



European Network of
Transmission System Operators
for Electricity

EQUIPMENT RELIABILITY PROFILE SPECIFICATION

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Revision History

Version	Date	Paragraph	Comments
0.1.0	2021-10-12		For CIM EG review. This profile replaces Available Remedial Action Profile. These new profiles include also information on SIPS, GLSK, limits, area and overlapping zone.
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917		

918 1 Introduction

919 The equipment reliability profile enables exchanges of additional information related to
920 equipment as well as FACTS, limits, area and GLSK amongst others.

921 2 Application profile specification

922 2.1 Version information

923 The content is generated from UML model file CIM17-2_CGMES31v01_PROF-
924 20v02_NC24v19_MS10v03_DES10v01.eap.

925 This edition is based on the IEC 61970 UML version 'IEC61970CIM17v40', dated '2020-08-24'.

- 926 - Title: Equipment Reliability Vocabulary
- 927 - Keyword: ER
- 928 - Description: This vocabulary is describing the equipment reliability profile.
- 929 - Version IRI: <https://ap-voc.cim4.eu/EquipmentReliability/2.4>
- 930 - Version info: 2.4.1
- 931 - Prior version: <https://ap-voc.cim4.eu/EquipmentReliability/2.3>
- 932 - Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-
933 7:amd1|file://iec61970cim17v40_iec61968cim13v13a_iec62325cim03v17a.eap|urn:iso:
934 std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-2|file://CIM17-
935 2_CGMES31v01_PROF-20v02_NC24v19_MS10v03_DES10v01.eap
- 936 - Identifier: 376b0343-2bdc-4e36-8d43-26978e3c2315

937

938 2.2 Constraints naming convention

939 The naming of the rules shall not be used for machine processing. The rule names are just a
940 string. The naming convention of the constraints is as follows.

941 "{rule.Type}:{rule.Standard}:{rule.Profile}:{rule.Property}:{rule.Name}"

942 where

943 rule.Type: C – for constraint; R – for requirement

944 rule.Standard: the number of the standard e.g. 301 for 61970-301, 456 for 61970-456, 13 for
945 61968-13. 61970-600 specific constraints refer to 600 although they are related to one or
946 combination of the 61970-450 series profiles. For NC profiles, NC is used.

947 rule.Profile: the abbreviation of the profile, e.g. TP for Topology profile. If set to "ALL" the
948 constraint is applicable to all IEC 61970-600 profiles.

949 rule.Property: for UML classes, the name of the class, for attributes and associations, the name
950 of the class and attribute or association end, e.g. EnergyConsumer, IdentifiedObject.name, etc.
951 If set to "NA" the property is not applicable to a specific UML element.

952 rule.Name: the name of the rule. It is unique for the same property.

953 Example: C:600:ALL:IdentifiedObject.name:stringLength

954 **2.3 Profile constraints**

955 This clause defines requirements and constraints that shall be fulfilled by applications that
956 conform to this document.

957 This document is the master for rules and constraints tagged "NC". For the sake of self-
958 containment, the list below also includes a copy of the relevant rules from IEC 61970-452,
959 tagged "452".

- 960 • C:452:ALL:NA:datatypes

961 According to 61970-501, datatypes are not exchanged in the instance data. The
962 UnitMultiplier is 1 in cases none value is specified in the profile.

- 963 • R:452:ALL:NA:exchange

964 Optional and required attributes and associations must be imported and exported if they
965 are in the model file prior to import.

- 966 • R:452:ALL:NA:exchange1

967 If an optional attribute does not exist in the imported file, it does not have to be exported
968 in case exactly the same data set is exported, i.e. the tool is not obliged to automatically
969 provide this attribute. If the export is resulting from an action by the user performed after
970 the import, e.g. data processing or model update the export can contain optional
971 attributes.

- 972 • R:452:ALL:NA:exchange2

973 In most of the profiles the selection of optional and required attributes is made so as to
974 ensure a minimum set of required attributes without which the exchange does not fulfil
975 its basic purpose. Business processes governing different exchanges can require
976 mandatory exchange of certain optional attributes or associations. Optional and required
977 attributes and associations shall therefore be supported by applications which claim
978 conformance with certain functionalities of the IEC 61970-452. This provides flexibility
979 for the business processes to adapt to different business requirements and base the
980 exchanges on IEC 61970-452 compliant applications.

- 981 • R:452:ALL:NA:exchange3

982 An exporter may, at his or her discretion, produce a serialization containing additional
983 class data described by the CIM Schema but not required by this document provided
984 these data adhere to the conventions established in Clause 5.

- 985 • R:452:ALL:NA:exchange4

986 From the standpoint of the model import used by a data recipient, the document
987 describes a subset of the CIM that importing software shall be able to interpret in order
988 to import exported models. Data providers are free to exceed the minimum requirements
989 described herein as long as their resulting data files are compliant with the CIM Schema
990 and the conventions established in Clause 5. The document, therefore, describes
991 additional classes and class data that, although not required, exporters will, in all
992 likelihood, choose to include in their data files. The additional classes and data are
993 labelled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them
994 from their required counterparts. Please note, however, that data importers could
995 potentially receive data containing instances of any and all classes described by the
996 CIM Schema.

- 997 • R:452:ALL:NA:cardinality

- 998 The cardinality defined in the CIM model shall be followed, unless a more restrictive
999 cardinality is explicitly defined in this document. For instance, the cardinality on the
1000 association between VoltageLevel and BaseVoltage indicates that a VoltageLevel shall
1001 be associated with one and only one BaseVoltage, but a BaseVoltage can be associated
1002 with zero to many VoltageLevels.
- 1003 • R:452:ALL:NA:associations
- 1004 Associations between classes referenced in this document and classes not referenced
1005 here are not required regardless of cardinality.
- 1006 • R:452:ALL:IdentifiedObject.name:rule
- 1007 The attribute “name” inherited by many classes from the abstract class IdentifiedObject
1008 is not required to be unique. It must be a human readable identifier without additional
1009 embedded information that would need to be parsed. The attribute is used for purposes
1010 such as User Interface and data exchange debugging. The MRID defined in the data
1011 exchange format is the only unique and persistent identifier used for this data exchange.
1012 The attribute IdentifiedObject.name is, however, always required for CoreEquipment
1013 profile and Short Circuit profile.
- 1014 • R:452:ALL:IdentifiedObject.description:rule
- 1015 The attribute “description” inherited by many classes from the abstract class
1016 IdentifiedObject must contain human readable text without additional embedded
1017 information that would need to be parsed.
- 1018 • R:452:ALL:NA:uniqueIdentifier
- 1019 All IdentifiedObject-s shall have a persistent and globally unique identifier (Master
1020 Resource Identifier - mRID).
- 1021 • R:452:ALL:NA:unitMultiplier
- 1022 For exchange of attributes defined using CIM Data Types (ActivePower, Susceptance,
1023 etc.) a unit multiplier of 1 is used if the UnitMultiplier specified in this document is “none”.
- 1024 • C:452:ALL:IdentifiedObject.name:stringLength
- 1025 The string IdentifiedObject.name has a maximum of 128 characters.
- 1026 • C:452:ALL:IdentifiedObject.description:stringLength
- 1027 The string IdentifiedObject.description is maximum 256 characters.
- 1028 • C:452:ALL:NA:float
- 1029 An attribute that is defined as float (e.g. has a type Float or a type which is a Datatype
1030 with .value attribute of type Float) shall support ISO/IEC 60559:2020 for floating-point
1031 arithmetic using single precision floating point. A single precision float supports 7
1032 significant digits where the significant digits are described as an integer, or a decimal
1033 number with 6 decimal digits. Two float values are equal when the significant with 7
1034 digits are identical, e.g. 1234567 is equal 1.234567E6 and so are 1.2345678 and
1035 1.234567E0.
- 1036 • R:NC:ER:AreaDispatchableUnit.interconnection

- 1037 In cases where the AreaDispatchingUnit is providing dispatch support for a control area
1038 outside its location it shall refer to TieCorridor that refers to ControlArea. Otherwise, the
1039 AreaDispatchingUnit shall refer to SchedulingArea.
- 1040 • C:NC:ER:AreaDispatchableUnit:associations
- 1041 The AreaDispatchableUnit shall be associated with either GeneratingUnit,
1042 PowerElectronicsUnit, EnergyConsumer, ScheduleResource or HydroPump.
- 1043 • C:NC:ER:EnergyComponent:associations
- 1044 The EnergyComponent shall be associated with either GeneratingUnit,
1045 PowerElectronicsUnit, EnergyConsumer or HydroPump.
- 1046 • R:NC:ER:VoltageAngleLimit:AngleReferenceTerminal
- 1047 Due to the nature of the exchange and requirements it is allowed that the association
1048 VoltageAngleLimit.AngleReferenceTerminal provides a dangling reference. This occurs
1049 when the referenced Terminal is in another MAS. Validation of this association is only
1050 performed when all dangling references are completed.
- 1051 • R:NC:ALL:NA:serialization
- 1052 The profiles are defined in the EnterpriseArchitect application and have multiple artifacts
1053 that describe them. The main artifacts are:
- 1054 1) the EAP file (EnterpriseArchitect project file),
1055 2) the profiles' specification document and
1056 3) the application profiles (RDFS and SHACL).
- 1057 Due to the complexity of the profiles, there are various cross profile associations that,
1058 from profiling and profile maintenance point of view, it is not practical to include the
1059 complete inheritance structure in all profiles. If this is done the documentation provided
1060 for all profiles would also include duplicated information on the description of classes
1061 defined in other profiles. The following cases are often observed in profiles:
- 1062 ○ Case 1: An association end refers to an abstract class
1063 ○ Case 2: An abstract class (stereotyped with "Description") has an association
1064 (direction to another class)
1065 ○ Case 3: An abstract class (not stereotyped with "Description") has an
1066 association (direction to another class)
1067 ○ Case 4: An abstract class has attributes and subclasses are not in the profile
- 1068 In all cases, the datasets shall only include the subtypes of the abstract classes with
1069 the related properties (i.e. association or attributes) defined in the profile. The
1070 information is taken from either canonical model or the profiles where complete
1071 (expected) inheritance structure for the related abstract class is described. SHACL
1072 based constraints include constraints only for the concrete classes that are subtypes of
1073 the abstract class in the profile, and this can be used to inform which are the concrete
1074 classes expected in a dataset that conforms to this profile.
- 1075 It should be taken into account that this approach deviates from MVAL5 (IEC 61970-
1076 600-1:2021), which creates multiple inheritance at serialization. For instance, with this
1077 more explicit exchange the serialization of the association between abstract class
1078 Equipment and abstract class Circuit for a PowerTransformer will be serialized as
1079 follows:
- 1080 ○ for association
- 1081 <cim:PowerTransformer rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">

1082 <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>
 1083 </cim:PowerTransformer>
 1084 o for attribute
 1085 <cim:ACLineSegment rdf:about="_04f681aa-6999-4fb3-9775-acaa5eb7ceff">
 1086 <cim:Equipment.inService>true</cim:Equipment.inService>
 1087 </cim:ACLineSegment>

1088 The usage of rdf:ID or rdf:about depends on the stereotype of the class. rdf:about is
 1089 used if the class has the stereotype "Description".

1090 An example of not allowed serialization, as the Equipment is an abstract class

1091 <cim:Equipment rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">
 1092 <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>
 1093 </cim:Equipment>

1094 • C:NC:ER:HydroPowerPlant:operatingMode

1095 The SynchronousMachine.operatingMode of all SynchronousMachine objects part of a
 1096 HydroPowerPlant shall be consistent.

1097 • C:NC:ER:Circuit:associations

1098 The Circuit shall be associated with either Equipment or Terminal.

1099 • C:NC:ER:FunctionOutputVariable.PropertyReference:value

1100 The value of the association end FunctionOutputVariable.PropertyReference shall be
 1101 one of the values published in the skos:ConceptScheme
 1102 <https://energy.referencedata.eu/PropertyReference/>.

1103 • C:NC:ER:RotatingMachine.GeneratingUnit:associationApplicability

1104 An EquivalentGeneratingUnit shall not be referenced by a RotatingMachine via the
 1105 association end RotatingMachine.GeneratingUnit.

1106 • C:NC:ER:InfeedLimit:requiredAttributes

1107 An InfeedLimit shall have either .normalValueA or .normalValueW.

1108

1109

1110

1111 2.4 Metadata

1112 ENTSO-E agreed to extend the header and metadata definitions by IEC 61970-552 Ed2. This
 1113 new header definitions rely on W3C recommendations which are used worldwide and are
 1114 positively recognised by the European Commission. The new definitions of the header mainly
 1115 use Provenance ontology (PROV-O), Time Ontology and Data Catalog Vocabulary (DCAT). The
 1116 global new header applicable for this profile is included in the metadata and document header
 1117 specification document.

1118 The header vocabulary contains all attributes defined in IEC 61970-552. This is done only for
1119 the purpose of having one vocabulary for header and to ensure transition for data exchanges
1120 that are using IEC 61970-552:2016 header. This profile does not use IEC 61970-552:2016
1121 header attributes and relies only on the extended attributes.

1122 **2.4.1 Constraints**

1123 The identification of the constraints related to the metadata follows the same convention for
1124 naming of the constraints as for profile constraints.

- 1125 • R:NC:ALL:wasAttributedTo:usage

1126 The prov:wasAttributedTo should normally be the “X” EIC code of the actor or their URI
1127 (prov:Agent).

1128

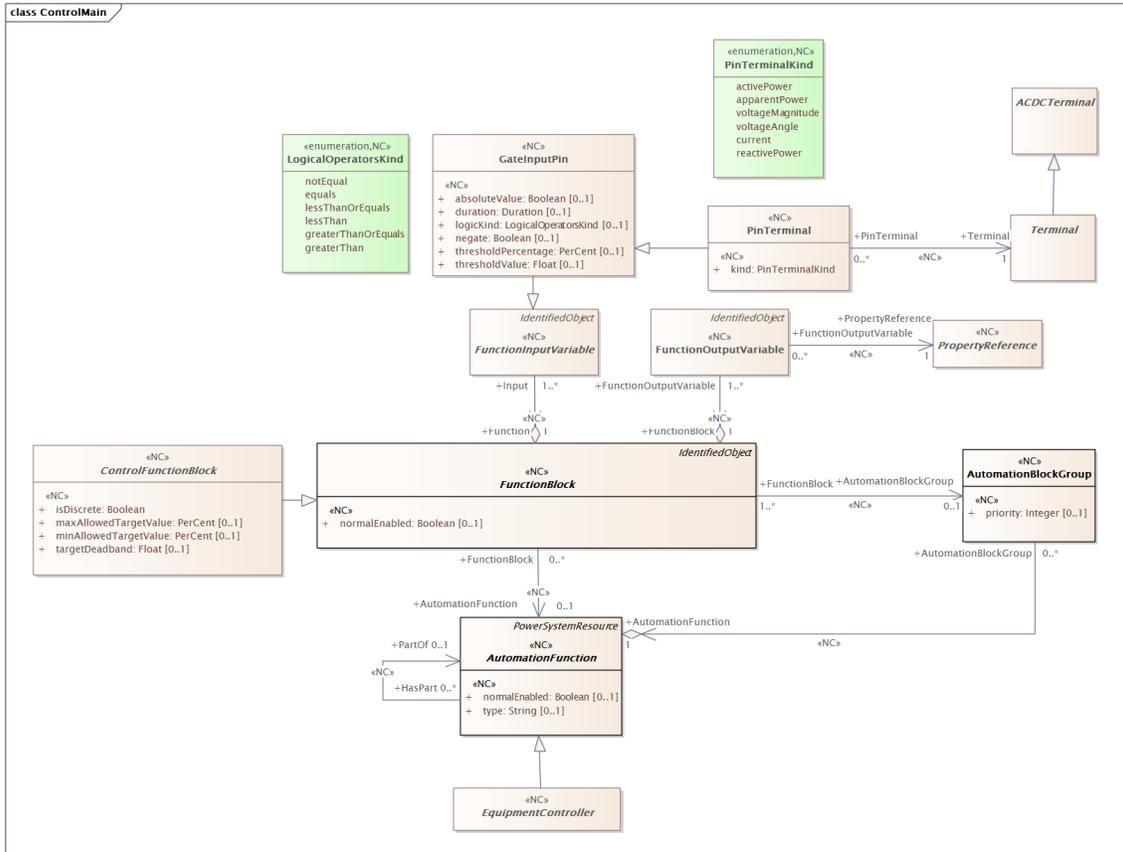
1129 **2.4.2 Reference metadata**

1130 The header defined for this profile requires availability of a set of reference metadata. For
1131 instance, the attribute prov:wasGeneratedBy requires a reference to an activity which produced
1132 the model or the related process. The activities are defined as reference metadata and their
1133 identifiers are referenced from the header to enable the receiving entity to retrieve the “static”
1134 (reference) information that it is not modified frequently. This approach imposes a requirement
1135 that both the sending entity and the receiving entity have access to a unique version of the
1136 reference metadata. Therefore, each business process shall define which reference metadata
1137 is used and where it is located.

1138 **3 Detailed Profile Specification**

1139 **3.1 General**

1140 This package contains equipment reliability profile.



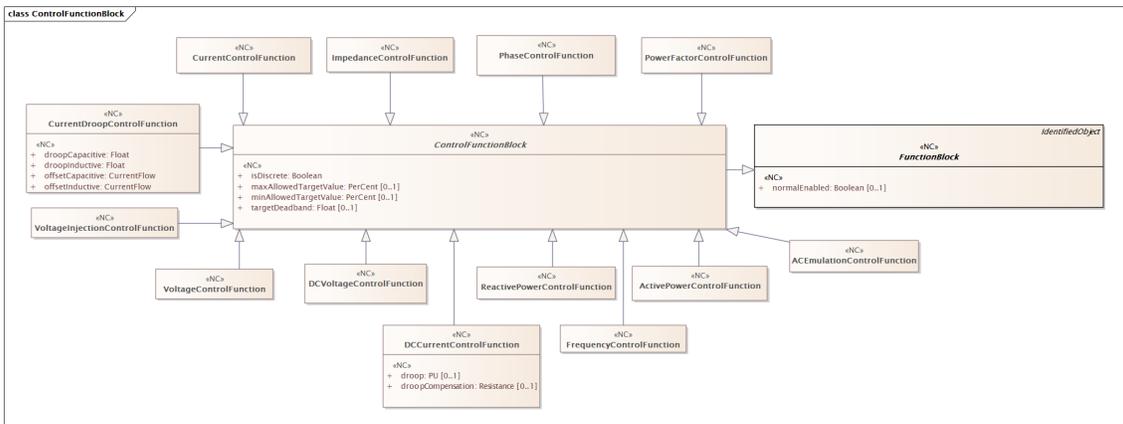
1141

1142

Figure 1 – Class diagram EquipmentReliabilityProfile::ControlMain

1143

Figure 1: The diagram shows main structure of the control related classes.



