QUESTIONS & ANSWERS ON CIM/CGMES DATA EXCHANGE IMPLEMENTATION

European Network of
Transmission System Operators
for Electricity

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Q&A on CIM/CGMES data exchange implementation
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16   **provided at cim@entsoe.eu**

17   **NOTE CONCERNING WORDING USED IN THIS DOCUMENT**

18   The force of the following words is modified by the requirement level of the document in which
19   they are used.

20   • SHALL: This word, or the terms "REQUIRED" or "MUST", means that the definition is an
21   absolute requirement of the specification.

22   • SHALL NOT: This phrase, or the phrase "MUST NOT", means that the definition is an
23   absolute prohibition of the specification.

24   • SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid
25   reasons in particular circumstances to ignore a particular item, but the full implications must
26   be understood and carefully weighed before choosing a different course.

27   • SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there may
28   exist valid reasons in particular circumstances when the particular behaviour is acceptable
29   or even useful, but the full implications should be understood and the case carefully weighed
30   before implementing any behaviour described with this label.

31   • MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional.

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33   Revision History

Version	Date	Paragraph	Comments
1.0.0	2024-03-20		For CIM WG review
1.0.1	2024-04-10		Integration of comments from CIM WG. For ICTC approval.

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1 Introduction

This document summarizes frequent answered questions. It will be updated frequently in order to provide up to date information. The intent is to facilitate the knowledge sharing within the community.

2 Standardisation

2.1 Why are standardisation activities slow and lengthy?

IEC standarisation activities are based on a voluntary effort of international experts. Inputs are taken from various projects and via members of the groups. Once a proposal is made the procedure to approve a standard takes about 1 year. The process can be speeded up if there is funding to prepare the draft proposal and to test it.

2.2 How can I provide my comments during the standardisation process?

There are different stages in which IEC sends draft standards to National Committees for review and voting. The stage "Committee draft - CD" and "Committee Draft for voting - CDV" are important to provide your feedback. When the standard is at CDV stage it is also accessible to general public for comments.

2.3 Can I use an old version of a standard?

When a new edition of a standard is published the previous edition is withdrawn and any further changes (additional features and extensions, and bug fixes) are pursued only on new edition. The reason for publishing new version is to both fix problems and/or add additional functionalities. It is strongly recommended that applications and business processes have a process to transition and utilise the latest versions of standards.

3 Conformity

3.1 Why is conformity process necessary?

Conformity assessment is necessary to validate conformance to a standard or business process requirements. There are mainly two types.

    i) Conformity assessment of a version of a software to check if the software implements the standard correctly, so called FAT (Factory Assessment Test) and

    ii) Conformity assessment to validate if an entity conforms to a set of requirements defined for a given data exchange as part of a business process. This is called SAT conformity (Site Acceptance Test).[0]

Conformity is different than user acceptance testing which is specific and bound to the terms of a software development project. Conformity is assessed by external party following the rules of impartiality.

3.2 The software I am using passed CGMES conformity, but I still have problems. I am losing confidence in the conformity process. Why is this happening?

Here some of the reasons:

- **FAT vs. SAT**: CGMES conformity process focuses on the FAT conformity, the SAT part is not developed.

- **Test data**: Data used for conformity process is somewhat limited.

- **Internal modelling styles in software/products**: Most products have internal data models and build converters to export CGMES data for data exchange. It is impossible to validate whether a vendor has enabled export of all combinations available inside the software. There is a good chance that the most common combinations were developed for export. It should be a task of user's forum to articulate requirements on what the application should

support (then test data and test use cases could be adapted to check this). In addition, the application might not be designed to cover all combinations as it is used for a specific (narrow) purpose with smaller scope.

- **Data quality**: Vendors design their exports assuming the data is correct, and often the exports are not correct due to bad data. Only application users can fix this, by fixing the model. The standard and conformity cannot fix this, but what could help would be additional requirements for software development or integration workflows to detect inconsistent data at early stages as well as quick procedures to improve the data.

