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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 456: Profils d'état de réseaux électriques résolus

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

Part 456: Solved power system state profiles

FOREWORD

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IEC 61970-456 has been prepared by IEC technical committee 57: Power systems management and associated information exchange. It is an International Standard.

This third edition cancels and replaces the second edition published in 2018. This edition constitutes a technical revision. It is based on the IEC 61970 UML version 'IEC61970CIM17v40', dated 2020-08-24.

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

a) Updated to support CIM17 (IEC 61970-301:2020+AMD1) and align with IEC 61970-452:ED4.
b) The classes PowerElectronicsConnection, PowerElectronicsUnit and PowerElectronicsWindUnit are added to the Steady State Hypothesis (SSH) profile to match the changes done for Edition 4 of IEC 61970-452, Core Equipment profile.
c) Added relevant terms used in this document.

d) Clarified use of Equipment.inService and Equipment.normallyInService.

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

Draft	Report on voting
57/2406/FDIS	57/2440/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.

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

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

This document is one of several parts of the IEC 61970 series that defines common information model (CIM) datasets exchanged between application programs in energy management systems (EMS).

The IEC 61970-300 series specifies 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 component interface 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 standard does not include the method of exchange, and therefore is applicable to a variety of exchange implementations. The examples in this document are based on the exchanged data formatted specified in IEC 61970-552 CIM XML model exchange standard.

This document specifies three profiles:

- The Steady State Hypothesis (SSH) profile that describes power flow application input variables such as voltage set points, switch statuses etc.
- The topology profile (TP) that describes a bus-branch model. A topology model may be created by a network model builder from a node-breaker model with SSH as inputs using topology processing or by a tool where a user interactively builds a topology model. Therefore, a topology model is defined as an output.
- State variables profile (SV) that describes the solution of a power system case such as is produced by power flow or state estimation applications.

This document describes the inputs and solutions (outputs) with reference to a power system model that conforms to IEC 61970-452 in this series of related standards. The separation of information into profiles also enables separation of data into documents corresponding to the profiles. In this way the profiles defined in this document generate small data documents compared with traditional bus-branch or node-breaker formats that include the network, the initial conditions and the result.

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

Part 456: Solved power system state profiles

1 Scope

This part of IEC 61970 belongs to the IEC 61970-450 to IEC 61970-499 series that, taken as a whole, defines at an abstract level the content and exchange mechanisms used for data transmitted between power system analyses applications, control centres and/or control centre components.

The purpose of this document is to rigorously define the subset of classes, class attributes, and roles from the CIM necessary to describe the result of state estimation, power flow and other similar applications that produce a steady-state solution of a power network, under a set of use cases which are included informatively in this document.

This document is intended for two distinct audiences, data producers and data recipients, and can be read from those two perspectives. From the standpoint of model export software used by a data producer, the document defines how a producer may describe an instance of a network case in order to make it available to some other program. From the standpoint of a consumer, the document defines what that importing software must be able to interpret in order to consume power flow cases.

There are many different use cases for which use of this document is expected and they differ in the way that the document will be applied in each case. Implementers are expected to consider what use cases they wish to cover in order to know the extent of different options they must cover. As an example, the profiles defined in this document will be used in some cases to exchange starting conditions rather than solved conditions, so if this is an important use case, it means that a consumer application needs to be able to handle an unsolved state as well as one which has met some solution criteria.

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:—[1]

IEC 61970-452:2021, *Energy management system application program interface (EMS-API) – Part 452: CIM static transmission network model profiles*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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[1] Under preparation. Stage at the time of publication: IEC/RPVC 61970-301/AMD1:2021