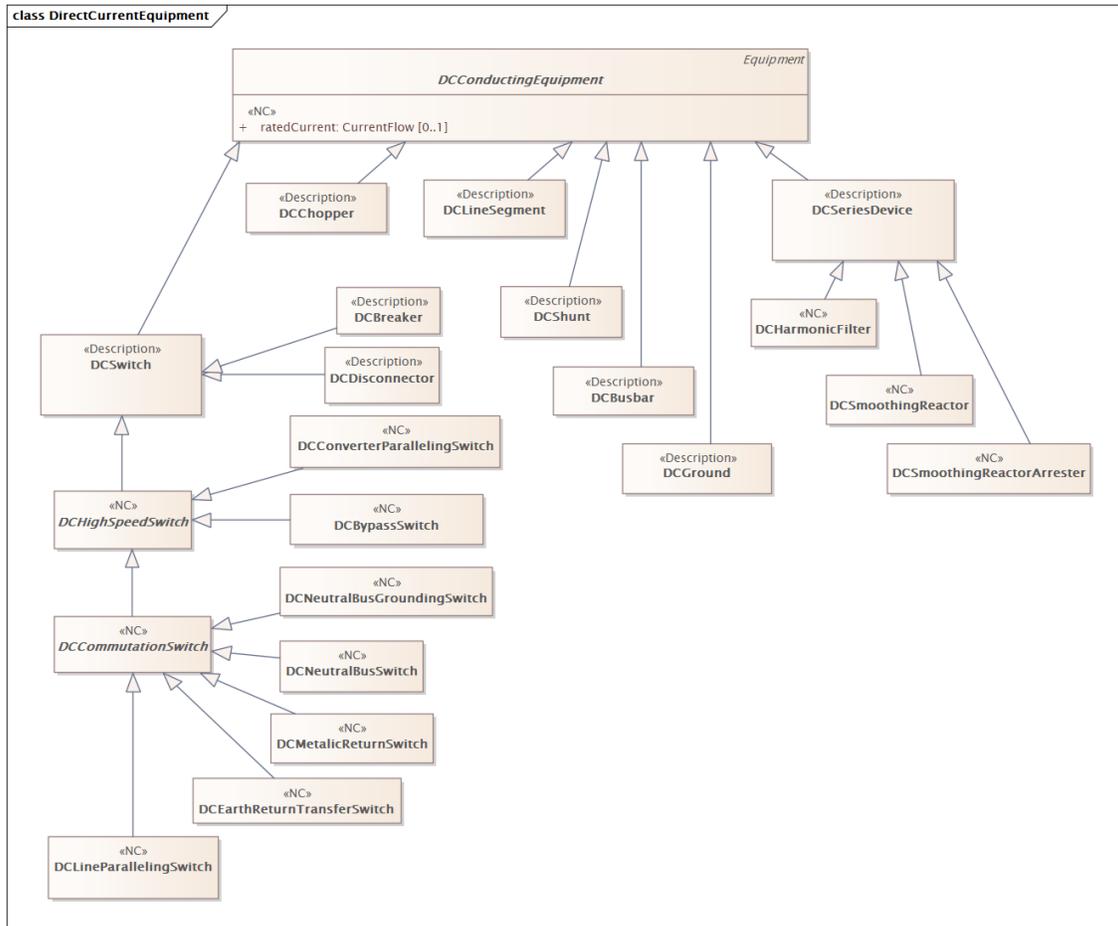
1144

1145

Figure 2 – Class diagram EquipmentReliabilityProfile::ControlFunctionBlock

1146

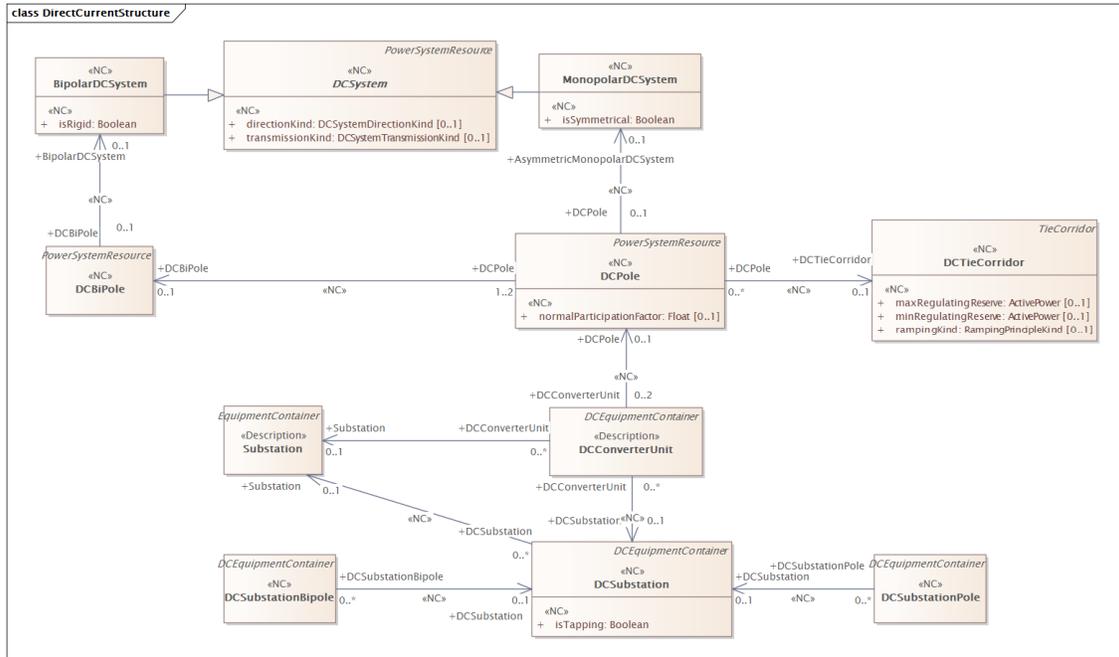
Figure 2: The diagram shows control function block related classes.



1150

1151 **Figure 4 – Class diagram EquipmentReliabilityProfile::DirectCurrentEquipment**

1152 Figure 4: The diagram shows the DC equipment model.



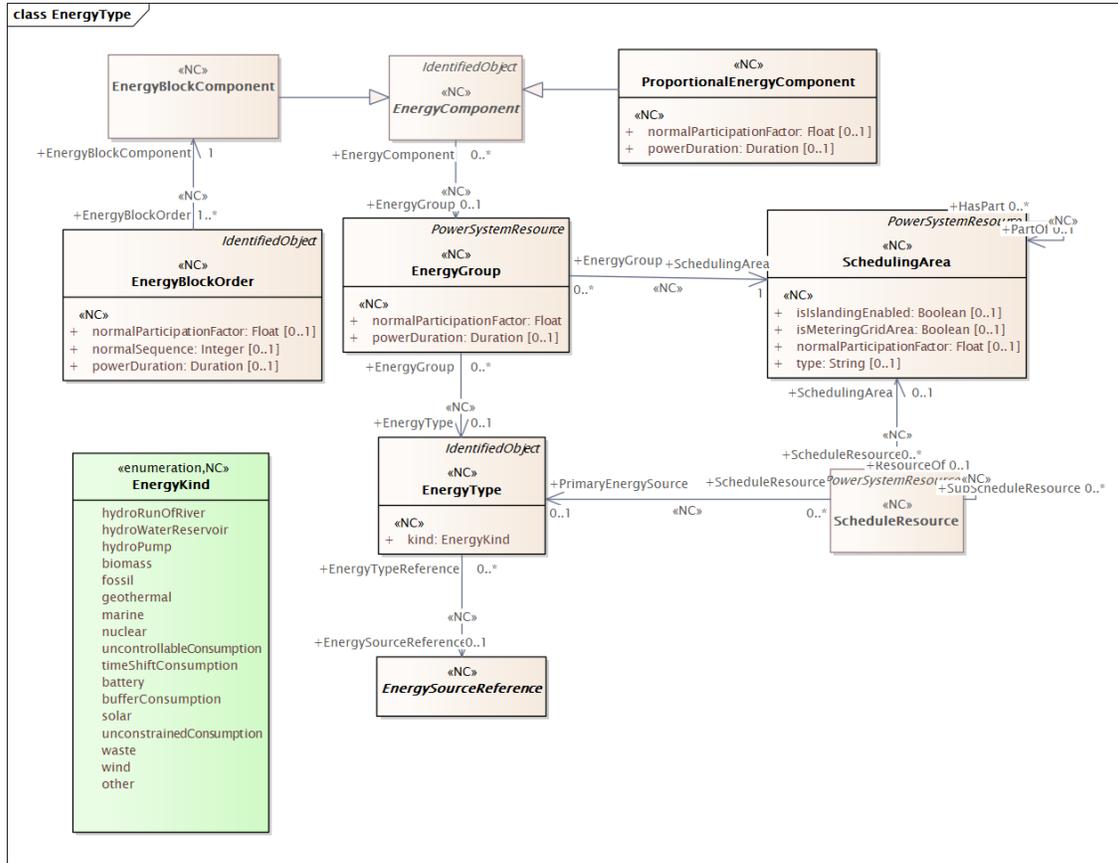
1153

1154

Figure 5 – Class diagram EquipmentReliabilityProfile::DirectCurrentStructure

1155

Figure 5: The diagram contains classes related to direct current structure.

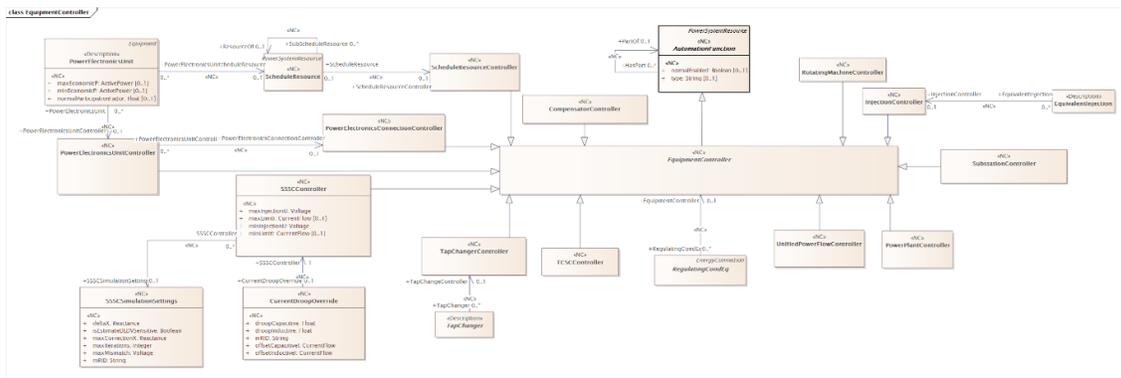


1156

1157

Figure 6 – Class diagram EquipmentReliabilityProfile::EnergyType

1158 Figure 6:

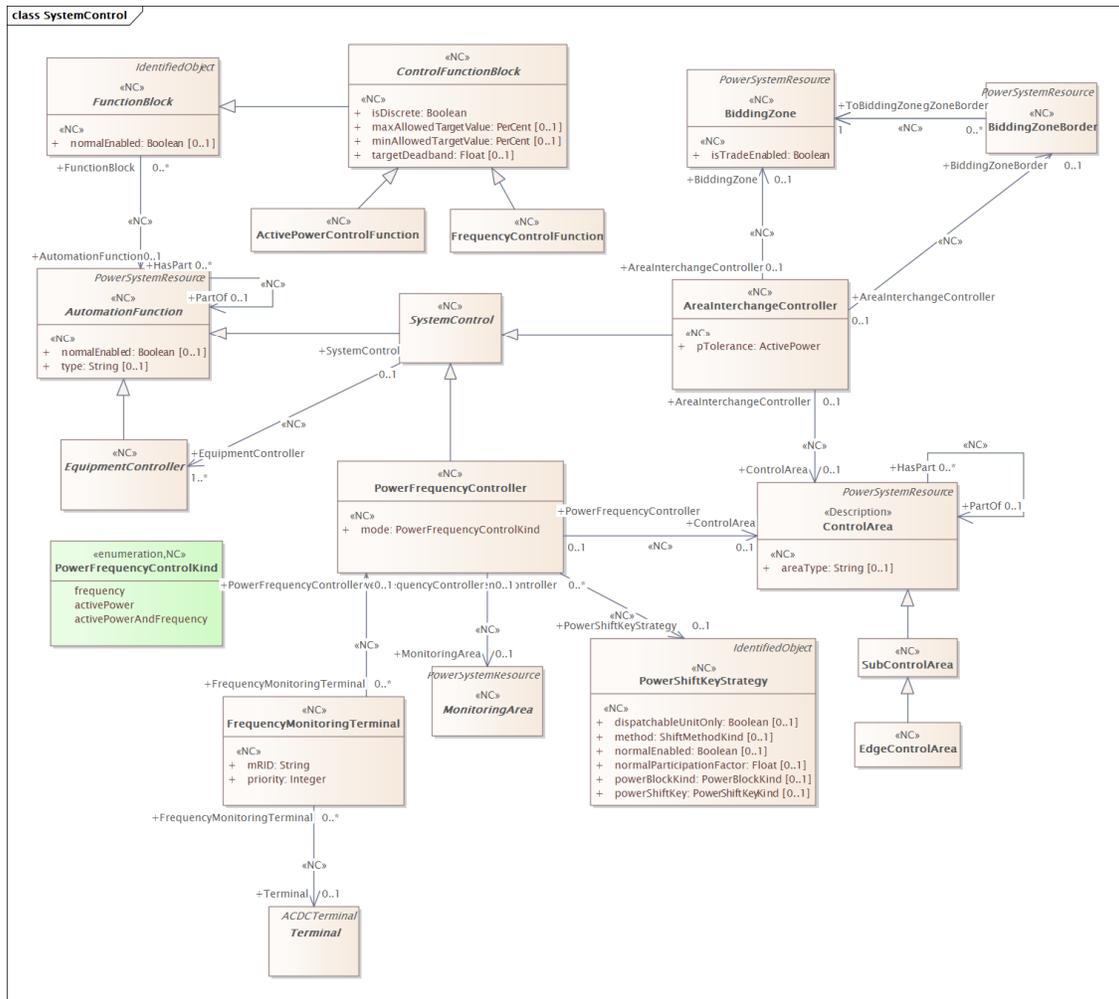


1159

1160

Figure 7 – Class diagram EquipmentReliabilityProfile::EquipmentController

1161 Figure 7: The diagram shows equipment controller related classes.



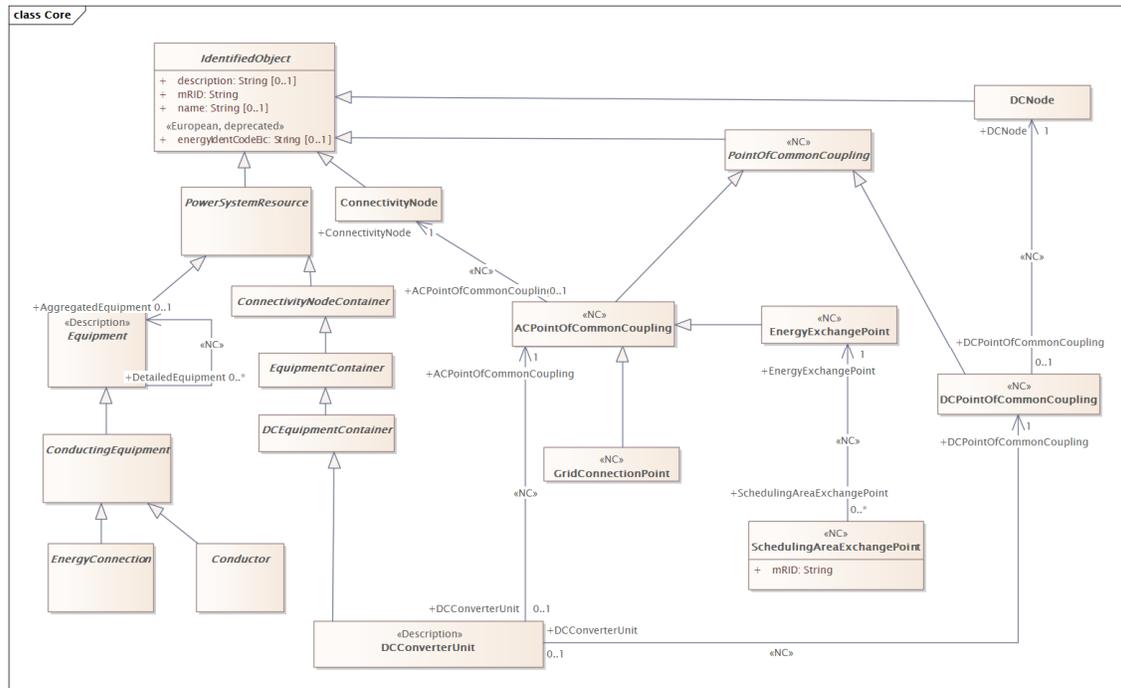
1162

1163

Figure 8 – Class diagram EquipmentReliabilityProfile::SystemControl

1164

Figure 8: The diagram contains classes related to system control.



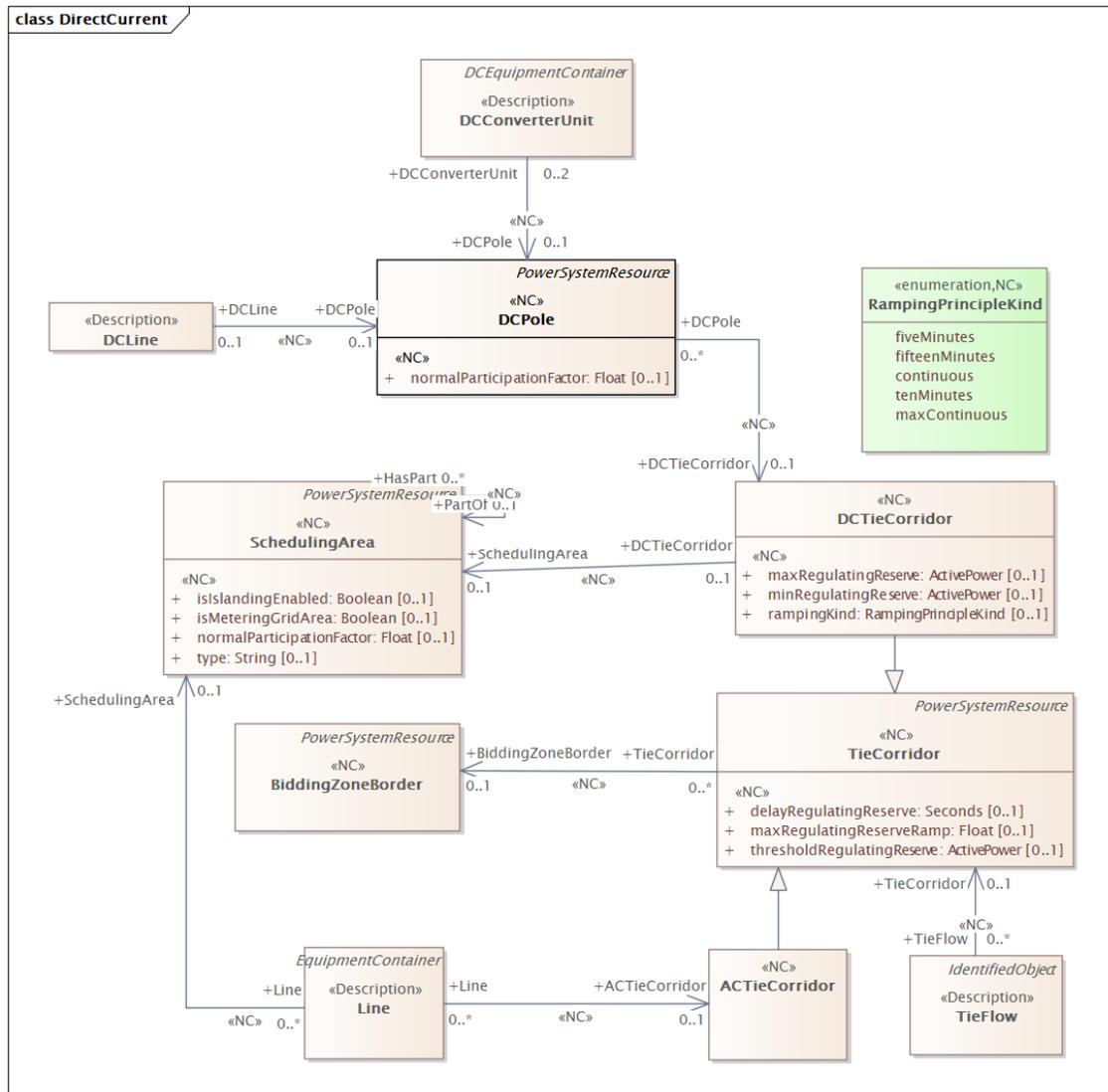
1165

1166

Figure 9 – Class diagram EquipmentReliabilityProfile::Core

1167

Figure 9: The diagram shows classes from Base CIM used in the profile.