3.3 It is important that conformity process uses real models. Why is this not organised so far?

The big obstacle here is confidentiality. TSOs, DSOs, standardisation bodies, vendors are calling for more real data to be used in conformity process, but at the same time any requests for making data available fail due to confidentiality reasons. Data can be provided on NDA basis, but this would mean that every single conformity process will need to include agreement on NDA, which also takes resources. If everybody is entitled to sign an NDA and get the data, over time thousands of NDAs will be signed. Data will also need to be improved to cover different cases, which will make the NDAs process an obstacle to some extent.

The most important is to prepare publicly available models that mirror the complexity of real models, but this requires effort which has not been prioritised so far. This is the paradox: while tons of resources are spent on making data exchange work (curing the symptoms), no resources are allocated to improve the "upstream" situation (providing realistic test data for software to be able to handle from the FAT phase).

3.4 It is important that conformity process tests the workflow that is applied in a business processes using the data exchange standard. Why is this not organised so far?

Most of the business processes do not see interoperability resolved as there is no structured SAT type of conformity organised. The reason for not organising is the lack of resources and less clarity on the data workflow for a business process. In most cases requirements are getting aligned in the period of data exchange and prototyping new ways of performing the process.

This adds an additional layer of complexity and requires stricter project driven approach processes. Emphasis needs to be put on organising conformity to assess the readiness of entities per business process (or a set of related business processes) as well as well-designed transition processes enabling flexibility and supporting continuous improvements and innovation.

3.5 The conformity process was performed by ENTSO-E before and it was free. Now there is a fee to be tested for conformity. What is the reason?

The conformity process organised by ENTSO-E was never free. The funding necessary to organise this activity was provided by TSOs as part of their contribution to the ENTSO-E budget.

In the current setup, the assessed parties pay the conformity assessment fee. In the past, the conformity was done primarily for TSOs' vendors however, the Conformity Assessment Scheme (CAS) v3.0 aims at having vendors for other parties included too.

4 Interoperability

4.1 Interoperability tests are organised by projects/business processes. Why do we need to organise additional tests on a regular basis with vendors' participation?

There is a need to cover different objectives at different stages of development of an interoperable data exchange, which is just part of putting a given version of a business process in production.

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203 If interoperability testing (IOP) with participation of vendors and TSOs (in case of TSO use case
204 or DSOs in case of DSO use case, RCCs, aggregators, etc.) is not organised at the stage when
205 a standard/specification is developed, the business processes implicitly agree to bare the risk
206 on any interoperability issues that relate to the specification/standard.

207 By organising an IOP at an early stage there is an open forum for challenging the standard,
208 understanding the requirements, checking the feasibility of planned exchange. This is just a
209 milestone of the development process which minimises (but still does not eliminate all) the risks.

210 **4.2 Why is the data exchange still not fluent, and why is interoperability not there**
211 **after so many years of testing?**

212 You need to ask yourself how many of the recommended development and implementation
213 steps were strictly followed by all partis in the process, namely:

214 • Do we have a clear reference to all requirements that are valid for a given business process?

215 • Do all parties including vendors understand the process?

216 • Do all tools used in the data creation for a business process conform to the data exchange
217 standard and how this is assessed?

218 • Can all the parties that produce data consume it and are they satisfied with the data quality?

219 • Are all the parties involved in a business process having the same needs and the same
220 drive to implement the requirements?

221 • Do we have consistent communication flow ensuring the "single" message is understood by
222 all parties?

223 • Do we use the right version of a data exchange standard which satisfies the requirements?

224 It is rather agreed expectation and not surprising fact to have 50% gap in interoperability if 50%
225 of milestones are skipped.

226 **4.3 Who needs to organise interoperability tests and when?**

227 Interoperability tests need to be organised in a coordinated way and they need to be very well
228 planned. Regular IOP to test the standards are normally organised by the groups that participate
229 in the development of the standard.

230 The test should be organised at least once per year, but 2 tests can be necessary depending
231 on the scope of the standard and the priority of the release. It is important that business
232 processes are involved in the effort and make sure vendors expected to supply applications
233 part of the business process are involved in the effort as well as the uses cases are checked.

234 **5 CGMES**

235 **5.1 CGMES v3.0 seems like a major release as it is called v3.0. Is my understanding**
236 **correct?**

237 The only reason for calling it v3.0 is because the CIM namespace changed from CIM16 to
238 CIM17. It is considered a service pack kind of update with some additions and a few
239 incompatible changes .

