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

**Interface de programmation d'application pour système de gestion d'énergie
(EMS-API) –
Partie 302: Régimes dynamiques de modèle d'information commun (CIM)**



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ICS 33.200

ISBN 978-2-8322-4270-4

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 302: Common information model (CIM) dynamics

FOREWORD

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International Standard IEC 61970-302 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition published in 2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) The majority of issues detected in IEC 61970-302:2018 are addressed;
- b) IEEE 421.5-2016 on Excitation systems is fully covered;
- c) The IEEE turbine report from 2013 was considered and as a result a number of gas, steam and hydro turbines/governors are added;

- d) IEC 61400-27-1:2020 on wind turbines is fully incorporated;
- e) WECC Inverter-Based Resource (IBR) models, Hybrid STATCOM models and storage models are added;
- f) The user defined models are enhanced with a model which enables modelling of detailed dynamic model;
- g) A model to enable exchange of simulation results is added;
- h) The work on the HVDC models is not complete. The HVDC dynamics models are a complex domain in which there are no models that are approved or widely recognised on international level, i.e., there are only project-based models. At this stage IEC 61970-302:2022 only specifies some general classes. However, it is recognised that better coverage of HVDC will require a further edition of this document;
- i) Models from IEEE 1547-2018 “IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces” are added.
- j) The IEC and technical experts are in the process of clarifying the ownership of intellectual property in the standards. Older documents (that may be referred to) will not have these clarifications. Statements have been added to certain figures, tables, schemas, and enumerations throughout the document that indicate that they are reproduced with the permission of the UCA International User Group (UCAIug). These items are derived from the Common Information Model (CIM).

The text of this standard is based on the following documents:

Draft	Report on voting
57/2620/FDIS	57/2633/RVD

Full information on the voting for the approval of this International Standard 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 of the IEC 61970 series, under the general title: *Energy management system application program interface (EMS-API)*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn, or
- revised.

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.

INTRODUCTION

This document is part of the IEC 61970 series which defines an application program interface (API) for an energy management system (EMS).

The principal objective of the IEC 61970 series is to produce standards that facilitate the integration of EMS applications developed independently by different vendors, between entire EMSs developed independently, or between an EMS and other systems concerned with different aspects of power system operations, such as generation or distribution management systems (DMS). This is accomplished by defining application program interfaces to enable these applications or systems access to public data and exchange information independent of how such information is represented internally.

The common information model (CIM) specifies the semantics for this API. The component interface specifications (CIS), which are contained in other parts of the IEC 61970 standards, specify the content of the messages exchanged.

The CIM is an abstract model that represents all the major objects in an electric utility enterprise typically needed to model the operational aspects of a utility. This model includes public classes and attributes for these objects, as well as the relationships between them.

IEC 61970-301 defines the CIM Base set of packages which provide a logical view of the functional aspects of an energy management system.

This document builds on IEC 61970-301 and provides the specifications for the exchange models representing dynamic behaviour of the majority of power system components in common use today by utilities to perform system simulation studies for system dynamic assessment and for planning purposes.

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

Part 302: Common information model (CIM) dynamics

1 Scope

The common information model (CIM) is an abstract model that represents all the major objects in an electric utility enterprise typically involved in utility operations. By providing a standard way of representing power system resources as object classes and attributes, along with their relationships, the CIM facilitates the integration of energy management system (EMS) applications developed independently by different vendors, between entire EMSs developed independently, or between an EMS and other systems concerned with different aspects of power system operations, such as generation or distribution management. SCADA is modelled to the extent necessary to support power system simulation and communication between control centres. The CIM facilitates integration by defining a common language (i.e. semantics) based on the CIM to enable these applications or systems to access public data and exchange information independent of how such information is represented internally.

Due to the size of the complete CIM, the object classes contained in the CIM are grouped into a number of logical packages, each of which represents a certain part of the overall power system being modelled. Collections of these packages are being developed as separate International Standards.

This document specifies a Dynamics package which contains part of the CIM to support the exchange of models between software applications that perform analysis of the steady-state stability (small-signal stability) or transient stability of a power system as defined by IEEE / CIGRE *Definition and classification of power system stability IEEE/CIGRE joint task force on stability terms and definitions*.

The model descriptions in this document provide specifications for each type of dynamic model as well as the information that needs to be included in dynamic case exchanges between planning/study applications.

The scope of the CIM Dynamics package specified in this document includes:

- standard models: a simplified approach to describing dynamic models, where models representing dynamic behaviour of elements of the power system are contained in predefined libraries of classes which are interconnected in a standard manner. Only the names of the selected elements of the models along with their attributes are needed to describe dynamic behaviour.
- proprietary user-defined models: an approach providing users the ability to define the parameters of a dynamic behaviour model representing a vendor or user proprietary device where an explicit description of the model is not provided by this document. The same libraries and standard interconnections are used for both proprietary user-defined models and standard models. The behavioural details of the model are not documented in this document, only the model parameters.
- A model to enable exchange of models' descriptions. This approach can be used to describe user defined and standard models.
- A model to enable exchange of simulation results.