1168

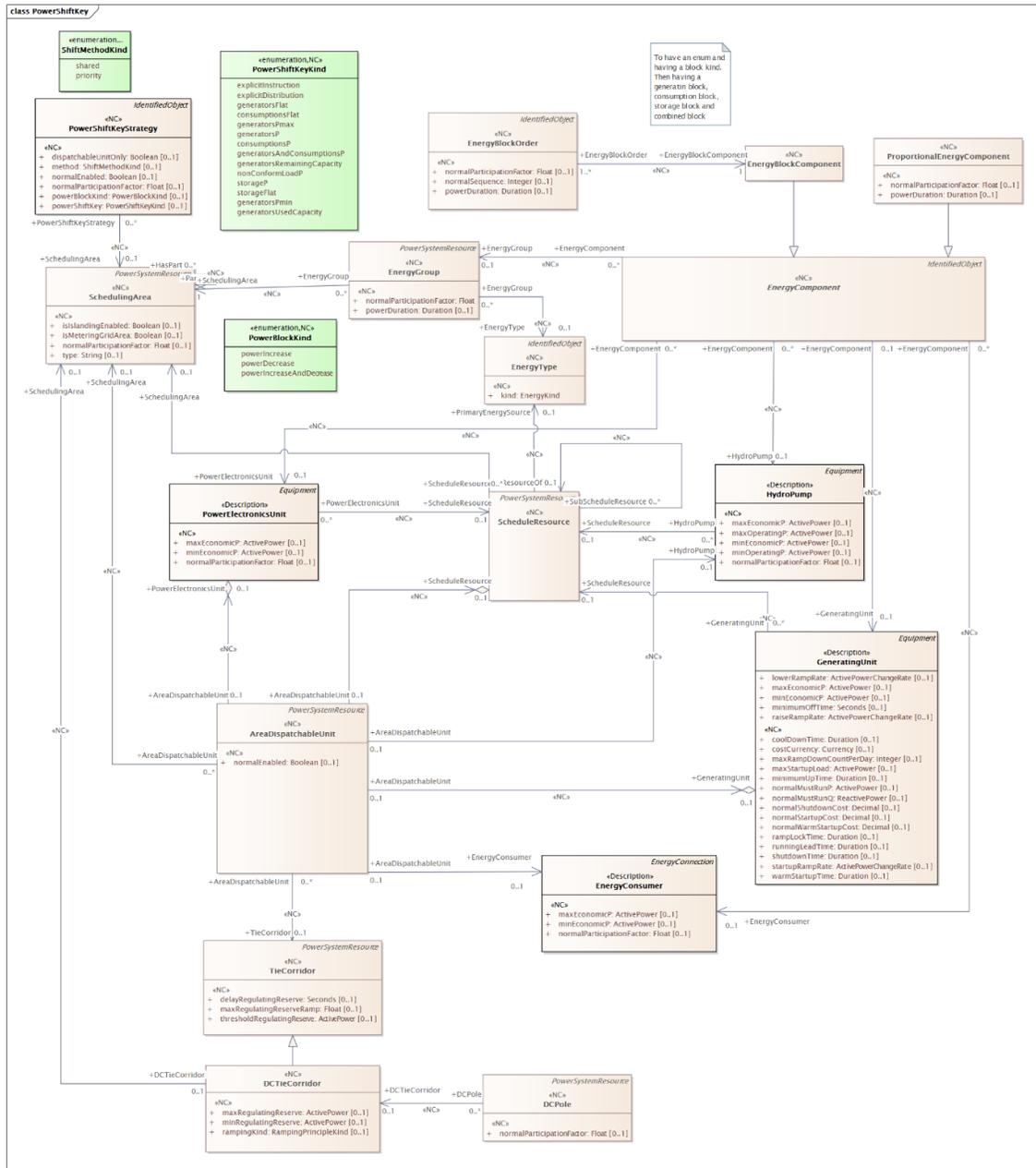
1169

Figure 10 – Class diagram EquipmentReliabilityProfile::DirectCurrent

1170

Figure 10: The diagram shows direct current related classes.

1176 Figure 12: The diagram shows Controllers and FACTS related classes.



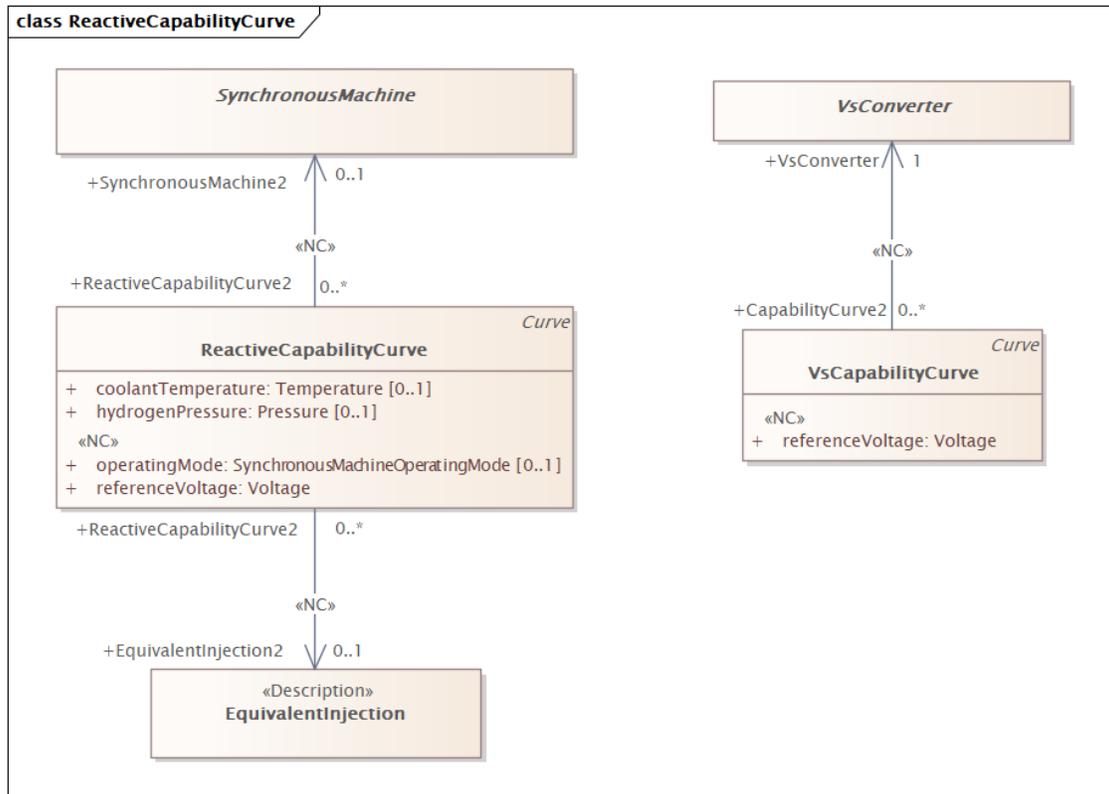
1177

1178

Figure 13 – Class diagram EquipmentReliabilityProfile::PowerShiftKey

1179

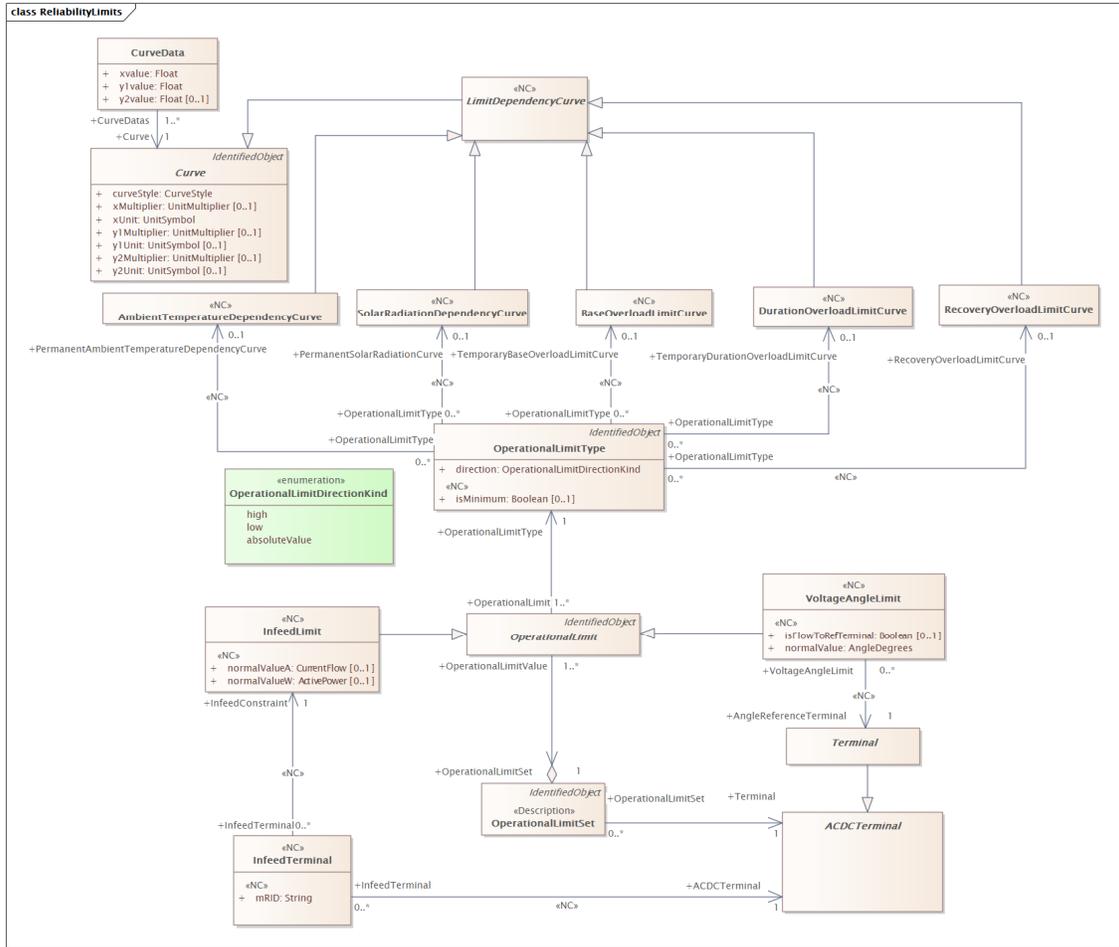
Figure 13: The diagram shows generation and load shift keys related classes.



1189

1190 **Figure 17 – Class diagram EquipmentReliabilityProfile::ReactiveCapabilityCurve**

1191 Figure 17: The diagram shows classes related to reactive capability curve.



1192

1193

Figure 18 – Class diagram EquipmentReliabilityProfile::ReliabilityLimits

1194

Figure 18: The diagram contains main classes related to the reliability limits.

1195

3.2 Organisation

1196

Inheritance path = [IdentifiedObject](#)

1197

Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.

1198

Table 1 shows all attributes of Organisation.

1199

Table 1 – Attributes of EquipmentReliabilityProfile::Organisation

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1200

1201

3.3 (abstract) OrganisationRole

1202

Inheritance path = [IdentifiedObject](#)

1203

Identifies a way in which an organisation may participate in the utility enterprise (e.g., customer,

1204

manufacturer, etc).

1205 Table 2 shows all attributes of OrganisationRole.

1206 **Table 2 – Attributes of EquipmentReliabilityProfile::OrganisationRole**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) The Global Location Number (GLN) is part of the GS1 systems of standards. GLN is a 13-digit number structured that include GS1 Company Prefix, Location Reference (N1-N12) and Check Digit (N13). GS1 is a neutral, not-for-profit, international organisation that develops and maintains standards for supply and demand chains across multiple sectors.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1207

1208 Table 3 shows all association ends of OrganisationRole with other classes.

1209 **Table 3 – Association ends of EquipmentReliabilityProfile::OrganisationRole with other classes**

1210

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	Organisation having this role.

1211

1212 3.4 (NC) OutageCoordinationRegion

1213 Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1214 A region that has a common organisation or service responsible for outage planning and coordination and its impact on grid operation.

1215 Table 4 shows all attributes of OutageCoordinationRegion.

1217 **Table 4 – Attributes of EquipmentReliabilityProfile::OutageCoordinationRegion**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1218

1219 Table 5 shows all association ends of OutageCoordinationRegion with other classes.

1220 **Table 5 – Association ends of EquipmentReliabilityProfile::OutageCoordinationRegion with other classes**

1221

mult from	name	mult to	type	description
0..*	OutageCoordinator	0..1	OutageCoordinator	(NC) The outage coordinator responsible for this outage coordination region.
0..*	SecurityCoordinator	0..1	SecurityCoordinator	(NC) The security coordinator that is responsible for this outage coordination region.

mult from	name	mult to	type	description
0..*	OverlappingZone	0..1	OverlappingZone	(NC) inherited from: Region

1222

1223 3.5 (NC) OutageCoordinator

1224 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
1225 [OrganisationRole](#) : [IdentifiedObject](#)

1226 A role that coordinates the planned availability status of relevant power system equipment to
1227 meet the need by the asset owner or operator and the security of the power system.

1228 Table 6 shows all attributes of OutageCoordinator.

1229 **Table 6 – Attributes of EquipmentReliabilityProfile::OutageCoordinator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1230

1231 Table 7 shows all association ends of OutageCoordinator with other classes.

1232 **Table 7 – Association ends of EquipmentReliabilityProfile::OutageCoordinator with**
1233 **other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1234

1235 3.6 (NC) OutagePlanningAgent

1236 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1237 An entity with the task of planning the availability status of a relevant power generating module,
1238 a relevant demand facility or a relevant grid element.

1239 Table 8 shows all attributes of OutagePlanningAgent.

1240 **Table 8 – Attributes of EquipmentReliabilityProfile::OutagePlanningAgent**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1241

1242 Table 9 shows all association ends of OutagePlanningAgent with other classes.

1243 **Table 9 – Association ends of EquipmentReliabilityProfile::OutagePlanningAgent with**
1244 **other classes**

mult from	name	mult to	type	description
0..*	OutageCoordinationRegion	1..1	OutageCoordinationRegion	(NC) Outage coordination region that this agent has outage planning responsible.
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1245

1246 3.7 (NC) PinTerminal

1247 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

1248 Input pin associated with a Terminal. It is used for comparison.

1249 Table 10 shows all attributes of PinTerminal.

1250

Table 10 – Attributes of EquipmentReliabilityProfile::PinTerminal

name	mult	type	description
kind	1..1	PinTerminalKind	(NC) The kind of quantity which is used as an input value.
absoluteValue	0..1	Boolean	(NC) inherited from: GateInputPin
logicKind	0..1	LogicalOperatorsKind	(NC) inherited from: GateInputPin
duration	0..1	Duration	(NC) inherited from: GateInputPin
negate	0..1	Boolean	(NC) inherited from: GateInputPin
thresholdPercentage	0..1	PerCent	(NC) inherited from: GateInputPin
thresholdValue	0..1	Float	(NC) inherited from: GateInputPin
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1251

1252 Table 11 shows all association ends of PinTerminal with other classes.

1253 **Table 11 – Association ends of EquipmentReliabilityProfile::PinTerminal with other**
1254 **classes**

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	(NC) The Terminal that is used in the input pin.
1..*	Function	1..1	FunctionBlock	(NC) inherited from: FunctionInputVariable

1255

1256 3.8 (NC) PowerElectricalChemicalUnit

1257 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1258 [IdentifiedObject](#)

1259 A unit capable of either generating electrical energy from chemical reactions or using electrical
1260 energy to cause chemical reactions.

1261 Table 12 shows all attributes of PowerElectricalChemicalUnit.

1262

Table 12 – Attributes of EquipmentReliabilityProfile::PowerElectricalChemicalUnit

name	mult	type	description
kind	1..1	PowerElectricalChemicalUnitKind	(NC) Kind of power electrical chemical unit.
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1263

1264

Table 13 shows all association ends of PowerElectricalChemicalUnit with other classes.

1265

1266

Table 13 – Association ends of EquipmentReliabilityProfile::PowerElectricalChemicalUnit with other classes

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1267

1268

3.9 (NC) PowerElectronicsMarineUnit

1269

1270

Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1271

A unit that capture energy from marine sources, e.g. waves, for generating electrical power.

1272

Table 14 shows all attributes of PowerElectronicsMarineUnit.

1273

Table 14 – Attributes of EquipmentReliabilityProfile::PowerElectronicsMarineUnit

name	mult	type	description
kind	1..1	MarineUnitKind	(NC) Kind of marine unit.
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1274

1275

Table 15 shows all association ends of PowerElectronicsMarineUnit with other classes.

1276
1277**Table 15 – Association ends of
EquipmentReliabilityProfile::PowerElectronicsMarineUnit with other classes**

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1278

3.10 (Description) PowerElectronicsUnit1280 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)1281 A generating unit or battery or aggregation that connects to the AC network using power
1282 electronics rather than rotating machines.

1283 Table 16 shows all attributes of PowerElectronicsUnit.

1284

Table 16 – Attributes of EquipmentReliabilityProfile::PowerElectronicsUnit

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value. In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$. In the case of priority strategy, the item with the lowest number gets allocated energy first.
maxEconomicP	0..1	ActivePower	(NC) Maximum high economic active power limit, that should not exceed the maximum operating active power limit.
minEconomicP	0..1	ActivePower	(NC) Low economic active power limit that shall be greater than or equal to the minimum operating active power limit.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1285

1286

Table 17 shows all association ends of PowerElectronicsUnit with other classes.

1287

1288

Table 17 – Association ends of EquipmentReliabilityProfile::PowerElectronicsUnit with other classes

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) The schedule resource that has this power electronics unit.
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) Power electronics unit controller for this power electronics unit.

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1289

1290 3.11 (NC) PowerFactorControlFunction

1291 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

1292 Power factor control function is a function block that calculates the operating point of the
1293 controlled equipment to achieve the target power factor.

