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**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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CONTENTS

FOREWORD.....	10
INTRODUCTION.....	12
1 Scope.....	13
2 Normative references	13
3 Terms and definitions	13
4 Profile specification	15
4.1 General.....	15
4.1.1 General	15
4.1.2 Steady state hypothesis profile	15
4.1.3 Topology profile.....	16
4.1.4 State variables profile.....	16
4.2 Requirements and constraints.....	16
5 Overview	21
5.1 General.....	21
5.2 Modelling authorities.....	22
5.3 Profile relationships	24
5.4 Connectivity model.....	25
6 Use cases	26
6.1 Overview.....	26
6.2 EMS network analysis integration.....	28
6.3 Power flow based network analysis.....	28
6.4 Model partitioning and boundary modelling	29
6.4.1 General	29
6.4.2 Network model boundaries	30
6.4.3 Network parts and model merge	31
6.4.4 Partitioning of a merged model	33
7 Data model with CIMXML examples.....	34
7.1 Topology processing	34
7.1.1 Overview	34
7.1.2 Bus-branch and node-breaker models	34
8 Detailed Profile specification	36
8.1 General.....	36
8.2 Package SteadyStateHypothesisProfile.....	36
8.2.1 General	36
8.2.2 (abstract) ACDCCConverter	41
8.2.3 (Description) ACDCCConverterDCTerminal.....	41
8.2.4 (abstract) ACDCTerminal.....	42
8.2.5 (Description) ActivePowerLimit	42
8.2.6 (Description) ApparentPowerLimit.....	42
8.2.7 (Description) AsynchronousMachine	43
8.2.8 (Description) BatteryUnit.....	43
8.2.9 (Description) Breaker.....	43
8.2.10 (abstract) ConductingEquipment.....	44
8.2.11 (Description) ConformLoad	44
8.2.12 (Description) ControlArea	44
8.2.13 (Description) CsConverter	45

8.2.14	(Description) CurrentLimit	46
8.2.15	(abstract) DCBaseTerminal	47
8.2.16	(Description) DCTerminal	47
8.2.17	(Description) Disconnecter	47
8.2.18	(Description) DisconnectingCircuitBreaker	48
8.2.19	(abstract) EnergyConnection	48
8.2.20	(Description) EnergyConsumer	48
8.2.21	(Description) EnergySource	49
8.2.22	Equipment	50
8.2.23	(abstract) EquivalentEquipment	50
8.2.24	(Description) EquivalentInjection	50
8.2.25	(Description) ExternalNetworkInjection	51
8.2.26	(Description) Fuse	51
8.2.27	(Description) GeneratingUnit	52
8.2.28	(Description) GroundDisconnecter	52
8.2.29	(Description) HydroGeneratingUnit	53
8.2.30	(abstract) IdentifiedObject root class	53
8.2.31	(Description) Jumper	53
8.2.32	(Description) LinearShuntCompensator	54
8.2.33	(Description) LoadBreakSwitch	54
8.2.34	(Description) NonConformLoad	54
8.2.35	(Description) NonlinearShuntCompensator	55
8.2.36	(Description) NuclearGeneratingUnit	55
8.2.37	(abstract) OperationalLimit	55
8.2.38	(abstract) PhaseTapChanger	56
8.2.39	(Description) PhaseTapChangerAsymmetrical	56
8.2.40	(Description) PhaseTapChangerLinear	57
8.2.41	(abstract) PhaseTapChangerNonLinear	57
8.2.42	(Description) PhaseTapChangerSymmetrical	57
8.2.43	(Description) PhaseTapChangerTabular	58
8.2.44	(Description) PowerElectronicsConnection	58
8.2.45	(abstract) PowerElectronicsUnit	59
8.2.46	(abstract) PowerSystemResource	59
8.2.47	(abstract) ProtectedSwitch	59
8.2.48	(Description) RatioTapChanger	60
8.2.49	(abstract,Description) RegulatingCondEq	60
8.2.50	(Description) RegulatingControl	60
8.2.51	(abstract) RotatingMachine	61
8.2.52	(abstract) ShuntCompensator	62
8.2.53	(Description) SolarGeneratingUnit	63
8.2.54	(Description) StaticVarCompensator	63
8.2.55	(Description) StationSupply	63
8.2.56	(Description) Switch	64
8.2.57	(Description) SynchronousMachine	64
8.2.58	(abstract) TapChanger	65
8.2.59	(Description) TapChangerControl	65
8.2.60	(Description) Terminal	66
8.2.61	(Description) ThermalGeneratingUnit	66
8.2.62	(Description) VoltageLimit	66