240 **5.2 Where can I find a list of changes in CGMES v3.0?**

241 The Annex of IEC 61970-600-2:2021. The latest versions of the standards are available for
242 purchase at IEC webstore (Welcome to the IEC Webstore).

243 Comparisons between machine readable artifacts were published by ENTSO-E here:

244 https://www.entsoe.eu/Documents/CIM_documents/Grid_Model_CIM/Diff_CGMESv24_CGME
245 Sv30.sip . Information provided in various webinars.

246 **5.3 Sometimes we refer to CGMES v2.4.15 sometimes to CGMES v2.4. What is the**
247 **difference?**

248 CGMES v2.4.15 was approved in August 2014. This version does not exist anymore because:

249 - In 2017, it was superseded by IEC Technical specifications (IEC TS 61970-600-1:2017,
250 IEC 61970-600-2:2017)

251 - The IEC technical specification from 2017 amended CGMES v2.4.15, from Aug 2014
252 with some clarifications that were agreed in 2016.

253 - ENTSO-E cannot publish documentation on it as it would be a breach of IEC copyright.

254 - In the frame of CGM, ENTSO-E published multiple QoCDC version which changed some
255 of CGMES specifications.

256 Therefore v2.4.15 is a version that nobody uses. When it is necessary to refer to old versions
257 it is preferred to use v2.4 instead. This document also used v2.4 when referring to the IEC
258 withdrawn version of CGMES.

259 **5.4 Why is CGMES v3 using IEC CIM17?**

260 With the publication of CIM17, IEC withdraws CIM16, CGMES v2.4 is also withdrawn following
261 IEC directives. Most of issues found in CIM16 were resolved in CIM17, it largely improves
262 documentation and reduces space for misinterpretation, it provides machine-processable
263 validation rules and it also clarifies the DC model, adds the Dynamics (DY) profile and among
264 other features. Moving to a next version is the way to resolve issues present in CGMES v2.4.

265 Currently v2.4 is not existing as multiple documents amended this version multiple times before
266 the withdrawal by IEC. In any case any fix results in a new version. One way was releases of
267 QoCDC documents, but this is only partial and forces implementation by monitoring output and
268 not directly by clarifying specification. Therefore, the implementation takes more time due to
269 the time to receive the feedback from the output and trigger implementation of changes.

270 **5.5 When will the next version of CGMES be published?**

271 There is no concrete publication plan (at ENTSO-E, we are continuously working), but there are
272 a number of documents that were already approved by ENTSO-E and the material could be
273 integrated in a next version of CGMES. This will depend on the IEC discussions.

274 In addition, CIM community is working on the next release of IEC CIM (CIM18). It is expected
275 that the process on commenting and approving next editions of the standards will start in 2024.
276 Note also that some of the Network Codes profiles can be merged with base CGMES 3.0 profiles
277 and this will result in a new version of CGMES .

278 The acceptance of an IEC standard depends on the IEC. If they do not accept it, it will remain
279 as ENTSO-E document. The following CGMES related standards were released after CGMES
280 (which was published June 2021):

281 • IEC 61970-301:2020+AMD1:2022 (Feb 2022)

282 • IEC 61970-452:2021 (Oct 2021)

283 • IEC 61970-456:2021 (Dec 2021)

284 • IEC 61970-302:2024 (Jan 2024)

285 • IEC 61970-457:2024 (Feb 2024)

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6   NC profiles

6.1   When will NC profiles be released as IEC standard?

Some canonical CIM extensions proposed by ENTSO-E for the sake of NC profiles will most probably be released as part of CIM18 IEC standards. NC profiles could become an IEC standard from the moment the community assesses that there will be less frequent modifications and we have good coverage of the variety of use cases.

6.2   Why were NC profiles not developed as a standard from the beginning?

It was considered that there will be frequent modifications in the first 1-2 years when also the requirements are adapted.

6.3   Why do we have so many NC profiles?

Modularity allows for reuse and flexibility, but fragmentation may increase (apparent) complexity. The win-win is the ability to always use the same modules (profiles) in different contexts and combinations.