1294 Table 18 shows all attributes of PowerFactorControlFunction.

1295 **Table 18 – Attributes of EquipmentReliabilityProfile::PowerFactorControlFunction**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1296

1297 Table 19 shows all association ends of PowerFactorControlFunction with other classes.

1298 **Table 19 – Association ends of**
1299 **EquipmentReliabilityProfile::PowerFactorControlFunction with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

1300

1301 3.12 (abstract,NC) PowerSystemOrganisationRole

1302 Inheritance path = [OrganisationRole](#) : [IdentifiedObject](#)

1303 A role that is responsible for the functional operational of a power system resource.

1304 Table 20 shows all attributes of PowerSystemOrganisationRole.

1305 **Table 20 – Attributes of EquipmentReliabilityProfile::PowerSystemOrganisationRole**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1306

1307 Table 21 shows all association ends of PowerSystemOrganisationRole with other classes.

1308

1309

**Table 21 – Association ends of
EquipmentReliabilityProfile::PowerSystemOrganisationRole with other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1310

1311 3.13 (abstract) PowerSystemResource

1312 Inheritance path = [IdentifiedObject](#)

1313 A power system resource (PSR) can be an item of equipment such as a switch, an equipment
1314 container containing many individual items of equipment such as a substation, or an
1315 organisational entity such as sub-control area. Power system resources can have
1316 measurements associated.

1317 Table 22 shows all attributes of PowerSystemResource.

1318

Table 22 – Attributes of EquipmentReliabilityProfile::PowerSystemResource

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1319

1320 3.14 (abstract,NC) PowerTransferCorridor

1321 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1322 A power transfer corridor is defined as a set of circuits (transmission lines or transformers)
1323 separating two portions of the power system, or a subset of circuits exposed to a substantial
1324 portion of the transmission exchange between two parts of the system.

1325 Table 23 shows all attributes of PowerTransferCorridor.

1326

Table 23 – Attributes of EquipmentReliabilityProfile::PowerTransferCorridor

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) It is the normal enable/disable the monitoring/assessment of a power transfer corridor. True means that the monitoring of the power transfer corridor is assessed. False means the power transfer corridor is not assessed.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1327

1328 3.15 (NC) PowerTransformerCircuit

1329 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1330 A power transformer circuit is a circuit that has at least one PowerTransformer and may or may
1331 not include related switching and/or auxiliary equipment.

1332 Table 24 shows all attributes of PowerTransformerCircuit.

1333

Table 24 – Attributes of EquipmentReliabilityProfile::PowerTransformerCircuit

name	mult	type	description
positiveFlowIn	1..1	Boolean	(NC) inherited from: Circuit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1334

1335

Table 25 shows all association ends of PowerTransformerCircuit with other classes.

1336

Table 25 – Association ends of EquipmentReliabilityProfile::PowerTransformerCircuit with other classes

1337

mult from	name	mult to	type	description
0..1	IdentifyingTerminal	0..1	Terminal	(NC) inherited from: Circuit

1338

3.16 (abstract,NC) PropertyReference root class

1339

The reference to a class and one of its properties.

1340

3.17 (NC) ProportionalEnergyComponent

1341

Inheritance path = [EnergyComponent](#) : [IdentifiedObject](#)

1342

Serves for grouping components within an energy group, with proportional energy allocation to all components.

1343

1344

Table 26 shows all attributes of ProportionalEnergyComponent.

1345

1346

Table 26 – Attributes of EquipmentReliabilityProfile::ProportionalEnergyComponent

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) Normal participation factor.
powerDuration	0..1	Duration	(NC) Duration for the active power.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1347

1348

Table 27 shows all association ends of ProportionalEnergyComponent with other classes.

1349

Table 27 – Association ends of EquipmentReliabilityProfile::ProportionalEnergyComponent with other classes

1350

mult from	name	mult to	type	description
0..*	PowerElectronicsUnit	0..1	PowerElectronicsUnit	(NC) inherited from: EnergyComponent
0..*	HydroPump	0..1	HydroPump	(NC) inherited from: EnergyComponent
0..1	GeneratingUnit	0..1	GeneratingUnit	(NC) inherited from: EnergyComponent
0..*	EnergyConsumer	0..1	EnergyConsumer	(NC) inherited from: EnergyComponent
0..*	EnergyGroup	0..1	EnergyGroup	(NC) inherited from: EnergyComponent

1351

1352 **3.18 (abstract) ACDCTerminal root class**

1353 An electrical connection point (AC or DC) to a piece of conducting equipment. Terminals are
1354 connected at physical connection points called connectivity nodes.

1355 **3.19 (NC) ActivePowerControlFunction**

1356 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

1357 Active power control function is a function block that calculates operating point of the controlled
1358 equipment to achieve the target active power.

1359 Table 28 shows all attributes of ActivePowerControlFunction.

1360

Table 28 – Attributes of EquipmentReliabilityProfile::ActivePowerControlFunction

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1361

1362 Table 29 shows all association ends of ActivePowerControlFunction with other classes.

1363

Table 29 – Association ends of EquipmentReliabilityProfile::ActivePowerControlFunction with other classes

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

1365

1366 **3.20 (NC) AmbientTemperatureDependencyCurve**

1367 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1368 A curve or functional relationship between the ambient temperature independent variable (X-
1369 axis) and relative temperature dependent (Y-axis) variables.

1370 Table 30 shows all attributes of AmbientTemperatureDependencyCurve.

1371

Table 30 – Attributes of EquipmentReliabilityProfile::AmbientTemperatureDependencyCurve

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve

name	mult	type	description
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1373

1374 **3.21 (NC) AreaDispatchableUnit**1375 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1376 Allocates a given producing or consuming unit, including direct current corridor and collection
1377 of units, to a given control area (through the scheduling area) for supporting the control of the
1378 given area through dispatch instruction.

1379 Table 31 shows all attributes of AreaDispatchableUnit.

1380 **Table 31 – Attributes of EquipmentReliabilityProfile::AreaDispatchableUnit**

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) Identifies if the unit is normally enabled to accept a dispatch instruction. If true, the unit is enabled to accept a dispatch instruction. If false, the unit has the capability, but it is not enabled to receive a dispatch instruction.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1381

1382 Table 32 shows all association ends of AreaDispatchableUnit with other classes.

1383 **Table 32 – Association ends of EquipmentReliabilityProfile::AreaDispatchableUnit with**
1384 **other classes**

mult from	name	mult to	type	description
0..1	PowerElectronicsUnit	0..1	PowerElectronicsUnit	(NC) The power electronics unit that belongs to this area dispatchable unit.
0..1	ScheduleResource	0..1	ScheduleResource	(NC) The resource which is mFRR for the EnergySchedulingArea to which the AreaDispatchableUnit is connected. Note that this can be different than the area for the energy schedule.
0..*	SchedulingArea	0..1	SchedulingArea	(NC) The scheduling area that has this area dispatchable unit.
0..1	GeneratingUnit	0..1	GeneratingUnit	(NC) The generating unit that belongs to area dispatchable unit.
0..1	HydroPump	0..1	HydroPump	(NC) Hydro Pump which is associated with the area dispatchable unit.
0..1	EnergyConsumer	0..1	EnergyConsumer	Energy consumer for this area dispatchable unit.
0..*	TieCorridor	0..1	TieCorridor	(NC) Tie Corridor which belongs to the Area Dispatchable Unit.

1385

1386 **3.22 (abstract,NC) AutomationFunction**1387 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1388 Automation function is a collection of functional block or other automation function that can be
1389 executed as a work cycle program as part of an automated system.

1390 Table 33 shows all attributes of AutomationFunction.

1391 **Table 33 – Attributes of EquipmentReliabilityProfile::AutomationFunction**

name	mult	type	description
type	0..1	String	(NC) Type of automation function.
normalEnabled	0..1	Boolean	(NC) True, if the automation function is enabled (active). Otherwise false.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1392

1393 Table 34 shows all association ends of AutomationFunction with other classes.

1394 **Table 34 – Association ends of EquipmentReliabilityProfile::AutomationFunction with
1395 other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) Automation function is part of this automation function.

1396

1397 **3.23 (NC) BaseOverloadLimitCurve**1398 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1399 A curve or functional relationship between

1400 - the relative loading - current loading over permanent loading (PATL) independent variable (X-
1401 axis), and

1402 - temporary overloading (TATL) limiting dependent (Y-axis) variables.

1403 Table 35 shows all attributes of BaseOverloadLimitCurve.

1404 **Table 35 – Attributes of EquipmentReliabilityProfile::BaseOverloadLimitCurve**

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1405

1406 **3.24 (NC) BiddingZone**1407 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1408 A bidding zone is a market-based method for handling power transmission congestion. It
1409 consists of scheduling areas that include the relevant production (supply) and consumption
1410 (demand) to form an electrical area with the same market price without capacity allocation.

1411 Table 36 shows all attributes of BiddingZone.

1412

Table 36 – Attributes of EquipmentReliabilityProfile::BiddingZone

name	mult	type	description
isTradeEnabled	1..1	Boolean	(NC) Identifies the mechanism for determining the energy price for a given bidding zone. If true, the bid and the offer is expected to be provided for the bidding zone to create the market price. If false, other mechanism determines the price of energy for a given bidding zone, e.g. virtual bidding zone.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1413

1414 Table 37 shows all association ends of BiddingZone with other classes.

1415 **Table 37 – Association ends of EquipmentReliabilityProfile::BiddingZone with other**
1416 **classes**

mult from	name	mult to	type	description
0..*	CapacityCalculationRegion	0..1	CapacityCalculationRegion	(NC) The capacity calculation region related to this bidding zone.
0..*	PowerCapacity	0..1	PowerCapacity	(NC) Power capacity which is associated to the bidding zone.

1417

1418 **3.25 (NC) BiddingZoneBorder**1419 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1420 A unidirectional interface between two adjacent Bidding Zones, representing the available
1421 transmission capacity from the Bidding Zone defined by the association FromBiddingZone
1422 (source) to the Bidding Zone defined by the association ToBiddingZone (sink). It defines the
1423 capacity constraints and market-based allocation mechanisms for cross-zonal electricity
1424 exchange in the specified direction, considering potential transmission congestion and market
1425 price differences.

1426 Table 38 shows all attributes of BiddingZoneBorder.

1427

Table 38 – Attributes of EquipmentReliabilityProfile::BiddingZoneBorder

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1428

1429 Table 39 shows all association ends of BiddingZoneBorder with other classes.

1430 **Table 39 – Association ends of EquipmentReliabilityProfile::BiddingZoneBorder with**
1431 **other classes**

mult from	name	mult to	type	description
0..*	ToBiddingZone	1..1	BiddingZone	(NC) The bidding zone for the to side.
0..*	FromBiddingZone	1..1	BiddingZone	(NC) The bidding zone for the from side.
0..*	CapacityCalculationRegion	0..1	CapacityCalculationRegion	(NC) The capacity calculation region for which the capacity is derived from.

1432

1433 3.26 (NC) CapacityCalculationRegion

1434 Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1435 Capacity calculation region is a coherent part of the interconnected system that is used for
1436 calculating the transmission capacity for a bidding zone or between bidding zones.

1437 Table 40 shows all attributes of CapacityCalculationRegion.

1438 **Table 40 – Attributes of EquipmentReliabilityProfile::CapacityCalculationRegion**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1439

1440 Table 41 shows all association ends of CapacityCalculationRegion with other classes.

1441 **Table 41 – Association ends of EquipmentReliabilityProfile::CapacityCalculationRegion**
1442 **with other classes**

mult from	name	mult to	type	description
0..*	SecurityCoordinator	0..1	SecurityCoordinator	(NC) The security coordinator responsible for the capacity calculation region.
0..*	CoordinatedCapacityCalculator	0..1	CoordinatedCapacityCalculator	(NC) Coordinated capacity calculator responsible for the capacity calculation of the region.
0..*	OverlappingZone	0..1	OverlappingZone	(NC) inherited from: Region

1443

1444 3.27 (NC) ElectricalChargingUnit

1445 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1446 [IdentifiedObject](#)

1447 A unit that supplies electrical power for charging electrical non-stationary entities, e.g. electrical
1448 vehicle, trucks, buses, ferries, boats and airplanes. The characteristic is that the energy
1449 consumption is highly schedule dependent.

1450 Table 42 shows all attributes of ElectricalChargingUnit.

1451 **Table 42 – Attributes of EquipmentReliabilityProfile::ElectricalChargingUnit**

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit

name	mult	type	description
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1452

1453

Table 43 shows all association ends of ElectricalChargingUnit with other classes.

1454

1455

Table 43 – Association ends of EquipmentReliabilityProfile::ElectricalChargingUnit with other classes

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1456

1457

3.28 (abstract,NC) Circuit

1458

Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1459

A circuit is a collection of equipment in a network graph that provide common stability limits.

1460

The relevant equipment is in general given by the identifying terminal. A software application

1461

that can do topology processing shall calculate the equipment belonging to the circuit, if there

1462

are no stability limits associated to it. In case of stability limits, the containment reflects the

1463

equipments that were used in the calculation/analysis.

1464

Table 44 shows all attributes of Circuit.

1465

Table 44 – Attributes of EquipmentReliabilityProfile::Circuit

name	mult	type	description
positiveFlowIn	1..1	Boolean	(NC) True, if the positive value on the terminal shall be considered flow into the circuit. False, if the positive value on the terminal shall be considered flow out of the circuit.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1466

1467

Table 45 shows all association ends of Circuit with other classes.

1468

Table 45 – Association ends of EquipmentReliabilityProfile::Circuit with other classes

mult from	name	mult to	type	description
0..1	IdentifyingTerminal	0..1	Terminal	(NC) Terminal that identifies the circuit.

1469

1470 **3.29 (NC) CircuitShare**1471 Inheritance path = [IdentifiedObject](#)

1472 Defines the share of the circuit which is part of an associated power transfer corridor.

1473 Table 46 shows all attributes of CircuitShare.

1474 **Table 46 – Attributes of EquipmentReliabilityProfile::CircuitShare**

name	mult	type	description
normalContributionFactor	0..1	PerCent	(NC) Normal contribution factor for the circuit which is part of a power transfer corridor. The allowed value range is [0,100].
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1475

1476 Table 47 shows all association ends of CircuitShare with other classes.

1477 **Table 47 – Association ends of EquipmentReliabilityProfile::CircuitShare with other classes**

1478

mult from	name	mult to	type	description
0..*	Circuit	1..1	Circuit	(NC) The circuit that has a share of the power system corridor.
0..*	PowerTransferCorridor	1..1	PowerTransferCorridor	(NC) The power transfer corridor that has this circuit share.

1479

1480 **3.30 (NC) ClosedDistributionSystemOperator**1481 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1482 A system operator which distributes electricity (or gas) within a geographically confined industrial, commercial or shared services and does not supply household customers.

1483 Table 48 shows all attributes of ClosedDistributionSystemOperator.

1486 **Table 48 – Attributes of EquipmentReliabilityProfile::ClosedDistributionSystemOperator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1487

1488 Table 49 shows all association ends of ClosedDistributionSystemOperator with other classes.

1489 **Table 49 – Association ends of EquipmentReliabilityProfile::ClosedDistributionSystemOperator with other classes**

1490

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1491

1492 **3.31 (NC) CompensatorController**1493 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
1494 [IdentifiedObject](#)

1495 Compensator controller is controlling the equipment to optimize the use of the compensators.

1496 Table 50 shows all attributes of CompensatorController.

1497 **Table 50 – Attributes of EquipmentReliabilityProfile::CompensatorController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1498

1499 Table 51 shows all association ends of CompensatorController with other classes.

1500 **Table 51 – Association ends of EquipmentReliabilityProfile::CompensatorController**
1501 **with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

1502

1503 **3.32 (abstract) ConductingEquipment**1504 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)1505 The parts of the AC power system that are designed to carry current or that are conductively
1506 connected through terminals.

1507 Table 52 shows all attributes of ConductingEquipment.

1508 **Table 52 – Attributes of EquipmentReliabilityProfile::ConductingEquipment**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1509

1510 Table 53 shows all association ends of ConductingEquipment with other classes.

1511 **Table 53 – Association ends of EquipmentReliabilityProfile::ConductingEquipment with**
1512 **other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1513

1514 **3.33 (abstract) ConnectivityNodeContainer**1515 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1516 A base class for all objects that may contain connectivity nodes or topological nodes.

1517 Table 54 shows all attributes of ConnectivityNodeContainer.

1518 **Table 54 – Attributes of EquipmentReliabilityProfile::ConnectivityNodeContainer**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1519

1520 **3.34 (Description) ControlArea**1521 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1522 A control area is a grouping of generating units and/or loads and a cutset of tie lines (as
 1523 terminals) which may be used for a variety of purposes including automatic generation control,
 1524 power flow solution area interchange control specification, and input to load forecasting. All
 1525 generation and load within the area defined by the terminals on the border are considered in
 1526 the area interchange control. Note that any number of overlapping control area specifications
 1527 can be superimposed on the physical model. The following general principles apply to
 1528 ControlArea:

1529 1. The control area orientation for net interchange is positive for an import, negative for an
 1530 export.

1531 2. The control area net interchange is determined by summing flows in Terminals. The
 1532 Terminals are identified by creating a set of TieFlow objects associated with a ControlArea
 1533 object. Each TieFlow object identifies one Terminal.

1534 3. In a single network model, a tie between two control areas must be modelled in both control
 1535 area specifications, such that the two representations of the tie flow sum to zero.

1536 4. The normal orientation of Terminal flow is positive for flow into the conducting equipment
 1537 that owns the Terminal. (i.e. flow from a bus into a device is positive.) However, the orientation
 1538 of each flow in the control area specification must align with the control area convention, i.e.
 1539 import is positive. If the orientation of the Terminal flow referenced by a TieFlow is positive into
 1540 the control area, then this is confirmed by setting TieFlow.positiveFlowIn flag TRUE. If not, the
 1541 orientation must be reversed by setting the TieFlow.positiveFlowIn flag FALSE.

1542 Table 55 shows all attributes of ControlArea.

1543 **Table 55 – Attributes of EquipmentReliabilityProfile::ControlArea**

name	mult	type	description
areaType	0..1	String	(NC) Type of control area.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1544

1545 Table 56 shows all association ends of ControlArea with other classes.

1546 **Table 56 – Association ends of EquipmentReliabilityProfile::ControlArea with other**
1547 **classes**

mult from	name	mult to	type	description
0..*	OutageCoordinationRegion	0..1	OutageCoordinationRegion	(NC) The outage coordination region that has this control area.
0..*	SystemOperator	0..1	SystemOperator	(NC) The system operator that operates this control area.
0..*	PartOf	0..1	ControlArea	(NC) The control area that is part of this control area.

1548

1549 3.35 (abstract,NC) ControlFunctionBlock

1550 Inheritance path = [FunctionBlock](#) : [IdentifiedObject](#)

1551 Control function block is a function block that contains an algorithm for controlling the
1552 equipment.

1553 Table 57 shows all attributes of ControlFunctionBlock.

1554 **Table 57 – Attributes of EquipmentReliabilityProfile::ControlFunctionBlock**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) True, if the control function is discrete. This applies to equipment with discrete controls, e.g. tap changers and shunt compensators.
targetDeadband	0..1	Float	(NC) Target deadband is used with discrete control to avoid excessive update of controls like tap changers and shunt compensator banks while regulating. The attribute shall be a positive value or zero. If isDiscrete is set to "false", the targetDeadband is to be ignored. Note that for instance, if the targetValue is 100 kV and the targetDeadband is 2 kV the range is from 99 to 101 kV.
maxAllowedTargetValue	0..1	PerCent	(NC) Maximum allowed target value given by the percent of target value. The allowed value range is [0,100].
minAllowedTargetValue	0..1	PerCent	(NC) Minimum allowed target value given by the percent of target value. The allowed value range is [0,100].
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1555

1556 Table 58 shows all association ends of ControlFunctionBlock with other classes.

1557 **Table 58 – Association ends of EquipmentReliabilityProfile::ControlFunctionBlock with**
1558 **other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

1559

1560 **3.36 (abstract) Curve**1561 Inheritance path = [IdentifiedObject](#)1562 A multi-purpose curve or functional relationship between an independent variable (X-axis) and
1563 dependent (Y-axis) variables.

