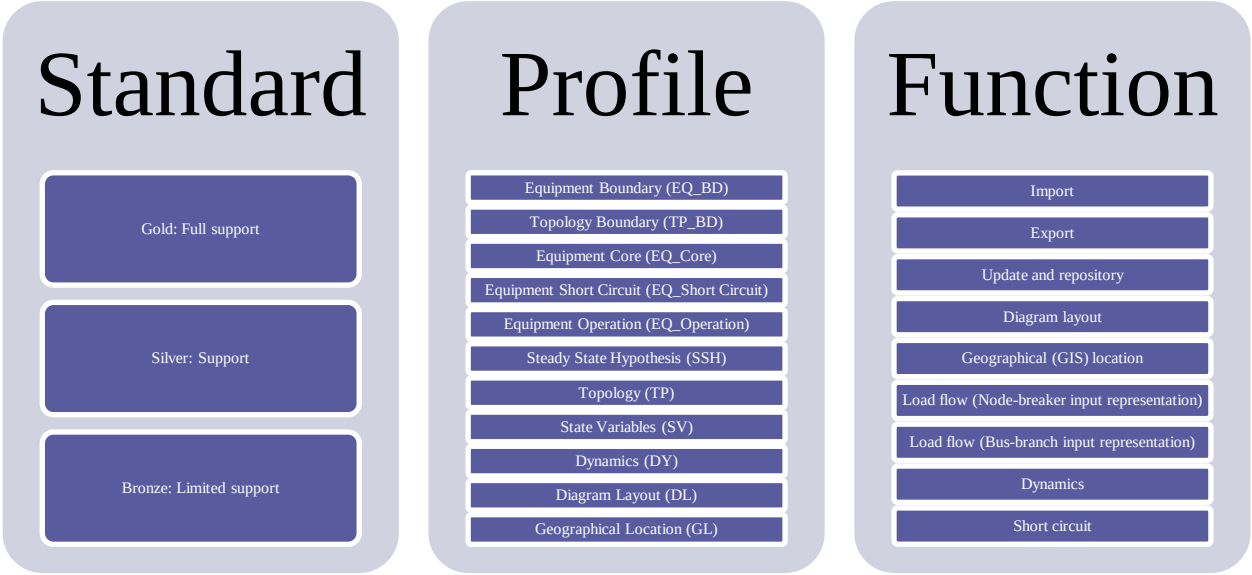

3.1. Standard category

The "Standard" category is the highest category which measures the overall support of CGMES by an Application. The category has three grades:

- Gold (Full support) – shall be granted to an Application that passes all TUC defined for CGMES conformity assessment;
- Silver (Support) – shall be granted to an Application that passes all TUC marked as "Silver" and "Bronze" across all functions defined for CGMES conformity assessment;
- Bronze (Limited support) – shall be granted to an Application that passes all mandatory (marked with "Bronze") TUC defined for at least one profile or function.

3.2. Profile category

The "Profile" category indicates which CGMES profiles are supported by an Application. The category has three grades:

- Gold (Full support) – shall be granted to an Application that passes all TUC defined for the following CGMES function categories: Import and Export. The Application supports this profile in combination with other CGMES profiles supported by the Application;
- Silver (Support) – shall be granted to an Application that passes all TUC defined for the following CGMES function categories: Import and Export;
- Bronze (Limited support) – shall be granted to an Application that passes all TUC defined for the following CGMES function categories: Import or Export.

3.3. Function category

The "Function" category indicates the level of functional support of CGMES by an Application. The category has three grades:

- Gold (Full support) – shall be granted to an Application that passes all TUC defined for a CGMES function for the profiles supported by the Application;
- Silver (Support) – shall be granted to an Application that passes all TUC marked as "Silver" and "Bronze" for a CGMES function for the profiles supported by the Application;

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- Bronze (Limited support) – shall be granted to an Application that passes all TUC marked as "Bronze" for a CGMES function for the profiles supported by the Application.

The spreadsheet (140610_CGMES_ConformityAssessment_FunctionCategoryMatrix_v1.0.0.xlsx), hereafter Table 1, defines the matrix for function category.

An Application, subject to conformity assessment, shall get score "Pass" to a given TUC only if the Application gets score "Pass" using all test configurations applicable to this TUC. In case an Application is assessed for more than one Function category and it is required to perform a given TUC for the Functions for which the Application is targeting, the TUC is performed only once and necessary references are provided in the report. For instance, if an Application is assessed for "Import" and "Load flow (Node-breaker input representation)" functions the TUC 01 "Import of Boundary Set instance data" shall be performed only once for all relevant test configurations. The results will be valid for both "Import" and "Load flow (Node-breaker input representation)" functions.