NC profiles are created to fit best the business processes. As there are multiple processes using the information in different points in time and with different inputs and outputs, it was necessary to apply a modular approach and ensure that there is clear separation between types of input information and output information. There are many use cases that need to be covered for processes such as CSA, CCC, OPC, STA which are all based on a CGM. The complexity of the methodologies and network codes drives the complexity of the data exchange.

6.4   Will some of the NC profiles be integrated with CGMES profiles?

Likely. Profiles like Equipment Reliability, Steady State Instruction were designed with the approach in mind to include them in Equipment and Steady State Hypothesis respectively. and Steady State Hypothesis Schedule profile is also a candidate for inclusion in the CGMES.

6.5   Do we need to have conformity related to NC profiles?

Yes, it is needed and there is early preparation for this process. As soon as NC Data Exchange Specification is enhanced and business rules for validation are defined, the information on the use case, constraints and test data can be used to create a conformity scheme for NC profiles.

6.6   Is there a file naming convention specified?

NC Data Exchange Specification provides guidance in the file naming. However, this is only to be used for human readability and not to be processed for the purpose of metadata extraction. The use of file packaging mechanisms and manifest are applied to this purpose. This is described in the ENTSO-E Metadata and document header data exchange specification.

7   RDF syntax

7.1   RDF syntax (CIM XML serialisation) is somewhat specific to CIM. Where can I get more information on this?

Indeed, there is RDF XML by W3C and CIM XML standardised in IEC 61970-552. ENTSO-E published a short document explaining the reasons and general background on the topic. You can find the information in https://www.entsoe.eu/Documents/CIM_documents/Grid_Model_CIM/RDF-SyntaxUserGuide_v1-0.pdf.

8   Transition between versions

8.1   We need to do an impact assessment before we decide on a transition. How do we do this?

It is proven that detailed impact assessment cannot be done without full transparency on procurement procedure, resource planning, TSO system integration. Anything discussed without complete information will be a guess.

8.2   We need to cover new requirements but to have this supported with CGMES v2.4 we need a workaround. How do we do this?

CIM WG recommends using the last version of the standards as they support natively all known requirements. Workarounds are costly and not sustainable not only for the TSO community, but for vendors as well, and consequently all the non-TSO parties relying on products using the standard.

8.3   My vendor says it is not clear when CGMES v3 will be implemented and what the status is. What do I need to recommend to my vendor?

You need to inform your vendor and provide the right information. Explain that it is a simple upgrade (patch) and not a major change and request the vendor to implement support for it and to run the conformance procedure. In case the TSO model remains with the same content the transformation to CGMES v3 may be tested by means of a simple adapter / script. ENTSO-E already provided tools to test conversion to CGMES v3. There are also open-source implementations, but these all are not production grade means to incorporate into operational business process, rather meant to support migration until your software vendor supports this functionality in their tool.

8.4   How do I get confidence on CGMES v3 support by my vendor?

Require your vendor to have CGMES v3 conformity informing that you are going to need this and use CGMES v3 as soon as possible. In this way you will at least have confidence for basic support. Then you will need to test with real data and integrate it in your environment.

8.5   I am not sure if ENTSO-E (OPDE) and RCC (EMF and other tools) will support CGMES v3. How do I know more about this?

Business processes require more data. There is no point, and it is even not possible upgrading CGMES v2.4. Everybody needs to look forward and to implement new requirements in new versions of data exchange standards.

Please approach ENTSO-E Secretariat, CGM OPDE TT, TYNDP project and/or the relevant Committee to get more information and require necessary changes.

8.6   Is it required to use CGMES v3 for ROSC process?

It is strongly recommended to use CGMES v3 but profiles in CGMES v2.4 can also be processed with workarounds and less functionalities.

8.7   Who is going to decide on implementation of CGMES v3?

It is the business processes that need to insist on prompt upgrades to new versions. CGMES v3 has been an international standard since June 2021 and with unchanged technical content since late 2020. Community already lost 2 years in thinking who is going to decide expecting that CGMES v2.4.15+<changes and adaptations since 2016>+QoCDC will be fully functional with the go live in Dec 2021. Fixing problems means fixing specifications and software that is impacted and this can be done only with CGMES v3 and higher. It is an iterative, short cycle process.