1564 Table 59 shows all attributes of Curve.

1565

Table 59 – Attributes of EquipmentReliabilityProfile::Curve

name	mult	type	description
curveStyle	1..1	CurveStyle	The style or shape of the curve.
xMultiplier	0..1	UnitMultiplier	Multiplier for X-axis.
xUnit	1..1	UnitSymbol	The X-axis units of measure.
y1Multiplier	0..1	UnitMultiplier	Multiplier for Y1-axis.
y1Unit	0..1	UnitSymbol	The Y1-axis units of measure.
y2Multiplier	0..1	UnitMultiplier	Multiplier for Y2-axis.
y2Unit	0..1	UnitSymbol	The Y2-axis units of measure.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1566

1567 **3.37 CurveData root class**1568 Multi-purpose data points for defining a curve. The use of this generic class is discouraged if
1569 a more specific class can be used to specify the X and Y axis values along with their specific
1570 data types.

1571 Table 60 shows all attributes of CurveData.

1572

Table 60 – Attributes of EquipmentReliabilityProfile::CurveData

name	mult	type	description
xvalue	1..1	Float	The data value of the X-axis variable, depending on the X-axis units.
y1value	1..1	Float	The data value of the first Y-axis variable, depending on the Y-axis units.
y2value	0..1	Float	The data value of the second Y-axis variable (if present), depending on the Y-axis units.

1573

1574 Table 61 shows all association ends of CurveData with other classes.

Table 61 – Association ends of EquipmentReliabilityProfile::CurveData with other classes

1575

1576

mult from	name	mult to	type	description
1..*	Curve	1..1	Curve	The curve of this curve data point.

1577

1578 **3.38 (Description) DCConverterUnit**1579 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
1580 [PowerSystemResource](#) : [IdentifiedObject](#)

1581 Indivisible operative unit comprising all equipment between the point of common coupling on
1582 the AC side and the point of common coupling – DC side, essentially one or more converters,
1583 together with one or more converter transformers, converter control equipment, essential
1584 protective and switching devices and auxiliaries, if any, used for conversion.
1585 Table 62 shows all attributes of DCConverterUnit.

1586 **Table 62 – Attributes of EquipmentReliabilityProfile::DCConverterUnit**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1587

1588 Table 63 shows all association ends of DCConverterUnit with other classes.

1589 **Table 63 – Association ends of EquipmentReliabilityProfile::DCConverterUnit with other**
1590 **classes**

mult from	name	mult to	type	description
0..2	DCPole	0..1	DCPole	(NC) The DC pole that has this DC converter unit.
0..*	Substation	0..1	Substation	The containing substation of the DC converter unit.
0..*	DCSubstation	0..1	DCSubstation	(NC) DC substation that has one or more DC converter units.
0..1	ACPointOfCommonCoupling	1..1	ACPointOfCommonCoupling	(NC) AC point of common coupling for this DC converter unit.
0..1	DCPointOfCommonCoupling	1..1	DCPointOfCommonCoupling	(NC) DCNode that is the point of common coupling at DC side of this DCConverterUnit.

1591

1592 3.39 (abstract) DCEquipmentContainer

1593 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) :
1594 [IdentifiedObject](#)

1595 A modelling construct to provide a root class for containment of DC as well as AC equipment.
1596 The class differ from the EquipmentContainer for AC in that it may also contain DCNode-s.
1597 Hence it can contain both AC and DC equipment.

1598 Table 64 shows all attributes of DCEquipmentContainer.

1599 **Table 64 – Attributes of EquipmentReliabilityProfile::DCEquipmentContainer**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1600

1601 3.40 (Description) DCLine root class

1602 Overhead lines and/or cables connecting two or more HVDC substations.

1603 Table 65 shows all association ends of DCLine with other classes.

1604 **Table 65 – Association ends of EquipmentReliabilityProfile::DCLine with other classes**

mult from	name	mult to	type	description
0..1	DCPole	0..1	DCPole	(NC) The DC pole that has this DC line.

1605

1606 **3.41 (NC) DCPole**1607 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1608 The direct current (DC) system pole (IEC 60633) is part of a DC system consisting of all the
1609 equipment in the DC substations and the interconnecting transmission lines, if any, which during
1610 normal operation exhibit a common direct voltage polarity with respect to earth.

1611 Table 66 shows all attributes of DCPole.

1612

Table 66 – Attributes of EquipmentReliabilityProfile::DCPole

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) Normal participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value. In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$. In the case of priority strategy, the item with the lowest number gets allocated energy first.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1613

1614 Table 67 shows all association ends of DCPole with other classes.

1615 **Table 67 – Association ends of EquipmentReliabilityProfile::DCPole with other classes**

mult from	name	mult to	type	description
0..*	DCTieCorridor	0..1	DCTieCorridor	(NC) The DCTieCorridor that has this DC pole.
1..2	DCBiPole	0..1	DCBiPole	(NC) DC system bipole that has two independently operatable DC system poles.
0..1	AsymmetricMonopolarDCSystem	0..1	MonopolarDCSystem	(NC) Asymmetric monopolar DC system that has this DC pole.

1616

1617 **3.42 (NC) DCTieCorridor**1618 Inheritance path = [TieCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1619 A collection of one or more direct current poles that connect two different control areas.

1620 Table 68 shows all attributes of DCTieCorridor.

1621

Table 68 – Attributes of EquipmentReliabilityProfile::DCTieCorridor

name	mult	type	description
maxRegulatingReserve	0..1	ActivePower	(NC) Maximum regulating reserve.
minRegulatingReserve	0..1	ActivePower	(NC) Minimum regulating reserve.
rampingKind	0..1	RampingPrincipleKind	(NC) Ramping principle is used to define a transition from one scheduled value to next one.
delayRegulatingReserve	0..1	Seconds	(NC) inherited from: TieCorridor
maxRegulatingReserveRamp	0..1	Float	(NC) inherited from: TieCorridor
thresholdRegulatingReserve	0..1	ActivePower	(NC) inherited from: TieCorridor
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1622

1623

Table 69 shows all association ends of DCTieCorridor with other classes.

1624

1625

Table 69 – Association ends of EquipmentReliabilityProfile::DCTieCorridor with other classes

mult from	name	mult to	type	description
0..1	SchedulingArea	0..1	SchedulingArea	(NC) The scheduling area that has this DC tie corridor.
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) inherited from: TieCorridor
0..*	BiddingZoneBorder	0..1	BiddingZoneBorder	(NC) inherited from: TieCorridor

1626

1627

3.43 (NC) DirectCurrentMasterController

1628

1629

Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1630

1631

1632

1633

1634

1635

1636

1637

1638

1639

1640

This control system is under the responsibility of the system operator.

Table 70 shows all attributes of DirectCurrentMasterController.

1641

Table 70 – Attributes of EquipmentReliabilityProfile::DirectCurrentMasterController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject

name	mult	type	description
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1642

1643

Table 71 shows all association ends of `DirectCurrentMasterController` with other classes.

1644

1645

**Table 71 – Association ends of
EquipmentReliabilityProfile::DirectCurrentMasterController with other classes**

mult from	name	mult to	type	description
0..1	DCTieCorridor	0..1	DCTieCorridor	(NC) DCTieCorridor controlled by this direct current master controller.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

1646

1647

3.44 (NC) DirectCurrentSystemOperator

1648

1649

Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1650

1651

1652

1653

System operator of the direct current pole. There are typically one or two system operators that are operating either the control area at one side or the control areas at both sides of the direct current pole. In some cases it is operated by an operator from the connected control areas.

Table 72 shows all attributes of `DirectCurrentSystemOperator`.

1654

Table 72 – Attributes of EquipmentReliabilityProfile::DirectCurrentSystemOperator

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1655

1656

Table 73 shows all association ends of `DirectCurrentSystemOperator` with other classes.

1657

1658

**Table 73 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSystemOperator with other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1659

1660

3.45 (NC) DistributionSystemOperator

1661

1662

Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1663

1664

1665

A system operator that is responsible for operating of energy distribution network from transmission level down to low voltage levels including the connection to household.

Table 74 shows all attributes of `DistributionSystemOperator`.

1666 **Table 74 – Attributes of EquipmentReliabilityProfile::DistributionSystemOperator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1667

1668

Table 75 shows all association ends of DistributionSystemOperator with other classes.

1669

1670

**Table 75 – Association ends of
EquipmentReliabilityProfile::DistributionSystemOperator with other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1671

3.46 (NC) DurationOverloadLimitCurve1673 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1674 A curve or functional relationship between

1675 - the overload duration independent variable (X-axis), and

1676 - temporary overloading (TATL) limiting dependent (Y-axis) variables.

1677 Table 76 shows all attributes of DurationOverloadLimitCurve.

1678

Table 76 – Attributes of EquipmentReliabilityProfile::DurationOverloadLimitCurve

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1679

3.47 (NC) EnergyAlignmentCoordinator1681 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1682 A role that is responsible for alignment of forecast and schedule energy to a given energy coordination region.

1684 Table 77 shows all attributes of EnergyAlignmentCoordinator.

1685

1686 **Table 77 – Attributes of EquipmentReliabilityProfile::EnergyAlignmentCoordinator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1687

1688

Table 78 shows all association ends of EnergyAlignmentCoordinator with other classes.

1689

1690

**Table 78 – Association ends of
EquipmentReliabilityProfile::EnergyAlignmentCoordinator with other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1691

1692 3.48 (NC) EnergyBlockComponent

1693 Inheritance path = [EnergyComponent](#) : [IdentifiedObject](#)

1694 Energy block component where the energy group is distributed according to the energy block order of each energy component in an energy group.

1695 Table 79 shows all attributes of EnergyBlockComponent.

1697

Table 79 – Attributes of EquipmentReliabilityProfile::EnergyBlockComponent

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1698

1699

Table 80 shows all association ends of EnergyBlockComponent with other classes.

1700

1701

**Table 80 – Association ends of EquipmentReliabilityProfile::EnergyBlockComponent
with other classes**

mult from	name	mult to	type	description
0..*	PowerElectronicsUnit	0..1	PowerElectronicsUnit	(NC) inherited from: EnergyComponent
0..*	HydroPump	0..1	HydroPump	(NC) inherited from: EnergyComponent
0..1	GeneratingUnit	0..1	GeneratingUnit	(NC) inherited from: EnergyComponent
0..*	EnergyConsumer	0..1	EnergyConsumer	(NC) inherited from: EnergyComponent
0..*	EnergyGroup	0..1	EnergyGroup	(NC) inherited from: EnergyComponent

1702

1703 3.49 (NC) EnergyBlockOrder

1704 Inheritance path = [IdentifiedObject](#)

1705 The energy block order is a block (an amount) of energy that forms the sequence of orders that are going to be distributed to an energy block component.

1706 Table 81 shows all attributes of EnergyBlockOrder.

1707

1708

Table 81 – Attributes of EquipmentReliabilityProfile::EnergyBlockOrder

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) Normal participation factor.
normalSequence	0..1	Integer	(NC) Normal sequence represents the local order of the power block order. The sequence order for a given block dispatch instruction. The sequence number need to be unique for a given block dispatch instruction, e.g. two order in the same instruction cannot have the same sequence.
powerDuration	0..1	Duration	(NC) Duration for the active power.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1709

1710

Table 82 shows all association ends of EnergyBlockOrder with other classes.

1711

Table 82 – Association ends of EquipmentReliabilityProfile::EnergyBlockOrder with other classes

1712

mult from	name	mult to	type	description
1..*	EnergyBlockComponent	1..1	EnergyBlockComponent	(NC) The energy block component that has this energy block order.

1713

3.50 (abstract,NC) EnergyComponentInheritance path = [IdentifiedObject](#)

The energy component for a producer or a consumer that has the same energy characteristic, e.g. fuel type and technology.

Table 83 shows all attributes of EnergyComponent.

1719

Table 83 – Attributes of EquipmentReliabilityProfile::EnergyComponent

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1720

1721

Table 84 shows all association ends of EnergyComponent with other classes.

1722

Table 84 – Association ends of EquipmentReliabilityProfile::EnergyComponent with other classes

1723

mult from	name	mult to	type	description
0..*	PowerElectronicsUnit	0..1	PowerElectronicsUnit	(NC) The power electronics unit that relates to this energy component.
0..*	HydroPump	0..1	HydroPump	(NC) The hydro pump that relates to this energy component.

mult from	name	mult to	type	description
0..1	GeneratingUnit	0..1	GeneratingUnit	(NC) The generating unit that is part of this energy component.
0..*	EnergyConsumer	0..1	EnergyConsumer	(NC) The energy consumer that relates to this energy component.
0..*	EnergyGroup	0..1	EnergyGroup	(NC) The energy group that has this energy component.

1724

1725 3.51 (abstract) EnergyConnection

1726 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
1727 [IdentifiedObject](#)

1728 A connection of energy generation or consumption on the power system model.

1729 Table 85 shows all attributes of EnergyConnection.

1730

Table 85 – Attributes of EquipmentReliabilityProfile::EnergyConnection

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1731

1732 Table 86 shows all association ends of EnergyConnection with other classes.

Table 86 – Association ends of EquipmentReliabilityProfile::EnergyConnection with other classes

1733

1734

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1735

1736 3.52 (Description) EnergyConsumer

1737 Inheritance path = [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) :
1738 [PowerSystemResource](#) : [IdentifiedObject](#)

1739 Generic user of energy - a point of consumption on the power system model.

1740 EnergyConsumer.pfixed, .qfixed, .pfixedPct and .qfixedPct have meaning only if there is no

1741 LoadResponseCharacteristic associated with EnergyConsumer or if

1742 LoadResponseCharacteristic.exponentModel is set to False.

1743 Table 87 shows all attributes of EnergyConsumer.

1744

Table 87 – Attributes of EquipmentReliabilityProfile::EnergyConsumer

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value. In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated

name	mult	type	description
			value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$. In the case of priority strategy, the item with the lowest number gets allocated energy first.
maxEconomicP	0..1	ActivePower	(NC) Maximum high economic active power limit, that should not exceed the maximum operating active power limit.
minEconomicP	0..1	ActivePower	(NC) Low economic active power limit that shall be greater than or equal to the minimum operating active power limit.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1745

1746

Table 88 shows all association ends of EnergyConsumer with other classes.

1747

Table 88 – Association ends of EquipmentReliabilityProfile::EnergyConsumer with other classes

1748

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1749

3.53 (NC) EnergyCoordinationRegion

Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

A region that has a common organisation or a service that is responsible for alignment of forecast and scheduling of energy.

Table 89 shows all attributes of EnergyCoordinationRegion.

1755

Table 89 – Attributes of EquipmentReliabilityProfile::EnergyCoordinationRegion

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1756

1757

Table 90 shows all association ends of EnergyCoordinationRegion with other classes.

1758

Table 90 – Association ends of EquipmentReliabilityProfile::EnergyCoordinationRegion with other classes

1759

mult from	name	mult to	type	description
0..*	EnergyAlignmentCoordinator	0..1	EnergyAlignmentCoordinator	(NC) The energy alignment coordinator that operates this energy coordination region.
0..*	OverlappingZone	0..1	OverlappingZone	(NC) inherited from: Region

1760

1761 **3.54 (NC) EnergyType**1762 Inheritance path = [IdentifiedObject](#)

1763 A source of the energy.

1764 An energy type reference refers to an energy characteristic that is needed for reporting, e.g.

1765 European Energy Certificate System (EECS). The kind of energy should be possible to be linked

1766 with different type of energy forecast, e.g. wind production for a given area based on wind

1767 forecast.

1768 Table 91 shows all attributes of EnergyType.

1769

Table 91 – Attributes of EquipmentReliabilityProfile::EnergyType

name	mult	type	description
kind	1..1	EnergyKind	(NC) The kind of energy type.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1770

1771 Table 92 shows all association ends of EnergyType with other classes.

1772

Table 92 – Association ends of EquipmentReliabilityProfile::EnergyType with other classes

1773

mult from	name	mult to	type	description
0..*	EnergySourceReference	0..1	EnergySourceReference	(NC) Energy source reference which has energy type references.

1774

1775 **3.55 (abstract,Description) Equipment**1776 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1777 The parts of a power system that are physical devices, electronic or mechanical.

1778 Table 93 shows all attributes of Equipment.

1779

Table 93 – Attributes of EquipmentReliabilityProfile::Equipment

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1780

1781 Table 94 shows all association ends of Equipment with other classes.

1782

Table 94 – Association ends of EquipmentReliabilityProfile::Equipment with other classes

1783

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) The circuit that contains its member equipment.
0..*	AggregatedEquipment	0..1	Equipment	(NC) An aggregated representation of the detailed equipment.

1784

1785 **3.56 (abstract) EquipmentContainer**1786 Inheritance path = [ConnectivityNodeContainer](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1787 A modelling construct to provide a root class for containing equipment.

1788 Table 95 shows all attributes of EquipmentContainer.

1789 **Table 95 – Attributes of EquipmentReliabilityProfile::EquipmentContainer**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1790

1791 **3.57 (abstract,NC) EquipmentController**1792 Inheritance path = [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1793 Equipment controller is an automation function that can control one or multiple equipment function to achieve all the targets inside the given tolerance.

1795 Table 96 shows all attributes of EquipmentController.

1796 **Table 96 – Attributes of EquipmentReliabilityProfile::EquipmentController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1797

1798 Table 97 shows all association ends of EquipmentController with other classes.

1799 **Table 97 – Association ends of EquipmentReliabilityProfile::EquipmentController with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

1801

1802 **3.58 (NC) ExceptionalPowerTransferCorridor**1803 Inheritance path = [PowerTransferCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1804 Potential power transfer corridor that can be triggered by equipment which changes its in service status or it is operating in an island.

1806 Table 98 shows all attributes of ExceptionalPowerTransferCorridor.

1807 **Table 98 – Attributes of EquipmentReliabilityProfile::ExceptionalPowerTransferCorridor**

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) inherited from: PowerTransferCorridor

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1808

1809 **3.59 (abstract,NC) FACTSEquipment**1810 Inheritance path = [RegulatingCondEq](#) : [EnergyConnection](#) : [ConductingEquipment](#) :1811 [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1812 Flexible Alternating Current Transmission System regulating equipment.