Some Suppliers may not be able to use the test configurations provided by ENTSO-E because by the design of the Application they are not able to import any data. In this case such Suppliers can participate in the CGMES Conformity Assessment by both exporting their data and manually inserting data from relevant test configurations before performing the export. For these specific situations the Assessment Body shall be contacted and the content (which function categories and TUC could be applied) of the Declaration of Conformity shall be clarified and documented. In cases when the Supplier is using real data, this data shall not be confidential for the reviewers part of the Review Team assigned to assess the Application.

Some Applications cannot import single instance file belonging to CGMES profiles due to their design to convert a complete dataset for the purpose of performing load flow calculation or other analyses. In this case such an Application could only be tested with TUC 9 and/or TUC 21 for import and/or export functions. It should be noted that depending on the purpose of the Application and the business process in which it is used, it shall have additional procedures to satisfy CGMES requirement on support of partial exchange e.g. where one instance file belonging to a Model Authority Set is exchanged.

4. Types of Applications

CGMES can be supported by Applications with different functionalities. Therefore large variety of Applications will seek CGMES conformity. The Framework defined an Application as computer software, referring to a particular version in use for commercial activities, may it be an off-the-shelf product or a version customised for the use in a particular business environment.
Taking into account the conformity categories and test use cases defined in the CGMES conformity assessment scheme the following types (not a definite list) of Applications could seek CGMES conformity:

- Data management applications;
- Data converters;
- Power system analysis applications;
- SCADA/EMS applications.

Each of these types of Applications could easily achieve conformity on a given CGMES profile or a function they are designed to support. However some applications such as data converters could have very limited CGMES coverage if only tested as a data converted. In some cases it might be appropriate that such Applications are tested as part of a suite of Applications. This would allow performing better assessment of the conformity of the Application which is applying for the Second party assessment according to the Framework.

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In such cases the Declaration of Conformity and the Attestation of Conformity shall explicitly indicate the purpose of the Application and list other Applications that were part of the suite during the tests. The Declaration of Conformity and the Attestation of Conformity are issued for the Application which applied for CGMES conformity and do not give information on CGMES conformity of other applications part of the suite. ENTSO-E shall not be liable for misuse of other Applications' names. Suppliers are duly responsible to handle the relation with other Applications (and their Suppliers if different) part of the suite.

5. Guidelines on CGMES conformity categories

There are many different business processes that require slightly different approach in terms of level of detail of the exchanged data or the number of functionalities to be supported by the Applications. The CGMES conformity categories (i.e. Standard, Profile, Function) defined in this document aim at providing users of the Applications an instrument to be able to guide their Suppliers what the targeted conformity grade is necessary so that the Application can be used in different data exchanges. Different business processes can refer to these categories in order to define requirements for the Applications. This will facilitate Suppliers in planning the development of their Applications to satisfy users' requirements.

Users that would like to use Application A for long term planning exchanges as a tool for load flow analyses excluding short circuit, DL, GL and node-breaker representation, but including difference exchange and model assembling shall require the Supplier to target the following CGMES conformity:

- **Standard**: Bronze
- **Profile**:
  - EQ_BD: Gold as import, export and dependencies with other profiles is required
  - TP_BD: Gold as import, export and dependencies with other profiles is required
  - EQ_Core: Gold as import, export and dependencies with other profiles is required
  - EQ_Short Circuit: N/A as it is assumed not required in this specific case
  - EQ_Operation: N/A as it is assumed not required in this specific case
  - SSH: Gold as import, export and dependencies with other profiles is required
  - TP: Gold as import, export and dependencies with other profiles is required
  - SV: Gold as import, export and dependencies with other profiles is required
  - DL: N/A as it is assumed not required in this specific case
  - GL: N/A as it is assumed not required in this specific case
  - DY: N/A as it is assumed not required in this specific case
- **Function**:
  - Import: Gold as for all profiles that are supported by the Application all TUC are passed
  - Export: Gold as for all profiles that are supported by the Application all TUC are passed
  - Update and repository: Gold as for all profiles that are supported by the Application all TUC are passed
  - Diagram layout: N/A as the DL profile is not supported
  - Geographical location: N/A as the GL profile is not supported
  - Load flow (Node-breaker input representation): N/A as the Application does not support node-breaker model representation
  - Load flow (Bus-branch input representation): Gold as the Application could support all TUC defined for Gold.
  - Dynamics: N/A as the DY profile is not supported
  - Short circuit: N/A as the EQ_Short Circuit profile is not supported

If the user would like that the application supports node breaker model representation it shall require the application to have Load flow function which receives Silver or even Gold grade.

