



SLOVENSKI STANDARD
SIST EN IEC 61970-600-1:2021

01-november-2021

Aplikacijski programski vmesnik za sistem upravljanja z energijo (EMS-API) - 600-1. del: Specifikacija izmenjave skupnega modela mreže (CGMS) - Struktura in pravila

Energy management system application program interface (EMS-API) - Part 600-1: Common Grid Model Exchange Specification (CGMES) - Structure and rules

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 61970-600-1:2021](https://standards.iteh.ai/catalog/standards/sist/826e295-4564bca-049b-74cdd13be22c/sist-en-iec-61970-600-1-2021)

Ta slovenski standard je istoveten z: EN IEC 61970-600-1:2021

ICS:

29.240.30	Krmilna oprema za elektroenergetske sisteme	Control equipment for electric power systems
35.200	Vmesniška in povezovalna oprema	Interface and interconnection equipment

SIST EN IEC 61970-600-1:2021

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 61970-600-1:2021](https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021>

EUROPEAN STANDARD

EN IEC 61970-600-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2021

ICS 33.200

English Version

Energy management system application program interface
(EMS-API) - Part 600-1: Common Grid Model Exchange
Standard (CGMES) - Structure and rules
(IEC 61970-600-1:2021)

Interface de programmation d'application pour système de
gestion d'énergie (EMS-API) - Partie 600-1: Spécification
pour l'échange de modèle de réseau commun (CGMES) -
Structure et règles
(IEC 61970-600-1:2021)

Schnittstelle der Anwendungsprotokolle von
Energieverwaltungssystemen (EMS-API) - Teil 600-1:
Spezifikation für den Austausch von
Elektrizitätsversorgungssystemmodellen (CGMES) -
Strukturen und Regeln
(IEC 61970-600-1:2021)

This European Standard was approved by CENELEC on 2021-07-09. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 61970-600-1:2021 (E)**European foreword**

The text of document 57/2366/FDIS, future edition 1 of IEC 61970-600-1, prepared by IEC/TC 57 "Power systems management and associated information exchange" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61970-600-1:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-04-09
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-07-09

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61970-600-1:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61970-501:2006 NOTE Harmonized as EN 61970-501:2006 (not modified)

IEC 61970-452 NOTE Harmonized as EN 61970-452
<https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd15bc22c/sist-en-iec-61970-600-1-2021>

IEC 61970-453 NOTE Harmonized as EN 61970-453

IEC 61970-456 NOTE Harmonized as EN IEC 61970-456

IEC 61968-13 NOTE Harmonized as EN IEC 61968-13

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61970-301	2020	Energy management system application program interface (EMS-API) - Part 301: Common information model (CIM) base	EN IEC 61970-301	2020
IEC 61970-302	2018	Energy management system application program interface (EMS-API) - Part 302: Common information model (CIM) dynamics	EN IEC 61970-302	2018
IEC 61970-552	2016	Energy management system application program interface (EMS-API) - Part 552: CIMXML Model exchange format	EN 61970-552	2016

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 61970-600-1:2021](https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021>



IEC 61970-600-1

Edition 1.0 2021-06

INTERNATIONAL STANDARD



**Energy management system application program interface (EMS-API) –
Part 600-1: Common Grid Model Exchange Standard (CGMES) – Structure and
rules**

STANDARD PREVIEW
(standards.iteh.ai)

SIST EN IEC 61970-600-1:2021
<https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-9814-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	9
3 Terms, definitions and abbreviated terms	10
3.1 Terms and definitions.....	10
3.2 Abbreviated terms.....	11
4 Data exchange context.....	12
5 Specifications and functionalities.....	15
5.1 General constraints.....	15
5.2 Model authority sets (MAS).....	17
5.3 File header	18
5.4 File body.....	19
5.5 Profiles and instance file types.....	19
5.5.1 General	19
5.5.2 CGMES profiles' properties	19
5.5.3 CGMES extensions.....	21
5.5.4 Equipment profile and instance file.....	22
5.5.5 Topology profile and instance file	23
5.5.6 Steady state hypothesis profile and instance file.....	23
5.5.7 State variables profile and instance file	24
5.5.8 Equipment boundary profile and instance file.....	24
5.5.9 Topology boundary profile and instance file.....	24
5.5.10 Diagram layout profile and instance file.....	24
5.5.11 Geographical location profile and instance file.....	25
5.5.12 Dynamics profile and instance file.....	25
5.6 File exchange	26
5.7 Boundary point – properties and location	27
5.8 Model merging process	29
5.9 CIM XML document/distribution validity.....	32
5.10 Naming Convention.....	33
6 CGMES governance	36
6.1 General.....	36
6.2 Versions of the CGMES and the profiles	37
6.3 Conformity assessment.....	38
6.4 Implementation process	38
Annex A (xxxx)	39
Annex B (normative) File header guidelines	40
B.1 General.....	40
B.2 Exchange scenarios.....	40
B.3 Examples.....	41
B.3.1 Example 1: File header of full model.....	41
B.3.2 Example 2: File header of full model that is depending on another model	42
B.3.3 Example 3: File header of full model that is depending on a model and supersedes another model.....	43

