



# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



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### Energy management system application program interface (EMS-API) – Part 452: CIM static transmission network model profiles

### Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 452: Profils du modèle de réseau de transport statique CIM

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

#### Part 452: CIM static transmission network model profiles

#### FOREWORD

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International Standard IEC 61970-452 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This third edition cancels and replaces the second edition published in 2015. This edition constitutes a technical revision.

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

- a) The Equipment profile has been split into three separate profiles, CoreEquipment, Operation and ShortCircuit.
- b) The HVDC model has been replaced with the new model defined in Edition 6 of 61970-301.
- c) Added attribute IdentifiedObject.mRID.

- d) Added class BusNameMarker.
- e) Added attribute HydroPowerPlant.hydroPlantType.
- f) Removed attribute HydroGeneratingUnit.energyConversionCapability.
- g) Added classes related to grounding (PetersenCoil, GroundImpedance, GroundDisconnector, GroundSwitch, and Ground).
- h) A number of changes have been made to whether specific attributes and associations are required or optional.

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

FDIS	Report on voting
57/1868/FDIS	57/1892/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.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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.

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.

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## INTRODUCTION

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

The IEC 61970-3x series specifies a Common Information Model (CIM). The CIM is an abstract model that represents all of the major objects in an electric utility enterprise typically needed to model the operational aspects of a utility. It provides the semantics for the IEC 61970 APIs specified in the IEC 61970-4x series of Component Interface Standards (CIS). The IEC 61970-3x series includes IEC 61970-301, *Common Information Model (CIM) base* and draft standard IEC 61970-302<sup>1</sup>, *Common Information Model (CIM) for Dynamics*.

This document is one of the IEC 61970-4x series of Component Interface Standards that specify the functional requirements for interfaces that a component (or application) shall implement to exchange information with other components (or applications) and/or to access publicly available data in a standard way. The component interfaces describe the specific message contents and services that can be used by applications for this purpose. The implementation of these messages in a particular technology is described in the IEC 61970-5x series.

This document specifies the specific profiles (or subsets) of the CIM for exchange of static power system data between utilities, security coordinators and other entities participating in a interconnected power system, such that all parties have access to the modeling of their neighbor's systems that is necessary to execute state estimation or power flow applications. Currently three profiles, the CoreEquipment Profile, the Operation Profile and the Short Circuit Profile, have been defined. A companion standard, IEC 61970-552, defines the CIM XML Model Exchange Format based on the Resource Description Framework (RDF) Schema specification language. IEC 61970-552 is the common industry approach and is recommended to be used to transfer power system model data for the IEC 61970-452 profile.

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1 Under preparation. Stage at the time of publication: IEC/AFDIS 61970-302:2017.

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

### **Part 452: CIM static transmission network model profiles**

#### **1 Scope**

This IEC document is one of the IEC 61970-450 to 499 series that, taken as a whole, defines at an abstract level the content and exchange mechanisms used for data transmitted between control centers and/or control center components, such as power systems applications.

The purpose of this document is to define the subset of classes, class attributes, and roles from the CIM necessary to execute state estimation and power flow applications. The North American Electric Reliability Council (NERC) Data Exchange Working Group (DEWG) Common Power System Modeling group (CPSM) produced the original data requirements, which are shown in Annex E. These requirements are based on prior industry practices for exchanging power system model data for use primarily in planning studies. However, the list of required data has been extended to facilitate a model exchange that includes parameters common to breaker-oriented applications. Where necessary this document establishes conventions, shown in Clause 6, with which an XML data file must comply in order to be considered valid for exchange of models.

This document is intended for two distinct audiences, data producers and data recipients, and may be read from two perspectives.

From the standpoint of model export software used by a data producer, the document describes a minimum subset of CIM classes, attributes, and associations which must be present in an XML formatted data file for model exchange. This standard does not dictate how the network is modelled, however. It only dictates what classes, attributes, and associations are to be used to describe the source model as it exists.

Optional and required classes, attributes and associations must be imported if they are in the model file prior to import. If an optional attribute does not exist in the imported file, it does not have to be exported in case exactly the same data set is exported, i.e. the tool is not obliged to automatically provide this attribute. If any mandatory attribute or association is missing, the exchanged data is considered invalid. Specific business processes may relax restrictions of the profile, but such exchanges would not be considered to be compliant with the standard. Business processes governing different exchanges can also require mandatory exchange of certain optional attributes or associations.

Furthermore, an exporter may, at his or her discretion, produce an XML data file containing additional class data described by the CIM RDF Schema but not required by this document provided these data adhere to the conventions established in Clause 6.

From the standpoint of the model import used by a data recipient, the document describes a subset of the CIM that importing software must be able to interpret in order to import exported models. As mentioned above, data providers are free to exceed the minimum requirements described herein as long as their resulting data files are compliant with the CIM RDF Schema and the conventions established in Clause 6. The document, therefore, describes additional classes and class data that, although not required, exporters will, in all likelihood, choose to include in their data files. The additional classes and data are labeled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them from their required counterparts. Please note, however, that data importers could potentially receive data containing instances of any and all classes described by the CIM RDF Schema.

## 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.

NOTE For general glossary definitions, see IEC 60059, *International Electrotechnical Vocabulary*.

IEC 61968-13, *Application integration at electric utilities – System interfaces for distribution management – Part 13: CIM RDF Model exchange format for distribution*

IEC 61970-301:2016, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

IEC 61970-456, *Energy management system application program interface (EMS-API) – Part 456: Solved power system state profiles*

IEC 61970-501, *Energy management system application program interface (EMS-API) – Part 501: Common Information Model Resource Description Framework (CIM RDF) schema*

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

*Extensible Markup Language (XML) 1.0* (Second Edition), <http://www.w3.org/TR/REC-xml>