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INTERNATIONAL STANDARD

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colour inside

Energy management system application program interface (EMS-API) – Part 457: Dynamics profile

Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 457: Profil de régimes dynamiques



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 457: Dynamics profile

FOREWORD

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IEC 61970-457 has been prepared by IEC technical committee 57: Power systems management and associated information exchange. It is an International Standard.

This second edition cancels and replaces the first edition published in 2021. 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 and fixed in IEC 61970-302:2022 led to update of this document;

b) IEEE 421.5-2016 on Excitation systems is fully covered;

c) 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 approach was enhanced in IEC 61970-302:2022 adding a model which enables modelling of a detailed dynamic model. This results in the creation of two additional profiles in this document. These are the Detailed Model Configuration profile and Detailed Model Parameterisation profile;

g) A model to enable exchange of simulation results was added in IEC 61970-302:2022. This results in the creation of two additional profiles in this document. These are the Simulation Settings profile and Simulation Results profile;

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 as well as next edition of IEC 61970-302;

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 International Standard is based on the following documents:

Draft	Report on voting
57/2621/FDIS	57/2634/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.

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.

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.

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 document 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

The IEC 61970-300 series of documents specify the common information model (CIM). The CIM is an abstract model that represents the objects in an electric utility enterprise typically needed to model the operational aspects of a utility.

This document is one of the IEC 61970-400 series of profile standards that specify the semantic structure of data exchanged between components (or applications) and/or made publicly available data by a component. This document describes the payload that would be carried if applications are communicating via a messaging system, but the document does not include the method of exchange, and therefore is applicable to a variety of exchange implementations. All examples provided in this document are serialised according to in the IEC 61970-552:2016.

This document specifies the profile (or subset) of the CIM required to describe the exchanged dynamic model information needed to support the analysis of the steady state stability (small-signal stability) and/or transient stability of a power system or parts of it. The information is described with reference to a power system model that conforms to IEC 61970-452 and IEC 61970-456 in this series of related standards. Thus, equipment and other related power flow model data is not repeated in the information exchanged with this document. The schema(s) for expressing the dynamic model information are derived directly from the CIM, more specifically from IEC 61970-302.

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

Part 457: Dynamics profile

1 Scope

This part of IEC 61970 specifies a standard interface for exchanging dynamic model information needed to support the analysis of the steady state stability (small-signal stability) and/or transient stability of a power system or parts of it. The schema(s) for expressing the dynamic model information are derived directly from the CIM, more specifically from IEC 61970-302.

The scope of this document includes only the dynamic model information that needs to be exchanged as part of a dynamic study, namely the type, description and parameters of each control equipment associated with a piece of power system equipment included in the steady state solution of a complete power system network model. Therefore, this profile is dependent upon other standard profiles for the equipment as specified in IEC 61970-452: CIM static transmission network model profiles, the topology, the steady state hypothesis and the steady-state solution (as specified in IEC 61970-456: Solved power system state profiles) of the power system, which bounds the scope of the exchange. The profile information described by this document needs to be exchanged in conjunction with IEC 61970-452 and IEC 61970-456 profiles' information to support the data requirements of transient analysis tools. IEC 61970-456 provides a detailed description of how different profile standards can be combined to form various types of power system network model exchanges.

This document supports the exchange of the following types of dynamic models:

- standard models: a simplified approach to exchange, where models are contained in predefined libraries of classes interconnected in a standard manner that represent dynamic behaviour of elements of the power system. The exchange only indicates the name of the model along with the attributes needed to describe its behaviour.
- proprietary user-defined models: an exchange that would provide users the ability to exchange the parameters of a model representing a vendor or user proprietary device where an explicit description of the model is not described in this document. The connections between the proprietary models and standard models are the same as described for the standard models exchange. Recipient of the data exchange will need to contact the sender for the behavioural details of the model.

This document builds on IEC 61970-302, CIM for dynamics which defines the descriptions of the standard dynamic models, their function block diagrams, and how they are interconnected and associated with the static network model. This type of model information is assumed to be pre-stored by all software applications hence it is not necessary to be exchanged in real-time or as part of a dynamics model exchange.

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 61970-301:2020, *Energy management system application program interface (EMS-API) - Part 301: Common information model (CIM) base*
IEC 61970-301:2020/AMD1:2022