B.3.4	Example 4: File header of difference model that is depending on a full model and supersedes another full model.....	44
B.3.5	Example 5: File header of difference model that is depending on a difference model and supersedes another difference model.....	45
	Bibliography.....	47
	Figure 1 – CGMES instance file dependency	20
	Figure 2 – Boundary point placed on a tie-line	27
	Figure 3 – Boundary point placed in a substation	27
	Figure 4 – HVDC as interconnection or internal line	28
	Figure 5 – HVDC grid.....	28
	Figure 6 – Merge process	31
	Figure B.1 – Example workflow events.....	40
	Table 1 – IdentifiedObject attributes	36
	Table 2 – IdentifiedObject attributes in EQBD profile	36

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN IEC 61970-600-1:2021

<https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ENERGY MANAGEMENT SYSTEM APPLICATION
PROGRAM INTERFACE (EMS-API) –****Part 600-1: Common Grid Model Exchange Standard (CGMES) –
Structure and rules**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61970-600-1 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This first edition cancels and replaces IEC TS 61970-600-1 published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC TS 61970-600-1:2017:

- Terms and definitions were updated.
- The “Type” column in all tables was deleted to increase readability of the document as all the rules are considered required, hence categorisation is not necessary.
- Requirement HGEN4 was added to define additional rules to the file header compared to IEC 61970-552:2016.

- Annex B on “Summary of specific rules for naming conventions” is deleted as the information was either integrated in the UML or considered outdated.
- Annex D referring to the PST modelling is deleted as it will be fully integrated in IEC 61970-301:2020+AMD11.
- Annex E “Implementation guide” is deleted as all rules and implementation guidance is or will be integrated in either Clause 5 of this document or IEC 61970-301:2020 (and its future Amendment 1) or IEC 61970-452 or IEC 61970-456 as referenced by this document. Note that former Subclause E.11.2 on ConformLoadGroup and NonConformLoadGroup was implemented differently due to another issue, please refer to IEC 61970-600-2:2020.
- Rules GENC17, GENC18, GENC19, EQ__4, EQ__5, SV__4, BPPL12, BPPL13, MVAL5, EXCH9, TP__4 and MARP12 were added.
- Rules GENC3, GENC6, PROF2, PROF4, PROF5, PROF8, PROF9, EXCH5, EXCH6, EXCH7, MAS_4, MAS_6, MAS_9, MAS_10, MAS_11, MAS_13, EQ__1, HREF2, HREF3, HREF5, MVAL3, TPBD1, TPBD2, BPPL10, NAMC12 and NAMC13 are deleted as they are considered not relevant due to other changes.
- The following rules were modified: GENC1, GENC2, GENC4, GENC5, GENC7, GENC8, GENC9, GENC10, GENC16, EQBD2, BPPL11, EXCH2, EXCH3, EXCH8, FBOD3, FBOD5, PROF10, PROF11, MAS_1, MAS_8, HGEN3, HREF1, EEXT1, EQ__2, TP__1, TP__2, TP__3, MARP10, MARP11, NAMC1, NAMC4, NAMC11, NAMC14, BPPL1, BPPL2 and BPPL3.
- Explicit equipment boundary profile definition (EQBD) has been deprecated (refer to Subclause 4.6.5 of IEC 61970-301:2020 and future Amendment 1 for details on deprecations) in this edition in favour of using its full profile counterpart (EQ) for exchange of boundary datasets. The topology boundary profile (TPBD) is not included in the CGMES as TP is considered output and therefore it is no need to exchange Topology information part of the boundary model authority set.
- Annex F has been deleted.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
57/2366/FDIS	57/2382/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61970 series, published under the general title *Energy management system application program interface (EMS-API)*, can be found on the IEC website.

¹ An amendment to IEC 61970-301:2020 is currently under consideration.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 61970-600-1:2021](https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/826aa205-4f5f-4bea-949c-74cdd13be22c/sist-en-iec-61970-600-1-2021>

INTRODUCTION

The purpose of this document is to define the Common Grid Model Exchange Standard (CGMES) based on Common Information Model (CIM) standards defined in IEC 61970-series, IEC 61968-series and IEC 62325-series and to address requirements defined by the European legislation. However, the document is not limited to the European legislation requirements and business processes, it is created to support data exchange between applications that support power system model management and analysis. The data exchange can be between internal applications or between applications at System Operators (SO) and Regional Coordination Centre (RCC). This covers DSO-DSO, DSO-TSO, TSO-TSO, TSO-RCC/ISO/RTO and RCC-RCC interfaces, but not limited to these.