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370 **8.8   It is hard to move to CGMES v3.0 because I do not have node-breaker model**
371 **representation. It will take me too long to make this model.**

372 There is no requirement in CGMES v3 that more detailed model shall be exchanged. Data
373 exchange standard has nothing to do with model detail. For instance, a model with 2 nodes and
374 a line in between is a valid CGMES v3 exchange. However, if your process requires node-
375 breaker granularity and / or you need to mix node-breaker and bus-branch models, CGMES
376 v3.0 is crystal clear with this (because it fixes the issues from CGMES v2.4).

377 **8.9   The effort to migrate to CGMES v3 is big.**

378 Not true, CGMES v3 does not add new functionalities, it is a service pack of CGMES v2.4.

379 **8.10   Can we stabilise on CGMES v2.4 and then move to higher versions?**

380 Some questions that may arise are:

381 •   What are the factual arguments of the proponents that in 6 months it will be stable?

382 •   What does stabilisation mean?

383 •   Is CGMES 2.4 still version 2.4 after clarification and side documents have been published?

384 Stabilisation means that nobody changes anything except bug fixing of software for 3-4 months.
385 The normal practice is that after the short "stabilisation period" an analysis of the situation is
386 done and the specification is updated to a newer version in order to enable consistent
387 implementation and achieve the next milestone. The CGM community did not follow such
388 practice.

389 The fastest possible action to get facts-based stabilisation for good is the immediate move to
390 CGMES v3. However, in general, the decision on the use of a given profile version is up to the
391 project implementing that data exchange.

392 The recommendation is to plan for a CGMES version transition strategy which will increase the
393 benefits.

394 **8.11   Let's first have long term planning use CGMES v3 and then operational planning.**

395 This approach was already tried between 2009 and 2015 with CGMES as data exchange format
396 for the TYNDP process in long-term planning.

397 For nearly 6 years operational planning was in passive mode but the operational planning
398 process is still not using CGMES. The systems used for long-term planning and operational
399 planning are different and so their requirements.

400 The recommendation is to plan for a CGMES version transition strategy which will increase the
401 benefits.

402 **8.12   It will take me too long to migrate (e.g. 1.5 years) so we cannot decide now.**

403 It is recommended to immediately start a gap analysis and a transition strategy so the last TSO
404 to adopt the last version of the CGMES standard can be on time for a go live (i.e., CORE ROSC
405 go live in mid 202x).

406 **9   Model validation**

407 **9.1   What is recommended regarding model validation?**

408 SHACL validation is recommended approach as this is the way to validate RDF based data using
409 a standard (W3C recommendation) approach. For the same input, SHACL validation must
410 provide the same output, and not be tool-dependent, which is the case if the tool implements
411 W3C recommendation correctly.

412 **9.2   What kind of rules/constraints are validated?**

413   There are different rules/constraints defined. Constraints included as part of the data exchange
414   standard and constraints that are business specific and defined outside the standards. Both
415   constrains should have SHACL based machine readable representation. Business specific
416   constraints shall not override constraints defined in the standards. If a change is necessary, a
417   new version of the standard needs to be released and implemented.

418   **9.3   Where are the different kind of rules/constraints validated?**

419   CGMES and NC profiles do not specify where validation occurs. This is a business question
420   that needs to follow requirements by the EU Regulations and methodologies. It is important to
421   ensure that there is no duplicated validation and only relevant information is validated.

422   **9.4   How can I make sure that my model is good enough? What are the mechanisms**
423   **provided by ENTSO-E to validate my model?**

424   There are multiple elements here. You need to ensure that you have conformity to the data
425   exchange standard, i.e. tools that are used in the process to prepare datasets (models) to be
426   exchanged need to conform and be assessed using ENTSO-E Conformity Assessment Process.
427   As an entity providing data you need to be assessed if that content of the data conforms to the
428   requirements by the business processes where this data is used. This is part of the Site
429   Acceptance Test (SAT) conformity. Such test is not put in place.

430   ENTSO-E provides some tools to validate data, e.g. CIMdesk, SUV, but not of these tools
431   validates the business content of the data. There is a need to work on SAT Conformity in order
432   to have more structured way to confirm that an entity satisfies business process requirements.