8.2.63	(Description) VsConverter.....	67
8.2.64	(Description) WindGeneratingUnit.....	68
8.2.65	AsynchronousMachineKind enumeration.....	68
8.2.66	BatteryStateKind enumeration	68
8.2.67	CsOperatingModeKind enumeration.....	68
8.2.68	CsPpccControlKind enumeration	69
8.2.69	SynchronousMachineOperatingMode enumeration	69
8.2.70	UnitMultiplier enumeration	69
8.2.71	UnitSymbol enumeration.....	70
8.2.72	VsPpccControlKind enumeration.....	76
8.2.73	VsQpccControlKind enumeration	76
8.2.74	ActivePower datatype	77
8.2.75	AngleDegrees datatype	77
8.2.76	AngleRadians datatype.....	77
8.2.77	ApparentPower datatype.....	78
8.2.78	CurrentFlow datatype	78
8.2.79	PerCent datatype.....	78
8.2.80	PU datatype.....	79
8.2.81	ReactivePower datatype	79
8.2.82	RealEnergy datatype	79
8.2.83	Resistance datatype	79
8.2.84	Voltage datatype.....	80
8.2.85	Boolean primitive	80
8.2.86	Date primitive	80
8.2.87	Float primitive.....	80
8.2.88	Integer primitive.....	80
8.2.89	String primitive	80
8.3	Package TopologyProfile	80
8.3.1	General	80
8.3.2	(Description) ACDCCConverterDCTerminal.....	82
8.3.3	(abstract) ACDCTerminal.....	82
8.3.4	(abstract) BaseVoltage root class	82
8.3.5	(Description) ConnectivityNode root class.....	82
8.3.6	(abstract) ConnectivityNodeContainer root class.....	83
8.3.7	(abstract) DCBaseTerminal.....	83
8.3.8	(abstract) DCEquipmentContainer root class	83
8.3.9	(Description) DCNode.....	83
8.3.10	(Description) DCTerminal	84
8.3.11	DCTopologicalNode	84
8.3.12	(abstract) IdentifiedObject root class	85
8.3.13	(Description) Terminal	85
8.3.14	TopologicalNode.....	86
8.3.15	Date primitive	87
8.3.16	(abstract) ReportingGroup	87
8.3.17	String primitive	87
8.4	Package StateVariablesProfile	87
8.4.1	General	87
8.4.2	(abstract) ACDCCConverter	90
8.4.3	(abstract) ACDCTerminal.....	90

8.4.4	(Description) CsConverter	90
8.4.5	(abstract) ConductingEquipment root class	91
8.4.6	DCTopologicalIsland	91
8.4.7	(abstract) DCTopologicalNode	92
8.4.8	(abstract) IdentifiedObject root class	92
8.4.9	(abstract) ShuntCompensator root class	93
8.4.10	SvInjection root class	93
8.4.11	SvPowerFlow root class	93
8.4.12	SvShuntCompensatorSections root class	94
8.4.13	SvStatus root class	94
8.4.14	SvSwitch root class	95
8.4.15	SvTapStep root class	95
8.4.16	SvVoltage root class	96
8.4.17	(abstract) Switch	96
8.4.18	(abstract) TapChanger root class	96
8.4.19	(abstract) Terminal	97
8.4.20	TopologicalIsland	97
8.4.21	(abstract) TopologicalNode root class	98
8.4.22	(Description) VsConverter	98
8.4.23	UnitMultiplier enumeration	98
8.4.24	UnitSymbol enumeration	99
8.4.25	ActivePower datatype	105
8.4.26	AngleDegrees datatype	105
8.4.27	CurrentFlow datatype	105
8.4.28	ReactivePower datatype	105
8.4.29	Voltage datatype	106
8.4.30	Boolean primitive	106
8.4.31	Date primitive	106
8.4.32	Float primitive	106
8.4.33	String primitive	106
	Bibliography	107
	Figure 1 – Relations between MAS, profile and dataset	23
	Figure 2 – Profile relationships	24
	Figure 3 – Connectivity and solution model	25
	Figure 4 – The European power system with regions	27
	Figure 5 – Information exchange in power flow and sharing of results	27
	Figure 6 – EMS datasets to an external client	28
	Figure 7 – Node-breaker power flow integration architecture	29
	Figure 8 – Bus-branch power flow integration architecture	29
	Figure 9 – Line boundary dataset example	30
	Figure 10 – Substation boundary dataset example	30
	Figure 11 – Merged model	31
	Figure 12 – Alternate boundary modelling	32
	Figure 13 – Merged model alternatives	32
	Figure 14 – Partitioning of a merged model	33
	Figure 15 – Relation between ConnectivityNode and TopologicalNode	35