1813 Table 99 shows all attributes of FACTSEquipment.

1814 **Table 99 – Attributes of EquipmentReliabilityProfile::FACTSEquipment**

name	mult	type	description
slope	1..1	VoltagePerReactivePower	(NC) The characteristics slope which defines how the reactive power output changes in proportion to the difference between the regulated bus voltage and the voltage setpoint. The attribute shall be a positive value or zero.
ratedI	0..1	CurrentFlow	(NC) Rated current of the FACTS equipment.
ratedU	0..1	Voltage	(NC) Rated voltage of the FACTS equipment.
ratedC	0..1	Reactance	(NC) Capacitive reactance at maximum reactive power. Shall always be positive.
ratedL	0..1	Reactance	(NC) Inductive rating at maximum inductive reactive power. Shall always be negative.
minC	0..1	Reactance	(NC) Capacitive reactance at minimum reactive power. Shall always be positive.
maxC	0..1	Reactance	(NC) Capacitive reactance at maximum reactive power. Shall always be positive.
minL	0..1	Reactance	(NC) Inductive rating at minimum inductive reactive power. Shall always be negative.
maxL	0..1	Reactance	(NC) Inductive rating at maximum inductive reactive power. Shall always be negative.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1815

1816 Table 100 shows all association ends of FACTSEquipment with other classes.

1817 **Table 100 – Association ends of EquipmentReliabilityProfile::FACTSEquipment with**
1818 **other classes**

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1819

1820 **3.60 (NC) FlexibleEnergyUnit**1821 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1822 [IdentifiedObject](#)

1823 Flexible consumer or embedded producer of energy. The unit cannot be a net producer.

1824 Table 101 shows all attributes of FlexibleEnergyUnit.

1825 **Table 101 – Attributes of EquipmentReliabilityProfile::FlexibleEnergyUnit**

name	mult	type	description
uncontrollable	0..1	ActivePower	(NC) The active power, that forms the base consumption for the unit. This is measured and expected consumption. Load sign convention is used, i.e. positive sign means flow out from a node.
timeShift	0..1	ActivePower	(NC) The active power, that can be shifted from one pricing interval (market time unit) to another. It is expected to be a limited on the length of the shift. Example from household could be washing machine or dishwasher. Example from industry is the possible to shut down a machine for the relevant period. Load sign convention is used, i.e. positive sign means flow out from a node.
buffer	0..1	ActivePower	(NC) The active power, that has the flexibility to operate as production and/or consumption. The buffer is bound. Example are heat pump, cooling system, embedded batteries including electric vehicle. Load sign convention is used, i.e. positive sign means flow out from a node.
unconstrained	0..1	ActivePower	(NC) The active power, that has the flexibility to operate as production without any bound by a buffer. Example are alternative heating (wood, gas, diesel etc) or power generators. Load sign convention is used, i.e. positive sign means flow out from a node.
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1826

1827 Table 102 shows all association ends of FlexibleEnergyUnit with other classes.

1828 **Table 102 – Association ends of EquipmentReliabilityProfile::FlexibleEnergyUnit with other classes**
1829

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1830

1831 **3.61 (abstract,NC) FunctionBlock**1832 Inheritance path = [IdentifiedObject](#)1833 Function block is a function described as a set of elementary blocks. The blocks describe the
1834 function between input variables and output variables.

1835 Table 103 shows all attributes of FunctionBlock.

1836

Table 103 – Attributes of EquipmentReliabilityProfile::FunctionBlock

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) True, if the function block is enabled (active). Otherwise false.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1837

1838 Table 104 shows all association ends of FunctionBlock with other classes.

1839 **Table 104 – Association ends of EquipmentReliabilityProfile::FunctionBlock with other
1840 classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) Automation function describe automation that this function block is part of.
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) Automation block group which has function blocks.

1841

1842 **3.62 (abstract,NC) FunctionInputVariable**1843 Inheritance path = [IdentifiedObject](#)

1844 Functional input variable defines the domain of the function.

1845 Table 105 shows all attributes of FunctionInputVariable.

1846

Table 105 – Attributes of EquipmentReliabilityProfile::FunctionInputVariable

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1847

1848 Table 106 shows all association ends of FunctionInputVariable with other classes.

1849 **Table 106 – Association ends of EquipmentReliabilityProfile::FunctionInputVariable**
1850 **with other classes**

mult from	name	mult to	type	description
1..*	Function	1..1	FunctionBlock	(NC) Function block describe the function that function input variable provides the domain for.

1851

1852 3.63 (NC) FunctionOutputVariable

1853 Inheritance path = [IdentifiedObject](#)

1854 Functional output variable defines the codomain of the function.

1855 Table 107 shows all attributes of FunctionOutputVariable.

1856 **Table 107 – Attributes of EquipmentReliabilityProfile::FunctionOutputVariable**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1857

1858 Table 108 shows all association ends of FunctionOutputVariable with other classes.

1859 **Table 108 – Association ends of EquipmentReliabilityProfile::FunctionOutputVariable**
1860 **with other classes**

mult from	name	mult to	type	description
1..*	FunctionBlock	1..1	FunctionBlock	(NC) Function block describe the function that function output variable provides the codomain for.
0..*	PropertyReference	1..1	PropertyReference	(NC) Property reference refers to a given class and property that is populated by the function output variable.

1861

1862 3.64 (NC) GateInputPin

1863 Inheritance path = [FunctionInputVariable](#) : [IdentifiedObject](#)

1864 Input pin for a logical gate. The condition described in the input pin gives a logical true or false.

1865 The result from measurement and calculation are converted to a true or false.

1866 Table 109 shows all attributes of GateInputPin.

1867 **Table 109 – Attributes of EquipmentReliabilityProfile::GateInputPin**

name	mult	type	description
absoluteValue	0..1	Boolean	(NC) Indicates if the absolute value is used for comparison. If true, use the absolute value. If false, use the complex value (vector).
logicKind	0..1	LogicalOperatorsKind	(NC) The logical operator kind used for comparison.
duration	0..1	Duration	(NC) The time duration for which the condition is satisfied before acting. Default is 0 seconds.
negate	0..1	Boolean	(NC) Invert/negate the result of the comparison.

name	mult	type	description
thresholdPercentage	0..1	PerCent	(NC) The threshold percentage that should be used for compare with the percentage change between input value and threshold value. The allowed value range is [0,100].
thresholdValue	0..1	Float	(NC) The threshold value that should be used for compare with the input value.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1868

1869

Table 110 shows all association ends of GateInputPin with other classes.

1870

Table 110 – Association ends of EquipmentReliabilityProfile::GateInputPin with other classes

1871

mult from	name	mult to	type	description
1..*	Function	1..1	FunctionBlock	(NC) inherited from: FunctionInputVariable

1872

1873 3.65 (Description) GeneratingUnit

1874 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1875

1876 A single or set of synchronous machines for converting mechanical power into alternating-current power. For example, individual machines within a set may be defined for scheduling purposes while a single control signal is derived for the set. In this case there would be a
1877 GeneratingUnit for each member of the set and an additional GeneratingUnit corresponding to
1878 the set.
1879

1880 Table 111 shows all attributes of GeneratingUnit.

1881

Table 111 – Attributes of EquipmentReliabilityProfile::GeneratingUnit

name	mult	type	description
maxEconomicP	0..1	ActivePower	Maximum high economic active power limit, that should not exceed the maximum operating active power limit.
maxStartupLoad	0..1	ActivePower	(NC) Maximum consumption by the generating unit as part of the startup process.
minEconomicP	0..1	ActivePower	Low economic active power limit that shall be greater than or equal to the minimum operating active power limit.
shutdownTime	0..1	Duration	(NC) Time it takes to shutdown the unit.
lowerRampRate	0..1	ActivePowerChangeRate	The normal maximum rate the generating unit active power output can be lowered by control actions.
raiseRampRate	0..1	ActivePowerChangeRate	The normal maximum rate the generating unit active power output can be raised by control actions.
minimumOffTime	0..1	Seconds	Minimum time interval between unit shutdown and startup.
warmStartupTime	0..1	Duration	(NC) Time it takes to startup the unit when it is warm.

name	mult	type	description
coolDownTime	0..1	Duration	(NC) Time it takes from a unit shutdown until it is considered cold.
startupRampRate	0..1	ActivePowerChangeRate	(NC) The startup ramp rate of the generating unit which describes the speed of change of active power from zero to the minimum active power. When the ramp is not provided, the optimisation process shall consider the change as an instant change of active power from zero to minimum active power.
normalMustRunP	0..1	ActivePower	(NC) Normal minimum active power injection that is needed to meet must-run requirement. This value can be higher or equal to minimum operational limit. Load sign convention is used, i.e. positive sign means flow out from a node.
runningLeadTime	0..1	Duration	(NC) Time it takes to change the schedule when the unit is operating due to technical configuration of a supporting system, e.g. gas pipeline.
minimumUpTime	0..1	Duration	(NC) The time that a generating unit has to stay running after it has been switched on by the Remedial Action Optimizer.
normalStartupCost	0..1	Decimal	(NC) The normal initial startup cost incurred for each start of the GeneratingUnit.
normalWarmStartupCost	0..1	Decimal	(NC) The normal warm startup cost incurred for each start of the GeneratingUnit.
normalMustRunQ	0..1	ReactivePower	(NC) Normal minimum reactive power injection that is needed to meet must-run requirement. This value can be higher or equal to minimum operational limit. Load sign convention is used, i.e. positive sign means flow out from a node.
maxRampDownCountPerDay	0..1	Integer	(NC) Number of times the unit can do ramp down within a calendar day. One ramp down consists of a decrease of a power plant production level from a stable schedule to another regardless of how much time the power plant stays in such stable operating stage.
rampLockTime	0..1	Duration	(NC) Time between end or start of ramping. If a unit has just stopped the ramping, it will need to wait this time until a new ramping can start.
costCurrency	0..1	Currency	(NC) Currency the cost is given in.
normalShutdownCost	0..1	Decimal	(NC) The normal shutdown cost incurred for each shutdown of the GeneratingUnit.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1882

1883

Table 112 shows all association ends of GeneratingUnit with other classes.

1884 **Table 112 – Association ends of EquipmentReliabilityProfile::GeneratingUnit with other**
1885 **classes**

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) The schedule resource that has this generating unit.
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1886

1887 **3.66 (NC) GeothermalGeneratingUnit**1888 Inheritance path = [GeneratingUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1889 Generating unit that is generating electrical power from geothermal energy.

1890 Table 113 shows all attributes of GeothermalGeneratingUnit.

1891 **Table 113 – Attributes of EquipmentReliabilityProfile::GeothermalGeneratingUnit**

name	mult	type	description
kind	1..1	GeothermalUnitKind	(NC) Kind of geothermal generating unit.
maxEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
maxStartupLoad	0..1	ActivePower	(NC) inherited from: GeneratingUnit
minEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
shutdownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
lowerRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
raiseRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
minimumOffTime	0..1	Seconds	inherited from: GeneratingUnit
warmStartupTime	0..1	Duration	(NC) inherited from: GeneratingUnit
coolDownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
startupRampRate	0..1	ActivePowerChangeRate	(NC) inherited from: GeneratingUnit
normalMustRunP	0..1	ActivePower	(NC) inherited from: GeneratingUnit
runningLeadTime	0..1	Duration	(NC) inherited from: GeneratingUnit
minimumUpTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalStartupCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
normalWarmStartupCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
normalMustRunQ	0..1	ReactivePower	(NC) inherited from: GeneratingUnit
maxRampDownCountPerDay	0..1	Integer	(NC) inherited from: GeneratingUnit
rampLockTime	0..1	Duration	(NC) inherited from: GeneratingUnit
costCurrency	0..1	Currency	(NC) inherited from: GeneratingUnit
normalShutdownCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1892

1893 Table 114 shows all association ends of GeothermalGeneratingUnit with other classes.

1894 **Table 114 – Association ends of EquipmentReliabilityProfile::GeothermalGeneratingUnit**
1895 **with other classes**

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: GeneratingUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1896

1897 **3.67 (Description) HydroPump**1898 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1899 A synchronous motor-driven pump, typically associated with a pumped storage plant.

1900 Table 115 shows all attributes of HydroPump.

1901 **Table 115 – Attributes of EquipmentReliabilityProfile::HydroPump**

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value. In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$. In the case of priority strategy, the item with the lowest number gets allocated energy first.
maxEconomicP	0..1	ActivePower	(NC) Maximum high economic active power limit, that should not exceed the maximum operating active power limit.
maxOperatingP	0..1	ActivePower	(NC) This is the maximum operating active power limit the dispatcher can enter for this unit.
minEconomicP	0..1	ActivePower	(NC) Low economic active power limit that shall be greater than or equal to the minimum operating active power limit.
minOperatingP	0..1	ActivePower	(NC) This is the minimum operating active power limit the dispatcher can enter for this unit.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1902

1903 Table 116 shows all association ends of HydroPump with other classes.

1904 **Table 116 – Association ends of EquipmentReliabilityProfile::HydroPump with other**
1905 **classes**

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) The schedule resource that has this hydro pump.
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1906

1907 **3.68 (abstract) IdentifiedObject root class**1908 This is a root class to provide common identification for all classes needing identification and
1909 naming attributes.

1910 Table 117 shows all attributes of IdentifiedObject.

1911

Table 117 – Attributes of EquipmentReliabilityProfile::IdentifiedObject

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) The attribute is used for an exchange of the EIC code (Energy identification Code). The length of the string is 16 characters as defined by the EIC code. For details on EIC scheme please refer to ENTSO-E web site.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	1..1	String	Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	0..1	String	The name is any free human readable and possibly non unique text naming the object.

1912

1913 **3.69 (NC) ImpedanceControlFunction**1914 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)1915 Impedance control function is a function block that calculates the operating point of the
1916 controlled equipment to achieve the target impedance.

1917 Table 118 shows all attributes of ImpedanceControlFunction.

1918

Table 118 – Attributes of EquipmentReliabilityProfile::ImpedanceControlFunction

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1919

1920

Table 119 shows all association ends of ImpedanceControlFunction with other classes.

1921

1922

**Table 119 – Association ends of
EquipmentReliabilityProfile::ImpedanceControlFunction with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

1923

1924

3.70 (abstract,NC) LimitDependencyCurve

1925

Inheritance path = [Curve](#) : [IdentifiedObject](#)

1926

A curve or functional relationship between an independent variable (X-axis) and limiting dependent (Y-axis) variables.

1927

1928

Table 120 shows all attributes of LimitDependencyCurve.

1929

Table 120 – Attributes of EquipmentReliabilityProfile::LimitDependencyCurve

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1930

1931

3.71 (Description) Line

1932

Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1933

1934

Contains equipment beyond a substation belonging to a power transmission line.

1935

Table 121 shows all attributes of Line.

1936

Table 121 – Attributes of EquipmentReliabilityProfile::Line

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1937

1938

Table 122 shows all association ends of Line with other classes.

1939 **Table 122 – Association ends of EquipmentReliabilityProfile::Line with other classes**

mult from	name	mult to	type	description
0..*	ACTieCorridor	0..1	ACTieCorridor	(NC) ACTieCorridor that the line is part of.
0..*	SchedulingArea	0..1	SchedulingArea	(NC) The scheduling area that has this line.

1940

1941 **3.72 (NC) LineCircuit**1942 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)1943 A line circuit is a circuit that has at least one ACLineSegment and may or may not include
1944 related switching and/or auxiliary equipment.

1945 Table 123 shows all attributes of LineCircuit.

1946

Table 123 – Attributes of EquipmentReliabilityProfile::LineCircuit

name	mult	type	description
positiveFlowIn	1..1	Boolean	(NC) inherited from: Circuit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1947

1948 Table 124 shows all association ends of LineCircuit with other classes.

1949 **Table 124 – Association ends of EquipmentReliabilityProfile::LineCircuit with other classes**
1950

mult from	name	mult to	type	description
0..1	IdentifyingTerminal	0..1	Terminal	(NC) inherited from: Circuit

1951

1952 **3.73 (NC) LoadFrequencyControlArea**1953 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1954 A part of a synchronous area or an entire synchronous area, physically demarcated by points
1955 of measurement at interconnectors to other load frequency control (LFC) areas, operated by
1956 one or more TSOs fulfilling the obligations of load-frequency control.

1957 Table 125 shows all attributes of LoadFrequencyControlArea.

1958

Table 125 – Attributes of EquipmentReliabilityProfile::LoadFrequencyControlArea

name	mult	type	description
deficientGenerationLimit	0..1	PerCent	(NC) Percentage of average dispatch target plus average regulation used to calculate Deficient Generation Limit. The value shall be a positive value between 0 and 100.
frequencyBiasFactor	0..1	Float	(NC) Frequency bias in MW/Hz.
includeFrequencyBias	1..1	Boolean	(NC) True means the frequency bias that is taken into consideration in the frequency bias computation.
frequencyRestorationReserveDelay	0..1	Seconds	(NC) FRR delay expressed in seconds. Must be a positive multiple of AGC's cycle duration.

name	mult	type	description
frequencyRestorationReserveMaxRamp	0..1	ActivePowerChangeRate	(NC) Maximum authorized ramp for both FRR dispatching and ramp to zero.
frequencyRestorationReserveThreshold	0..1	ActivePower	(NC) Authorized threshold for both FRR dispatching and ramp to zero.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1959

1960

Table 126 shows all association ends of LoadFrequencyControlArea with other classes.

1961

1962

Table 126 – Association ends of EquipmentReliabilityProfile::LoadFrequencyControlArea with other classes

mult from	name	mult to	type	description
0..*	FrequencyControlOperator	0..1	LoadFrequencyControlOperator	(NC) The frequency control operator that operates this frequency control area.
0..*	LoadFrequencyControlBlock	0..1	LoadFrequencyControlBlock	(NC) The load frequency control block that has this load frequency control area.

1963

1964

3.74 (NC) LoadFrequencyControlBlock

1965

Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1966

A part of a synchronous area or an entire synchronous area, physically demarcated by points of measurement at interconnectors to other load frequency control (LFC) blocks, consisting of one or more LFC areas, operated by one or more TSOs fulfilling the obligations of load-frequency control.

1967

1968

1969

Table 127 shows all attributes of LoadFrequencyControlBlock.

1970

Table 127 – Attributes of EquipmentReliabilityProfile::LoadFrequencyControlBlock

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1972

1973

Table 128 shows all association ends of LoadFrequencyControlBlock with other classes.

1974

1975

Table 128 – Association ends of EquipmentReliabilityProfile::LoadFrequencyControlBlock with other classes

mult from	name	mult to	type	description
0..*	SynchronousArea	0..1	SynchronousArea	(NC) The synchronous area that has this load frequency control block.

1976

1977

3.75 (NC) LoadFrequencyControlOperator

1978

Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1979 A role that is responsible for operational security by operating the load frequency control (LFC)
1980 mechanism.

1981 Table 129 shows all attributes of LoadFrequencyControlOperator.

1982 **Table 129 – Attributes of EquipmentReliabilityProfile::LoadFrequencyControlOperator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1983

1984 Table 130 shows all association ends of LoadFrequencyControlOperator with other classes.

1985 **Table 130 – Association ends of**
1986 **EquipmentReliabilityProfile::LoadFrequencyControlOperator with other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

1987

1988 **3.76 (NC) ModularStaticSynchronousSeriesCompensator**

1989 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
1990 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1991 Modular static synchronous series compensator (MSSSC) is a type of flexible AC transmission
1992 system regulating equipment which consists of solid-state voltage source inverter connected in
1993 series with a transmission line. This is similar to static synchronous series compensator
1994 (SSSC), but without injection transformer. This enables the MSSSC to be truly modular with the
1995 ability to simply install a number of equipment in series to provide a desired maximum level of
1996 impedance. MSSSC can be dispersed into multiple location in a circuit working collectively
1997 under the same controller scheme.