The CGMES is created to address the information exchange requirements provided in Common Grid Model methodologies (CGMm) in accordance with the legal requirements stated in various European network codes guidelines. The CGMES applies to applications dealing with power system data management, as well as applications supporting the following analyses:

- power flow and contingency analyses,
- short circuit calculations,
- market information and transparency,
- capacity calculation for capacity allocation and congestion management, and
- dynamic security assessment.

The conformity of applications used for system operation and system development data exchanges with the CGMES is crucial for the needed interoperability of these applications. This document provides the grouping of all principle requirements for the CGMES Conformity Assessment Framework and the guiding principles for assessing applications' CGMES conformity. The description of the CGMES Conformity Assessment Process is currently not part of the IEC 61970-600-series, but it is planned to be included as an international standard in order to validate that the CGMES is correctly implemented by suppliers of the applications used by system operators (ISO/TSO/DSO etc) and for Regional Coordination Centres (RCCs).

ENERGY MANAGEMENT SYSTEM APPLICATION PROGRAM INTERFACE (EMS-API) –

Part 600-1: Common Grid Model Exchange Standard (CGMES) – Structure and rules

1 Scope

This part of IEC 61970, which covers the definition of Common Grid Model Exchange Standard (CGMES), defines the main rules and application's requirements to meet business requirements for assembled and merged model to fit relevant business services. This document does not define the business requirements, business processes nor how applications are implemented. This document defines how relevant Common Information Model (CIM) standards work together so that specific business requirements can be resolved.

It also includes extensions to the Common Information Model (CIM). The current extensions are defined in IEC 61970-301:2020 and will be covered in its future Amendment 1, but additional extensions can be defined in other standards in the IEC 61970-600-series. The extensions can be used to define additional profiles or to expand IEC 61970-450-series or IEC 61968-13 profiles. However, primary CGMES includes additional constraints on existing profiles and validation of assembled and merged models that is based on existing profiles. This can be done by making optional attributes and associations mandatory (required).

In addition, this document includes the specification of the serialisation that must be supported by referring to an existing standard defined in IEC 61970-550-series, e.g., IEC 61970-552, and making relevant constraints related to it.

The goal is to achieve interoperability between applications using CGMES in a high-performance environment with combined minimum effort so that relevant business processes are satisfied.

An overview of IEC 61970-600 series is provided in the following table, which also presents identified needs that are not yet addressed.

Part	Description	Scope
61970-600-1	Structure and rules. This part defines the structure of the series of standard and the rules that needs to be applied on the assembled and merged models that are defined by the different profile standards.	In the scope
61970-600-2	Exchange profiles specification. This part defines the IEC 61970-450-series and IEC 61968-13 related profiles that are included in CGMES. It includes the references to published standards and additional constraints defined to the relevant standard. If the relevant edition of a standard is not published, it also includes the profile definition and the standard's constraints.	In the scope
to be defined (TBD)	Information extension. This part defines additional information model that is not included in the relevant edition of IEC 61970-301, IEC 61970-302 or IEC 61968-11 that is needed to meet business requirement.	Identified as a need and not yet addressed neither in this document nor in IEC 61970-600 series
to be defined (TBD)	Extended exchange profiles specification. This part defines additional profiles that is not included in IEC 61970-450-series and IEC 61968-13 that is needed to meet business requirement.	
to be defined (TBD)	Conformity Assessment Scheme (CAS). This part defines the Conformity Assessment Scheme (CAS) including test use cases and references to test configurations to evaluate if an application tool conforms to the CGMES.	

SIST EN IEC 61970-600-1:2021

Clause 4, Data exchange context, describes the context the CGMES is developed to support.

Clause 5, Specifications and functionalities, defines the rules that shall be applied for validating a model part, an assembled and a merged model. When the rule is defined in the relevant profile it will include a reference to the rule.

Clause 6, CGMES governance, defines the governance of CGMES and the version strategy.

Annex A is left blank.

Annex B (normative), File header guidelines, explains the usage of the file header that is defined in IEC 61970-552.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61970-552:2016, *Energy management system application program interface (EMS-API) – Part 552: CIMXML Model exchange format*

IEC 61970-301:2020, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

IEC 61970-302:2018, *Energy management system application program interface (EMS-API) – Part 302: Common information model (CIM) dynamics*