Figure 16 – Bus-branch modelling of bus coupler and line transfer	36
Figure 17 – Class diagram SteadyStateHypothesisProfile::SteadyStateHypothesisProfile	37
Figure 18 – Class diagram SteadyStateHypothesisProfile::Core	38
Figure 19 – Class diagram SteadyStateHypothesisProfile::DC	39
Figure 20 – Class diagram SteadyStateHypothesisProfile::OperationalLimits	39
Figure 21 – Class diagram SteadyStateHypothesisProfile::Datatypes	40
Figure 22 – Class diagram TopologyProfile::TopologyProfile	81
Figure 23 – Class diagram TopologyProfile::Datatypes	81
Figure 24 – Class diagram StateVariablesProfile::StateVariablesProfile	88
Figure 25 – Class diagram StateVariablesProfile::Datatypes	89
Table 1 – Attributes of SteadyStateHypothesisProfile::ACDCCConverter	41
Table 2 – Attributes of SteadyStateHypothesisProfile::ACDCCConverterDCTerminal	42
Table 3 – Attributes of SteadyStateHypothesisProfile::ACDCTerminal	42
Table 4 – Attributes of SteadyStateHypothesisProfile::ActivePowerLimit	42
Table 5 – Attributes of SteadyStateHypothesisProfile::ApparentPowerLimit	43
Table 6 – Attributes of SteadyStateHypothesisProfile::AsynchronousMachine	43
Table 7 – Attributes of SteadyStateHypothesisProfile::BatteryUnit	43
Table 8 – Attributes of SteadyStateHypothesisProfile::Breaker	44
Table 9 – Attributes of SteadyStateHypothesisProfile::ConductingEquipment	44
Table 10 – Attributes of SteadyStateHypothesisProfile::ConformLoad	44
Table 11 – Attributes of SteadyStateHypothesisProfile::ControlArea	45
Table 12 – Attributes of SteadyStateHypothesisProfile::CsConverter	46
Table 13 – Attributes of SteadyStateHypothesisProfile::CurrentLimit	46
Table 14 – Attributes of SteadyStateHypothesisProfile::DCBaseTerminal	47
Table 15 – Attributes of SteadyStateHypothesisProfile::DCTerminal	47
Table 16 – Attributes of SteadyStateHypothesisProfile::Disconnecter	47
Table 17 – Attributes of SteadyStateHypothesisProfile::DisconnectingCircuitBreaker	48
Table 18 – Attributes of SteadyStateHypothesisProfile::EnergyConnection	48
Table 19 – Attributes of SteadyStateHypothesisProfile::EnergyConsumer	49
Table 20 – Attributes of SteadyStateHypothesisProfile::EnergySource	49
Table 21 – Attributes of SteadyStateHypothesisProfile::Equipment	50
Table 22 – Attributes of SteadyStateHypothesisProfile::EquivalentEquipment	50
Table 23 – Attributes of SteadyStateHypothesisProfile::EquivalentInjection	51
Table 24 – Attributes of SteadyStateHypothesisProfile::ExternalNetworkInjection	51
Table 25 – Attributes of SteadyStateHypothesisProfile::Fuse	52
Table 26 – Attributes of SteadyStateHypothesisProfile::GeneratingUnit	52
Table 27 – Attributes of SteadyStateHypothesisProfile::GroundDisconnecter	52
Table 28 – Attributes of SteadyStateHypothesisProfile::HydroGeneratingUnit	53
Table 29 – Attributes of SteadyStateHypothesisProfile::IdentifiedObject	53
Table 30 – Attributes of SteadyStateHypothesisProfile::Jumper	53
Table 31 – Attributes of SteadyStateHypothesisProfile::LinearShuntCompensator	54