1998 Table 131 shows all attributes of ModularStaticSynchronousSeriesCompensator.

1999 **Table 131 – Attributes of**
2000 **EquipmentReliabilityProfile::ModularStaticSynchronousSeriesCompensator**

name	mult	type	description
slope	1..1	VoltagePerReactivePower	(NC) inherited from: FACTSEquipment
ratedI	0..1	CurrentFlow	(NC) inherited from: FACTSEquipment
ratedU	0..1	Voltage	(NC) inherited from: FACTSEquipment
ratedC	0..1	Reactance	(NC) inherited from: FACTSEquipment
ratedL	0..1	Reactance	(NC) inherited from: FACTSEquipment
minC	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxC	0..1	Reactance	(NC) inherited from: FACTSEquipment
minL	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxL	0..1	Reactance	(NC) inherited from: FACTSEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject

name	mult	type	description
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2001

2002

2003

Table 132 shows all association ends of ModularStaticSynchronousSeriesCompensator with other classes.

2004

2005

2006

Table 132 – Association ends of EquipmentReliabilityProfile::ModularStaticSynchronousSeriesCompensator with other classes

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2007

2008

3.77 (Description) NuclearGeneratingUnit

2009

Inheritance path = [GeneratingUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2010

A nuclear generating unit.

2011

Table 133 shows all attributes of NuclearGeneratingUnit.

2012

Table 133 – Attributes of EquipmentReliabilityProfile::NuclearGeneratingUnit

name	mult	type	description
reactorKind	1..1	NuclearReactorKind	(NC) Kind of nuclear reactor.
maxEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
maxStartupLoad	0..1	ActivePower	(NC) inherited from: GeneratingUnit
minEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
shutdownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
lowerRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
raiseRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
minimumOffTime	0..1	Seconds	inherited from: GeneratingUnit
warmStartupTime	0..1	Duration	(NC) inherited from: GeneratingUnit
coolDownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
startupRampRate	0..1	ActivePowerChangeRate	(NC) inherited from: GeneratingUnit
normalMustRunP	0..1	ActivePower	(NC) inherited from: GeneratingUnit
runningLeadTime	0..1	Duration	(NC) inherited from: GeneratingUnit
minimumUpTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalStartupCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
normalWarmStartupCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
normalMustRunQ	0..1	ReactivePower	(NC) inherited from: GeneratingUnit
maxRampDownCountPerDay	0..1	Integer	(NC) inherited from: GeneratingUnit
rampLockTime	0..1	Duration	(NC) inherited from: GeneratingUnit
costCurrency	0..1	Currency	(NC) inherited from: GeneratingUnit
normalShutdownCost	0..1	Decimal	(NC) inherited from: GeneratingUnit

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2013

2014

Table 134 shows all association ends of NuclearGeneratingUnit with other classes.

2015

2016

Table 134 – Association ends of EquipmentReliabilityProfile::NuclearGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: GeneratingUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2017

2018

3.78 (abstract) OperationalLimit

2019

Inheritance path = [IdentifiedObject](#)

2020

A value and normal value associated with a specific kind of limit.

2021

The sub class value and normalValue attributes vary inversely to the associated

2022

OperationalLimitType.acceptableDuration (acceptableDuration for short).

2023

If a particular piece of equipment has multiple operational limits of the same kind (apparent

2024

power, current, etc.), the limit with the greatest acceptableDuration shall have the smallest limit

2025

value and the limit with the smallest acceptableDuration shall have the largest limit value. Note:

2026

A large current can only be allowed to flow through a piece of equipment for a short duration

2027

without causing damage, but a lesser current can be allowed to flow for a longer duration.

2028

Table 135 shows all attributes of OperationalLimit.

2029

Table 135 – Attributes of EquipmentReliabilityProfile::OperationalLimit

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2030

2031

Table 136 shows all association ends of OperationalLimit with other classes.

2032

2033

Table 136 – Association ends of EquipmentReliabilityProfile::OperationalLimit with other classes

mult from	name	mult to	type	description
1..*	OperationalLimitType	1..1	OperationalLimitType	The limit type associated with this limit.
1..*	OperationalLimitSet	1..1	OperationalLimitSet	The limit set to which the limit values belong.

2034

2035

3.79 (Description) OperationalLimitSet

2036

Inheritance path = [IdentifiedObject](#)

2037 A set of limits associated with equipment. Sets of limits might apply to a specific temperature,
2038 or season for example. A set of limits may contain different severities of limit levels that would
2039 apply to the same equipment. The set may contain limits of different types such as apparent
2040 power and current limits or high and low voltage limits that are logically applied together as a
2041 set.

2042 Table 137 shows all attributes of OperationalLimitSet.

2043 **Table 137 – Attributes of EquipmentReliabilityProfile::OperationalLimitSet**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2044

2045 Table 138 shows all association ends of OperationalLimitSet with other classes.

2046 **Table 138 – Association ends of EquipmentReliabilityProfile::OperationalLimitSet with**
2047 **other classes**

mult from	name	mult to	type	description
0..*	PowerTransferCorridor	0..1	PowerTransferCorridor	(NC) The power transfer corridor that has this operational limit set.
0..*	Terminal	1..1	ACDCTerminal	The terminal where the operational limit set apply.

2048

2049 3.80 OperationalLimitType

2050 Inheritance path = [IdentifiedObject](#)

2051 The operational meaning of a category of limits.

2052 Table 139 shows all attributes of OperationalLimitType.

2053 **Table 139 – Attributes of EquipmentReliabilityProfile::OperationalLimitType**

name	mult	type	description
direction	1..1	OperationalLimitDirectionKind	The direction of the limit.
isMinimum	0..1	Boolean	(NC) Defines if the operational limit type is minimum. If true, the value is a minimum value of the same kind. This applies to stability and PATL. If false, the limit has the normal behaviour. OperationalLimitType.direction attribute shall be absoluteValue.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2054

2055 Table 140 shows all association ends of OperationalLimitType with other classes.

2056 **Table 140 – Association ends of EquipmentReliabilityProfile::OperationalLimitType with**
2057 **other classes**

mult from	name	mult to	type	description
0..*	PermanentAmbientTemperatureDependencyCurve	0..1	AmbientTemperatureDependencyCurve	(NC) The permanent ambient temperature dependency curve for this operational limit type.
0..*	TemporaryBaseOverloadLimitCurve	0..1	BaseOverloadLimitCurve	(NC) The temporary base overload limit curve for this operational limit type.
0..*	TemporaryDurationOverloadLimitCurve	0..1	DurationOverloadLimitCurve	(NC) The temporary duration overload limit curve for this operational limit type.
0..*	PermanentSolarRadiationCurve	0..1	SolarRadiationDependencyCurve	(NC) The permanent solar radiation curve for this operational limit type.
0..*	RecoveryOverloadLimitCurve	0..1	RecoveryOverloadLimitCurve	(NC) This is the curve which provides the recovery time information for this limit type.

2058

2059 3.81 (NC) OrdinaryPowerTransferCorridor

2060 Inheritance path = [PowerTransferCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2061 Power transfer corridor defined for normal operating network.

2062 Table 141 shows all attributes of OrdinaryPowerTransferCorridor.

2063 **Table 141 – Attributes of EquipmentReliabilityProfile::OrdinaryPowerTransferCorridor**

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) inherited from: PowerTransferCorridor
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2064

2065 3.82 (NC,Description) PTCTriggeredEquipment

2066 Inheritance path = [IdentifiedObject](#)

2067 Power Transfer Corridor triggered equipment connects the equipment that will create the exceptional power transfer corridor when taking out of service. e.g. A system with three lines gets an exceptional power transfer corridor when one of the lines is taken out of service.

2068 Table 142 shows all attributes of PTCTriggeredEquipment.

2071 **Table 142 – Attributes of EquipmentReliabilityProfile::PTCTriggeredEquipment**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2072

2073 Table 143 shows all association ends of PTCTriggeredEquipment with other classes.

2074 **Table 143 – Association ends of EquipmentReliabilityProfile::PTCTriggeredEquipment**
2075 **with other classes**

mult from	name	mult to	type	description
0..*	Equipment	1..1	Equipment	(NC) The equipment which is part of power transfer corridor triggering.
1..*	ExceptionalPowerTransferCorridor	1..1	ExceptionalPowerTransferCorridor	(NC) The power transfer corridor which is triggered by this equipment.

2076

2077 3.83 (NC) ReactivePowerControlFunction

2078 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2079 Reactive power control function is a function block that calculate the operating point of the
2080 controlled equipment to achieve the target reactive power.

2081 Table 144 shows all attributes of ReactivePowerControlFunction.

2082 **Table 144 – Attributes of EquipmentReliabilityProfile::ReactivePowerControlFunction**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2083

2084 Table 145 shows all association ends of ReactivePowerControlFunction with other classes.

2085 **Table 145 – Association ends of**
2086 **EquipmentReliabilityProfile::ReactivePowerControlFunction with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2087

2088 3.84 (NC) RecoveryOverloadLimitCurve

2089 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

2090 The relation between the recovery time and an overload limit.

2091 Table 146 shows all attributes of RecoveryOverloadLimitCurve.

2092 **Table 146 – Attributes of EquipmentReliabilityProfile::RecoveryOverloadLimitCurve**

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve

name	mult	type	description
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2093

2094 **3.85 (abstract,NC) Region**2095 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2096 A region where the system operator belongs to.

2097 Table 147 shows all attributes of Region.

2098

Table 147 – Attributes of EquipmentReliabilityProfile::Region

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2099

2100 Table 148 shows all association ends of Region with other classes.

Table 148 – Association ends of EquipmentReliabilityProfile::Region with other classes

mult from	name	mult to	type	description
0..*	OverlappingZone	0..1	OverlappingZone	(NC) The overlapping zone which is impacted by this region.

2102

2103 **3.86 (abstract) RegulatingCondEq**2104 Inheritance path = [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2106 A type of conducting equipment that can regulate a quantity (i.e. voltage or flow) at a specific point in the network.

2108 Table 149 shows all attributes of RegulatingCondEq.

2109

Table 149 – Attributes of EquipmentReliabilityProfile::RegulatingCondEq

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2110

2111 Table 150 shows all association ends of RegulatingCondEq with other classes.

2112 **Table 150 – Association ends of EquipmentReliabilityProfile::RegulatingCondEq with**
2113 **other classes**

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) The equipment controller for this regulating conducting equipment.
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2114

2115 3.87 (NC) ScheduleResource

2116 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2117 A schedule resource is a market-based method for handling participation of small units,
2118 particularly located on the lower voltage level that is controlled by a Distributed System
2119 Operator (DSO). It is a collection of units that can operate in the market by providing bids, offers
2120 and a resulting committed operational schedule for the collection.

2121 Table 151 shows all attributes of ScheduleResource.

2122 **Table 151 – Attributes of EquipmentReliabilityProfile::ScheduleResource**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2123

2124 Table 152 shows all association ends of ScheduleResource with other classes.

2125 **Table 152 – Association ends of EquipmentReliabilityProfile::ScheduleResource with**
2126 **other classes**

mult from	name	mult to	type	description
0..*	PrimaryEnergySource	0..1	EnergyType	(NC) Primary energy reference type for this schedule resource.
0..*	SchedulingArea	0..1	SchedulingArea	(NC) The scheduling area that has this schedule resource.
0..*	ResourceOf	0..1	ScheduleResource	(NC) The schedule resource that has this subschedule resource.
0..1	ScheduleResourceController	0..1	ScheduleResourceController	(NC) Schedule resource controller for this schedule resource.

2127

2128 3.88 (NC) SchedulingArea

2129 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2130 An area where production and/or consumption of energy can be forecasted, scheduled and
2131 measured. The area is operated by only one system operator, typically a Transmission System
2132 Operator (TSO). The area can consist of a sub area, which has the same definition as the main
2133 area, but it can be operated by another system operator (typically Distributed System Operator
2134 (DSO) or a Closed Distributed System Operator (CDSO)). This includes microgrid concept. A
2135 substation is the smallest grouping that can be included in the area. The area size should be
2136 considered in terms of the possibility of accumulated reading (settlement metering) and the
2137 capability of operating as an island.

2138 Table 153 shows all attributes of SchedulingArea.

2139

Table 153 – Attributes of EquipmentReliabilityProfile::SchedulingArea

name	mult	type	description
isIslandingEnabled	0..1	Boolean	(NC) Identifies if the area can operate in island operation. If true, the area is enabled (capable) of operating as an electrical island. If false, the area does not have the capability or it is not enabled to operate as an electrical island.
isMeteringGridArea	0..1	Boolean	(NC) Identifies if the area is settlement metered for all import and export to the area. If true, the area is metered area. If false, it is not.
normalParticipationFactor	0..1	Float	(NC) Normal participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value. In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(\text{PF})$. In the case of priority strategy, the item with the lowest number gets allocated energy first.
type	0..1	String	(NC) Type of scheduling area.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2140

2141

Table 154 shows all association ends of SchedulingArea with other classes.

2142

2143

Table 154 – Association ends of EquipmentReliabilityProfile::SchedulingArea with other classes

mult from	name	mult to	type	description
0..*	EnergyCoordinationRegion	0..1	EnergyCoordinationRegion	(NC) The energy coordination region that has this scheduling area.
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) The load frequency control area which has this scheduling area.
0..*	SystemOperator	0..1	SystemOperator	(NC) The system operator for this scheduling area.
0..*	SynchronousArea	0..1	SynchronousArea	(NC) The synchronous area that has this scheduling area.
0..*	BiddingZone	0..1	BiddingZone	(NC) The bidding zone related to this scheduling area.
1..*	ControlArea	0..1	ControlArea	(NC) The control area for this scheduling area.
0..*	PowerCapacity	0..1	PowerCapacity	(NC) Power capacity of this scheduling area.
0..*	PartOf	0..1	SchedulingArea	(NC) The scheduling area is part of this scheduling area.

2144

2145 **3.89 (NC) SecurityCoordinator**

2146 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
2147 [OrganisationRole](#) : [IdentifiedObject](#)

2148 A role that coordinates the relevant remedial actions and their optimisation to ensure efficient
2149 use to achieve required operational security of the power system.

2150 Table 155 shows all attributes of SecurityCoordinator.

2151 **Table 155 – Attributes of EquipmentReliabilityProfile::SecurityCoordinator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2152

2153 Table 156 shows all association ends of SecurityCoordinator with other classes.

2154 **Table 156 – Association ends of EquipmentReliabilityProfile::SecurityCoordinator with
2155 other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

2156

2157 **3.90 (NC) SolarRadiationDependencyCurve**

2158 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

2159 A curve or functional relationship between

2160 - the solar radiation independent variable (X-axis), and

2161 - relative dependent (Y-axis) variables.

2162 Table 157 shows all attributes of SolarRadiationDependencyCurve.

2163 **Table 157 – Attributes of EquipmentReliabilityProfile::SolarRadiationDependencyCurve**

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2164

2165 **3.91 (NC) StaticSynchronousCompensator**

2166 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2167 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2168 Static synchronous compensator (STATCOM), also known as a static synchronous condenser
2169 (STATCON), is a type of flexible AC transmission system regulating equipment used on
2170 alternating current electricity transmission networks. It is based on a power electronics voltage-
2171 source converter and can act as either a source or sink of reactive AC power to an electricity
2172 network. If connected to a source of power it can also provide active AC power.

2173 Table 158 shows all attributes of StaticSynchronousCompensator.

2174 **Table 158 – Attributes of EquipmentReliabilityProfile::StaticSynchronousCompensator**

name	mult	type	description
slope	1..1	VoltagePerReactivePower	(NC) inherited from: FACTSEquipment
ratedI	0..1	CurrentFlow	(NC) inherited from: FACTSEquipment
ratedU	0..1	Voltage	(NC) inherited from: FACTSEquipment
ratedC	0..1	Reactance	(NC) inherited from: FACTSEquipment
ratedL	0..1	Reactance	(NC) inherited from: FACTSEquipment
minC	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxC	0..1	Reactance	(NC) inherited from: FACTSEquipment
minL	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxL	0..1	Reactance	(NC) inherited from: FACTSEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2175

2176 Table 159 shows all association ends of StaticSynchronousCompensator with other classes.

2177

2178

**Table 159 – Association ends of
EquipmentReliabilityProfile::StaticSynchronousCompensator with other classes**

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2179

2180 **3.92 (NC) StaticSynchronousSeriesCompensator**

2181 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2182 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2183 Static synchronous series compensator (SSSC) is a type of flexible AC transmission system
2184 which consists of a solid-state voltage source inverter coupled with a transformer that is
2185 connected in series with a transmission line. This device can inject an almost sinusoidal voltage
2186 in series with the line. This injected voltage could be considered as an inductive or capacitive
2187 reactance, which is connected in series with the transmission line. This feature can provide
2188 controllable voltage compensation. In addition, SSSC is able to reverse the power flow by
2189 injecting a sufficiently large series reactive compensating voltage. Moreover it can inject a

2190 voltage proportional to the difference between the line current and the pre-configured current
2191 threshold. It shall have two Terminal-s associated with it.
2192 Table 160 shows all attributes of StaticSynchronousSeriesCompensator.

2193
2194

**Table 160 – Attributes of
EquipmentReliabilityProfile::StaticSynchronousSeriesCompensator**

name	mult	type	description
slope	1..1	VoltagePerReactivePower	(NC) inherited from: FACTSEquipment
ratedI	0..1	CurrentFlow	(NC) inherited from: FACTSEquipment
ratedU	0..1	Voltage	(NC) inherited from: FACTSEquipment
ratedC	0..1	Reactance	(NC) inherited from: FACTSEquipment
ratedL	0..1	Reactance	(NC) inherited from: FACTSEquipment
minC	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxC	0..1	Reactance	(NC) inherited from: FACTSEquipment
minL	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxL	0..1	Reactance	(NC) inherited from: FACTSEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2195
2196
2197

Table 161 shows all association ends of StaticSynchronousSeriesCompensator with other classes.

2198
2199

**Table 161 – Association ends of
EquipmentReliabilityProfile::StaticSynchronousSeriesCompensator with other classes**

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2200

2201 3.93 (NC) SubSchedulingArea

2202 Inheritance path = [SchedulingArea](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
2203 An area that is a part of another scheduling area. Typically part of a Transmission System
2204 Operator (TSO) scheduling area operated by a Distributed System Operator (DSO) or a Close
2205 Distributed System Operator (CDSO). This includes microgrid concept. A sub scheduling area
2206 can contain other sub areas. A sub scheduling area leaf will form the smallest entity of any
2207 given energy area.

2208 Table 162 shows all attributes of SubSchedulingArea.

2209

Table 162 – Attributes of EquipmentReliabilityProfile::SubSchedulingArea

name	mult	type	description
isIslandingEnabled	0..1	Boolean	(NC) inherited from: SchedulingArea
isMeteringGridArea	0..1	Boolean	(NC) inherited from: SchedulingArea

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) inherited from: SchedulingArea
type	0..1	String	(NC) inherited from: SchedulingArea
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2210

2211

Table 163 shows all association ends of SubSchedulingArea with other classes.