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6. Examples

In order to illustrate the CGMES conformity categories the following examples are described:

6.1. Example 1: Application designed to convert instance data

Conformity assessment of an Application (App A) which is designed to convert instance data from CGMES form for the purpose of load flow analysis in another Application. It is assumed that App A is therefore designed to support EQ_BD, TP_BD, EQ_Core, EQ_ShortCircuit, EQ_Operation, SSH, TP and SV profiles. The App A cannot import difference instance files. The App A cannot export boundary set and cannot import or export EQ_Short Circuit. The Application targets assessment on Import and Export functions.

According to Table 1, the application shall be assessed on the following TUC:

- Import function: 1, 2, 3, 4, 5, 9, 10 and 11 as a limited set of profiles are supported by the Application
- Export function: 13, 14, 15, 16, 17, 21, 22 and 23.

Based on this example the Application would receive the following CGMES conformity, if the Application passes all necessary tests for all test configurations.

- **Standard**: Bronze
- **Profile**:
  - EQ_BD: Bronze
  - TP_BD: Bronze
  - EQ_Core: Gold
  - EQ_Operation: Gold
  - SSH: Gold
  - TP: Gold
  - SV: Gold
- **Function**:
  - Import: Silver
  - Export: Gold

6.2. Example 2: Application designed to manipulate instance data

Conformity assessment of an Application which is designed to manipulate instance data in CGMES form for the purpose of data repository. It is assumed that such application is designed to only import a profile – in this example EQ_Core, EQ_Short Circuit and EQ_Operation. The application targets only assessment of Update and repository function.

According to Table 1, the application shall be assessed on the following TUC:

- Update and repository function: only TUC 10 as only import could be supported.

Based on this example the Application would receive the following CGMES conformity, if the Application passes all necessary tests for all test configurations.

- **Standard**: Bronze
- **Profile**:
  - EQ_Core: Bronze
  - EQ_Short Circuit: Bronze
  - EQ_Operation: Bronze
- **Function**:
  - Update and repository: Bronze

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6.3. Example 3: Application designed to perform load flow analyses.

Conformity assessment of an Application which is designed to support CGMES exchanges and perform load flow analysis. It is assumed that such application is therefore designed to support EQ_BD, TP_BD, EQ_Core, SSH, TP and SV profiles. The Application can import, export these profiles and perform load flow calculations. The application can assemble and manage only bus-branch model representation. The Application handles difference files. The Application targets CGMES conformity on Import, Export and Load flow functions.

According to Table 1, the application shall be assessed on the following TUC:

- Import function: 1, 2, 3, 4, 5, 9, 10, 11
- Export function: 13, 14, 15, 16, 17, 21, 22, 23
- Load flow (Bus-branch input representation): 1, 9, 10, 11, 12, 13 21, 22, 23, 24, 25, 27, 29, 33 and from 37 to 46.

Based on this example the Application would receive the following CGMES conformity, if the Application passes all necessary tests for all test configurations.

- **Standard**: Bronze
- **Profile**:
  - EQ_BD: Gold
  - TP_BD: Gold
  - EQ_Core: Gold
  - SSH: Gold
  - TP: Gold
  - SV: Gold
- **Function**:
  - Import: Gold
  - Export: Gold
  - Load flow (Bus-branch input representation): Bronze

6.4. Example 4: Application designed to perform load flow, short circuit and dynamics analyses

Conformity assessment of an Application which is a suite of Applications designed to support CGMES exchanges and perform load flow, short circuit and dynamics analyses. The application handles DL and GL data and it is able to provide digital image exports of diagram and GIS information. It is assumed that such application is therefore designed to support EQ_BD, TP_BD, EQ_Core, EQ_Short Circuit, EQ_Operation, SSH, TP, SV, DY, DL and GL profiles. The Application can import, export these profiles, perform load flow, short circuit calculations and perform dynamics simulations. The application handles difference files. The application fails on TUC 23. The application targets conformity on all functions and profiles. Therefore the Application shall be assessed against all TUC marked with Bronze, Silver or Gold in Table 1.

Based on this example the Application would receive the following CGMES conformity, if the Application passes all necessary tests for all test configurations.

- **Standard**: Silver
- **Profile**:
  - EQ_BD: Gold
  - TP_BD: Gold
  - EQ_Core: Gold
  - EQ_Short Circuit: Gold
  - EQ_Operation: Gold
  - SSH: Gold
  - TP: Gold

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    - SV: Gold
    - DL: Gold
    - GL: Gold
    - DY: Gold
- **Function**:
    - Import: Gold
    - Export: Gold
    - Update and repository: Gold
    - Diagram layout: Gold
    - Geographical location: Gold
    - Load flow (Node-breaker input representation): Silver (as the Application fails on TUC 23)
    - Dynamics: Gold
    - Short circuit: Gold

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