Table 32 – Attributes of SteadyStateHypothesisProfile::LoadBreakSwitch	54
Table 33 – Attributes of SteadyStateHypothesisProfile::NonConformLoad	55
Table 34 – Attributes of SteadyStateHypothesisProfile::NonlinearShuntCompensator	55
Table 35 – Attributes of SteadyStateHypothesisProfile::NuclearGeneratingUnit	55
Table 36 – Attributes of SteadyStateHypothesisProfile::OperationalLimit	56
Table 37 – Attributes of SteadyStateHypothesisProfile::PhaseTapChanger	56
Table 38 – Attributes of SteadyStateHypothesisProfile::PhaseTapChangerAsymmetrical	56
Table 39 – Attributes of SteadyStateHypothesisProfile::PhaseTapChangerLinear	57
Table 40 – Attributes of SteadyStateHypothesisProfile::PhaseTapChangerNonLinear	57
Table 41 – Attributes of SteadyStateHypothesisProfile::PhaseTapChangerSymmetrical	58
Table 42 – Attributes of SteadyStateHypothesisProfile::PhaseTapChangerTabular	58
Table 43 – Attributes of SteadyStateHypothesisProfile::PowerElectronicsConnection	58
Table 44 – Attributes of SteadyStateHypothesisProfile::PowerElectronicsUnit	59
Table 45 – Attributes of SteadyStateHypothesisProfile::PowerSystemResource	59
Table 46 – Attributes of SteadyStateHypothesisProfile::ProtectedSwitch	59
Table 47 – Attributes of SteadyStateHypothesisProfile::RatioTapChanger	60
Table 48 – Attributes of SteadyStateHypothesisProfile::RegulatingCondEq	60
Table 49 – Attributes of SteadyStateHypothesisProfile::RegulatingControl	61
Table 50 – Attributes of SteadyStateHypothesisProfile::RotatingMachine	62
Table 51 – Attributes of SteadyStateHypothesisProfile::ShuntCompensator	62
Table 52 – Attributes of SteadyStateHypothesisProfile::SolarGeneratingUnit	63
Table 53 – Attributes of SteadyStateHypothesisProfile::StaticVarCompensator	63
Table 54 – Attributes of SteadyStateHypothesisProfile::StationSupply	64
Table 55 – Attributes of SteadyStateHypothesisProfile::Switch	64
Table 56 – Attributes of SteadyStateHypothesisProfile::SynchronousMachine	65
Table 57 – Attributes of SteadyStateHypothesisProfile::TapChanger	65
Table 58 – Attributes of SteadyStateHypothesisProfile::TapChangerControl	66
Table 59 – Attributes of SteadyStateHypothesisProfile::Terminal	66
Table 60 – Attributes of SteadyStateHypothesisProfile::ThermalGeneratingUnit	66
Table 61 – Attributes of SteadyStateHypothesisProfile::VoltageLimit	67
Table 62 – Attributes of SteadyStateHypothesisProfile::VsConverter	67
Table 63 – Attributes of SteadyStateHypothesisProfile::WindGeneratingUnit	68
Table 64 – Literals of SteadyStateHypothesisProfile::AsynchronousMachineKind	68
Table 65 – Literals of SteadyStateHypothesisProfile::BatteryStateKind	68
Table 66 – Literals of SteadyStateHypothesisProfile::CsOperatingModeKind	69
Table 67 – Literals of SteadyStateHypothesisProfile::CsPpccControlKind	69
Table 68 – Literals of SteadyStateHypothesisProfile::SynchronousMachineOperatingMode	69
Table 69 – Literals of SteadyStateHypothesisProfile::UnitMultiplier	70
Table 70 – Literals of SteadyStateHypothesisProfile::UnitSymbol	71
Table 71 – Literals of SteadyStateHypothesisProfile::VsPpccControlKind	76
Table 72 – Literals of SteadyStateHypothesisProfile::VsQpccControlKind	77
Table 73 – Attributes of SteadyStateHypothesisProfile::ActivePower	77

Table 74 – Attributes of SteadyStateHypothesisProfile::AngleDegrees	77
Table 75 – Attributes of SteadyStateHypothesisProfile::AngleRadians	78
Table 76 – Attributes of SteadyStateHypothesisProfile::ApparentPower	78
Table 77 – Attributes of SteadyStateHypothesisProfile::CurrentFlow	78
Table 78 – Attributes of SteadyStateHypothesisProfile::PerCent	78
Table 79 – Attributes of SteadyStateHypothesisProfile::PU	79
Table 80 – Attributes of SteadyStateHypothesisProfile::ReactivePower	79
Table 81 – Attributes of SteadyStateHypothesisProfile::RealEnergy	79
Table 82 – Attributes of SteadyStateHypothesisProfile::Resistance	80
Table 83 – Attributes of SteadyStateHypothesisProfile::Voltage	80
Table 84 – Attributes of TopologyProfile::ACDCConverterDCTerminal	82
Table 85 – Association ends of TopologyProfile::ACDCConverterDCTerminal with other classes	82
Table 86 – Attributes of TopologyProfile::ACDCTerminal	82
Table 87 – Association ends of TopologyProfile::ConnectivityNode with other classes	83
Table 88 – Attributes of TopologyProfile::DCBaseTerminal	83
Table 89 – Association ends of TopologyProfile::DCBaseTerminal with other classes	83
Table 90 – Attributes of TopologyProfile::DCNode	84
Table 91 – Association ends of TopologyProfile::DCNode with other classes	84
Table 92 – Attributes of TopologyProfile::DCTerminal	84
Table 93 – Association ends of TopologyProfile::DCTerminal with other classes	84
Table 94 – Attributes of TopologyProfile::DCTopologicalNode	85
Table 95 – Association ends of TopologyProfile::DCTopologicalNode with other classes	85
Table 96 – Attributes of TopologyProfile::IdentifiedObject	85
Table 97 – Attributes of TopologyProfile::Terminal	86
Table 98 – Association ends of TopologyProfile::Terminal with other classes	86
Table 99 – Attributes of TopologyProfile::TopologicalNode	86
Table 100 – Association ends of TopologyProfile::TopologicalNode with other classes	87
Table 101 – Attributes of TopologyProfile::ReportingGroup	87
Table 102 – Attributes of StateVariablesProfile::ACDCConverter	90
Table 103 – Attributes of StateVariablesProfile::ACDCTerminal	90
Table 104 – Attributes of StateVariablesProfile::CsConverter	91
Table 105 – Attributes of StateVariablesProfile::DCTopologicalIsland	92
Table 106 – Association ends of StateVariablesProfile::DCTopologicalIsland with other classes	92
Table 107 – Attributes of StateVariablesProfile::DCTopologicalNode	92
Table 108 – Attributes of StateVariablesProfile::IdentifiedObject	93
Table 109 – Attributes of StateVariablesProfile::SvInjection	93
Table 110 – Association ends of StateVariablesProfile::SvInjection with other classes	93
Table 111 – Attributes of StateVariablesProfile::SvPowerFlow	94
Table 112 – Association ends of StateVariablesProfile::SvPowerFlow with other classes	94
Table 113 – Attributes of StateVariablesProfile::SvShuntCompensatorSections	94

Table 114 – Association ends of StateVariablesProfile::SvShuntCompensatorSections with other classes	94
Table 115 – Attributes of StateVariablesProfile::SvStatus	95
Table 116 – Association ends of StateVariablesProfile::SvStatus with other classes	95
Table 117 – Attributes of StateVariablesProfile::SvSwitch	95
Table 118 – Association ends of StateVariablesProfile::SvSwitch with other classes	95
Table 119 – Attributes of StateVariablesProfile::SvTapStep	96
Table 120 – Association ends of StateVariablesProfile::SvTapStep with other classes	96
Table 121 – Attributes of StateVariablesProfile::SvVoltage	96
Table 122 – Association ends of StateVariablesProfile::SvVoltage with other classes	96
Table 123 – Attributes of StateVariablesProfile::Terminal	97
Table 124 – Attributes of StateVariablesProfile::TopologicalIsland	97
Table 125 – Association ends of StateVariablesProfile::TopologicalIsland with other classes	97
Table 126 – Attributes of StateVariablesProfile::VsConverter	98
Table 127 – Literals of StateVariablesProfile::UnitMultiplier	99
Table 128 – Literals of StateVariablesProfile::UnitSymbol	100
Table 129 – Attributes of StateVariablesProfile::ActivePower	105
Table 130 – Attributes of StateVariablesProfile::AngleDegrees	105
Table 131 – Attributes of StateVariablesProfile::CurrentFlow	105
Table 132 – Attributes of StateVariablesProfile::ReactivePower	106
Table 133 – Attributes of StateVariablesProfile::Voltage	106

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

Part 456: Solved power system state profiles

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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.

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