2212

2213

Table 163 – Association ends of EquipmentReliabilityProfile::SubSchedulingArea with other classes

mult from	name	mult to	type	description
0..*	EnergyCoordinationRegion	0..1	EnergyCoordinationRegion	(NC) inherited from: SchedulingArea
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) inherited from: SchedulingArea
0..*	SystemOperator	0..1	SystemOperator	(NC) inherited from: SchedulingArea
0..*	SynchronousArea	0..1	SynchronousArea	(NC) inherited from: SchedulingArea
0..*	BiddingZone	0..1	BiddingZone	(NC) inherited from: SchedulingArea
1..*	ControlArea	0..1	ControlArea	(NC) inherited from: SchedulingArea
0..*	PowerCapacity	0..1	PowerCapacity	(NC) inherited from: SchedulingArea
0..*	PartOf	0..1	SchedulingArea	(NC) inherited from: SchedulingArea

2214

2215 3.94 (Description) Substation

2216 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2217 A collection of equipment for purposes other than generation or utilization, through which

2218 electric energy in bulk is passed for the purposes of switching or modifying its characteristics.

2219 Table 164 shows all attributes of Substation.

2220

Table 164 – Attributes of EquipmentReliabilityProfile::Substation

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2222

2223

Table 165 shows all association ends of Substation with other classes.

2224 **Table 165 – Association ends of EquipmentReliabilityProfile::Substation with other**
2225 **classes**

mult from	name	mult to	type	description
0..*	SchedulingArea	0..1	SchedulingArea	(NC) The scheduling area that has this substation.

2226

2227 3.95 (NC) SubstationController

2228 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2229 [IdentifiedObject](#)

2230 Substation controller is controlling the equipment to optimize the use of the controlling
2231 equipment within a substation.

2232 Table 166 shows all attributes of SubstationController.

2233 **Table 166 – Attributes of EquipmentReliabilityProfile::SubstationController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2234

2235 Table 167 shows all association ends of SubstationController with other classes.

2236 **Table 167 – Association ends of EquipmentReliabilityProfile::SubstationController with**
2237 **other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2238

2239 3.96 (NC) SynchronousArea

2240 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2241 A synchronous area is an electrical area covered by interconnect with a common system
2242 frequency in a steady-state.

2243 Table 168 shows all attributes of SynchronousArea.

2244 **Table 168 – Attributes of EquipmentReliabilityProfile::SynchronousArea**

name	mult	type	description
nominalFrequency	1..1	Frequency	(NC) The nominal frequency for the Synchronous Area, e.g. 50 Hz for Europe.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2245

2246 **3.97 (abstract,NC) SystemOperationCoordinator**2247 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

2248 A role that coordinates relevant information and impact in regards to operating the power system.

2249 Table 169 shows all attributes of SystemOperationCoordinator.

2251 **Table 169 – Attributes of EquipmentReliabilityProfile::SystemOperationCoordinator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2252

2253 Table 170 shows all association ends of SystemOperationCoordinator with other classes.

2254 **Table 170 – Association ends of
EquipmentReliabilityProfile::SystemOperationCoordinator with other classes**

2255

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

2256

2257 **3.98 (abstract,NC) SystemOperator**2258 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

2259 System operator.

2260 Table 171 shows all attributes of SystemOperator.

2261 **Table 171 – Attributes of EquipmentReliabilityProfile::SystemOperator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2262

2263 Table 172 shows all association ends of SystemOperator with other classes.

2264 **Table 172 – Association ends of EquipmentReliabilityProfile::SystemOperator with
other classes**

2265

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

2266

2267 **3.99 (abstract,Description) TapChanger root class**

2268 Mechanism for changing transformer winding tap positions.

2269 Table 173 shows all association ends of TapChanger with other classes.

2270 **Table 173 – Association ends of EquipmentReliabilityProfile::TapChanger with other**
2271 **classes**

mult from	name	mult to	type	description
0..*	TapChangeController	0..1	TapChangerController	(NC) The tap changer controller that controls this TapChanger.

2272

2273 3.100 (abstract) Terminal

2274 Inheritance path = [ACDCTerminal](#)

2275 An AC electrical connection point to a piece of conducting equipment. Terminals are connected
2276 at physical connection points called connectivity nodes.

2277 3.101 (NC) TieCorridor

2278 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2279 A collection of one or more tie-lines or direct current poles that connect two different control
2280 areas.

2281 Table 174 shows all attributes of TieCorridor.

2282

Table 174 – Attributes of EquipmentReliabilityProfile::TieCorridor

name	mult	type	description
delayRegulatingReserve	0..1	Seconds	(NC) A positive number that is a multiple of Automatic Generation Control (AGC) run cycles that describes the delay in adapting imbalance of the tie corridor.
maxRegulatingReserveRamp	0..1	Float	(NC) Maximum authorized ramp for regulating reserve.
thresholdRegulatingReserve	0..1	ActivePower	(NC) Regulating reserve threshold.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2283

2284 Table 175 shows all association ends of TieCorridor with other classes.

2285 **Table 175 – Association ends of EquipmentReliabilityProfile::TieCorridor with other**
2286 **classes**

mult from	name	mult to	type	description
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) LoadFrequencyControlArea controlling the TieCorridor.
0..1	BiddingZoneBorder	0..*	BiddingZoneBorder	(NC) Bidding zone border in which the tie corridor is included.

2287

2288 3.102 (NC) ThyristorControlledSeriesCompensator

2289 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2290 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2291 Thyristor-controlled series capacitors (TCSC) is a type of flexible AC transmission system
2292 regulating equipment that is configured with controlled reactors in parallel with sections of a
2293 capacitor bank. This combination allows smooth control of the fundamental frequency
2294 capacitive reactance over a wide range. The thyristor valve contains a string of series connected

2295 high power thyristors. TCSC can control power flows in order to achieve eliminating of line
2296 overloads, reducing loop flows and minimising system losses.
2297 Table 176 shows all attributes of ThyristorControlledSeriesCompensator.

2298
2299

**Table 176 – Attributes of
EquipmentReliabilityProfile::ThyristorControlledSeriesCompensator**

name	mult	type	description
flexibleCapacitiveZ	1..1	Impedance	(NC) Flexible impedance that can be controlled by the compensator when operating in the capacitive range. Shall always be positive.
flexibleInductiveZ	1..1	Impedance	(NC) Flexible impedance that can be controlled by the compensator when operating in the inductive range. Shall always be negative.
minI	1..1	CurrentFlow	(NC) Minimum current below which the device bypassed.
reconnectionI	1..1	CurrentFlow	(NC) The current for which the TCSC returns back to operation after bypass.
slope	1..1	VoltagePerReactivePower	(NC) inherited from: FACTSEquipment
ratedI	0..1	CurrentFlow	(NC) inherited from: FACTSEquipment
ratedU	0..1	Voltage	(NC) inherited from: FACTSEquipment
ratedC	0..1	Reactance	(NC) inherited from: FACTSEquipment
ratedL	0..1	Reactance	(NC) inherited from: FACTSEquipment
minC	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxC	0..1	Reactance	(NC) inherited from: FACTSEquipment
minL	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxL	0..1	Reactance	(NC) inherited from: FACTSEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2300
2301
2302

Table 177 shows all association ends of ThyristorControlledSeriesCompensator with other classes.

2303
2304

**Table 177 – Association ends of
EquipmentReliabilityProfile::ThyristorControlledSeriesCompensator with other classes**

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2305
2306

3.103 (NC) TransmissionSystemOperator

2307 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) :
2308 [IdentifiedObject](#)
2309 A system operator role that is responsible for operating of an energy transmission network.
2310 Table 178 shows all attributes of TransmissionSystemOperator.

2311 **Table 178 – Attributes of EquipmentReliabilityProfile::TransmissionSystemOperator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2312

2313 Table 179 shows all association ends of TransmissionSystemOperator with other classes.

2314

2315 **Table 179 – Association ends of EquipmentReliabilityProfile::TransmissionSystemOperator with other classes**

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

2316

2317 **3.104 (NC) UnifiedPowerFlowController**2318 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2319 Unified power flow controller (UPFC) is providing fast-acting reactive power compensation on high-voltage electricity transmission networks.

2320 Table 180 shows all attributes of UnifiedPowerFlowController.

2323 **Table 180 – Attributes of EquipmentReliabilityProfile::UnifiedPowerFlowController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2324

2325 Table 181 shows all association ends of UnifiedPowerFlowController with other classes.

2326

2327 **Table 181 – Association ends of EquipmentReliabilityProfile::UnifiedPowerFlowController with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2328

2329 **3.105 (NC) VoltageAngleLimit**2330 Inheritance path = [OperationalLimit](#) : [IdentifiedObject](#)

2331 Voltage angle limit between two terminals. The association end OperationalLimitSet.Terminal defines one end and the host of the limit. The association end

2332 VoltageAngleLimit.AngleReferenceTerminal defines the reference terminal.

2333 Table 182 shows all attributes of VoltageAngleLimit.

2335

Table 182 – Attributes of EquipmentReliabilityProfile::VoltageAngleLimit

name	mult	type	description
normalValue	1..1	AngleDegrees	(NC) The difference in angle degrees between referenced by the association end OperationalLimitSet.Terminal and the Terminal referenced by the association end VoltageAngleLimit.AngleReferenceTerminal. The value shall be positive (greater than zero).
isFlowToRefTerminal	0..1	Boolean	(NC) True if the flow is from the operating limit terminal to the angle reference terminal. False means that the flow is the other direction. When it is not given, the limit is the same for both directions.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2336

2337

Table 183 shows all association ends of VoltageAngleLimit with other classes.

2338

2339

Table 183 – Association ends of EquipmentReliabilityProfile::VoltageAngleLimit with other classes

mult from	name	mult to	type	description
0..*	AngleReferenceTerminal	1..1	Terminal	(NC) The angle reference terminal for the voltage angle limit.
1..*	OperationalLimitType	1..1	OperationalLimitType	inherited from: OperationalLimit
1..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

2340

3.106 (NC) VoltageControlFunctionInheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

Voltage control function is a function block that calculate the operating point of the controlled equipment to achieve the target voltage.

2344

2345

Table 184 shows all attributes of VoltageControlFunction.

2346

Table 184 – Attributes of EquipmentReliabilityProfile::VoltageControlFunction

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2347

2348

Table 185 shows all association ends of VoltageControlFunction with other classes.

2349 **Table 185 – Association ends of EquipmentReliabilityProfile::VoltageControlFunction**
2350 **with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2351

2352 **3.107 Currency enumeration**

2353 Monetary currencies. ISO 4217 standard including 3-character currency code.

2354 Table 186 shows all literals of Currency.

2355 **Table 186 – Literals of EquipmentReliabilityProfile::Currency**

literal	value	description
AED	784	United Arab Emirates dirham.
AFN	971	Afghan afghani.
ALL	008	Albanian lek.
AMD	051	Armenian dram.
ANG	532	Netherlands Antillean guilder.
AOA	973	Angolan kwanza.
ARS	032	Argentine peso.
AUD	036	Australian dollar.
AWG	533	Aruban florin.
AZN	944	Azerbaijani manat.
BAM	977	Bosnia and Herzegovina convertible mark.
BBD	052	Barbados dollar.
BDT	050	Bangladeshi taka.
BGN	975	Bulgarian lev.
BHD	048	Bahraini dinar.
BIF	108	Burundian franc.
BMD	060	Bermudian dollar (customarily known as Bermuda dollar).
BND	096	Brunei dollar.
BOB	068	Boliviano.
BOV	984	Bolivian Mvdol (funds code).
BRL	986	Brazilian real.
BSD	044	Bahamian dollar.
BTN	064	Bhutanese ngultrum.
BWP	072	Botswana pula.
BYR	974	Belarusian ruble.
BZD	084	Belize dollar.
CAD	124	Canadian dollar.
CDF	976	Congolese franc.
CHF	756	Swiss franc.

literal	value	description
CLF	990	Unidad de Fomento (funds code), Chile.
CLP	152	Chilean peso.
CNY	156	Chinese yuan.
COP	170	Colombian peso.
COU	970	Unidad de Valor Real.
CRC	188	Costa Rican colon.
CUC	931	Cuban convertible peso.
CUP	192	Cuban peso.
CVE	132	Cape Verde escudo.
CZK	203	Czech koruna.
DJF	262	Djiboutian franc.
DKK	208	Danish krone.
DOP	214	Dominican peso.
DZD	012	Algerian dinar.
EEK	233	Estonian kroon.
EGP	818	Egyptian pound.
ERN	232	Eritrean nakfa.
ETB	230	Ethiopian birr.
EUR	978	Euro.
FJD	242	Fiji dollar.
FKP	238	Falkland Islands pound.
GBP	826	Pound sterling.
GEL	981	Georgian lari.
GHS	936	Ghanaian cedi.
GIP	929	Gibraltar pound.
GMD	270	Gambian dalasi.
GNF	324	Guinean franc.
GTQ	320	Guatemalan quetzal.
GYD	328	Guyanese dollar.
HKD	344	Hong Kong dollar.
HNL	340	Honduran lempira.
HRK	191	Croatian kuna.
HTG	332	Haitian gourde.
HUF	348	Hungarian forint.
IDR	360	Indonesian rupiah.
ILS	376	Israeli new sheqel.
INR	356	Indian rupee.
IQD	368	Iraqi dinar.
IRR	364	Iranian rial.
ISK	352	Icelandic króna.
JMD	388	Jamaican dollar.

literal	value	description
JOD	400	Jordanian dinar.
JPY	392	Japanese yen.
KES	404	Kenyan shilling.
KGS	417	Kyrgyzstani som.
KHR	116	Cambodian riel.
KMF	174	Comoro franc.
KPW	408	North Korean won.
KRW	410	South Korean won.
KWD	414	Kuwaiti dinar.
KYD	136	Cayman Islands dollar.
KZT	398	Kazakhstani tenge.
LAK	418	Lao kip.
LBP	422	Lebanese pound.
LKR	144	Sri Lanka rupee.
LRD	430	Liberian dollar.
LSL	426	Lesotho loti.
LTL	440	Lithuanian litas.
LVL	428	Latvian lats.
LYD	434	Libyan dinar.
MAD	504	Moroccan dirham.
MDL	498	Moldovan leu.
MGA	969	Malagasy ariary.
MKD	807	Macedonian denar.
MMK	104	Myanma kyat.
MNT	496	Mongolian tugrik.
MOP	446	Macanese pataca.
MRO	478	Mauritanian ouguiya.
MUR	480	Mauritian rupee.
MVR	462	Maldivian rufiyaa.
MWK	454	Malawian kwacha.
MXN	484	Mexican peso.
MYR	458	Malaysian ringgit.
MZN	943	Mozambican metical.
NAD	516	Namibian dollar.
NGN	566	Nigerian naira.
NIO	558	Cordoba oro.
NOK	578	Norwegian krone.
NPR	524	Nepalese rupee.
NZD	554	New Zealand dollar.
OMR	512	Omani rial.
PAB	590	Panamanian balboa.

literal	value	description
PEN	604	Peruvian nuevo sol.
PGK	598	Papua New Guinean kina.
PHP	608	Philippine peso.
PKR	586	Pakistani rupee.
PLN	985	Polish zloty.
PYG	600	Paraguayan guaraní.
QAR	634	Qatari rial.
RON	946	Romanian new leu.
RSD	941	Serbian dinar.
RUB	643	Russian rouble.
RWF	646	Rwandan franc.
SAR	682	Saudi riyal.
SBD	090	Solomon Islands dollar.
SCR	690	Seychelles rupee.
SDG	938	Sudanese pound.
SEK	752	Swedish krona/kronor.
SGD	702	Singapore dollar.
SHP	654	Saint Helena pound.
SLC	694	Sierra Leonean leone.
SOS	706	Somali shilling.
SRD	968	Surinamese dollar.
STD	678	São Tomé and Príncipe dobra.
SYP	760	Syrian pound.
SZL	748	Lilangeni.
THB	764	Thai baht.
TJS	972	Tajikistani somoni.
TMT	934	Turkmenistani manat.
TND	788	Tunisian dinar.
TOP	776	Tongan pa'anga.
TRY	949	Turkish lira.
TTD	780	Trinidad and Tobago dollar.
TWD	901	New Taiwan dollar.
TZS	834	Tanzanian shilling.
UAH	980	Ukrainian hryvnia.
UGX	800	Ugandan shilling.
USD	840	United States dollar.
UYU	858	Uruguayan peso.
UZS	860	Uzbekistan som.
VEF	937	Venezuelan bolívar fuerte.
VND	704	Vietnamese Dong.
VUV	548	Vanuatu vatu.

literal	value	description
WST	882	Samoan tala.
XAF	950	CFA franc BEAC.
XCD	951	East Caribbean dollar.
XOF	952	CFA Franc BCEAO.
XPF	953	CFP franc.
YER	886	Yemeni rial.
ZAR	710	South African rand.
ZMK	894	Zambian kwacha.
ZWL	932	Zimbabwe dollar.

2356

2357 **3.108 CurveStyle enumeration**

2358 Style or shape of curve.

2359 Table 187 shows all literals of CurveStyle.

2360

Table 187 – Literals of EquipmentReliabilityProfile::CurveStyle

literal	value	description
constantYValue		The Y-axis values are assumed constant until the next curve point and prior to the first curve point.
straightLineYValues		The Y-axis values are assumed to be a straight line between values. Also known as linear interpolation.

2361

2362 **3.109 (NC) MarineUnitKind enumeration**

2363 Kind of marine energy capture.

2364 Table 188 shows all literals of MarineUnitKind.

2365

Table 188 – Literals of EquipmentReliabilityProfile::MarineUnitKind

literal	value	description
currents		Capture energy from ocean current which are caused by forces like breaking waves, wind, coriolis effect etc.
pressure		Capture energy from pressure.
tidal		Capture energy from tidal power, which captures the energy of the current caused by the gravitational pull of the Sun and Moon.
wave		Capture energy from wind waves.
other		Other way of capture energy from marine elements.

2366

2367 **3.110 OperationalLimitDirectionKind enumeration**

2368 The direction attribute describes the side of a limit that is a violation.

2369 Table 189 shows all literals of OperationalLimitDirectionKind.

2370 **Table 189 – Literals of EquipmentReliabilityProfile::OperationalLimitDirectionKind**

literal	value	description
high		High means that a monitored value above the limit value is a violation. If applied to a terminal flow, the positive direction is into the terminal.
low		Low means a monitored value below the limit is a violation. If applied to a terminal flow, the positive direction is into the terminal.
absoluteValue		An absoluteValue limit means that a monitored absolute value above the limit value is a violation.

2371

2372 **3.111 (NC) PinTerminalKind enumeration**

2373 The kind of quantities that can serve as an input value for the pin.

2374 Table 190 shows all literals of PinTerminalKind.

2375 **Table 190 – Literals of EquipmentReliabilityProfile::PinTerminalKind**

literal	value	description
activePower		Active power on the Terminal.
apparentPower		Apparent power on the Terminal.
voltageMagnitude		Voltage magnitude on the Terminal.
voltageAngle		Voltage angle on the Terminal.
current		Current on the Terminal.
reactivePower		Reactive power on the Terminal.

2376

2377 **3.112 (NC) NuclearReactorKind enumeration**

2378 Kind of nuclear reactor.

2379 Table 191 shows all literals of NuclearReactorKind.

2380 **Table 191 – Literals of EquipmentReliabilityProfile::NuclearReactorKind**

literal	value	description
breeder		Reactor whose heat source is a nuclear reactor that generates more fissile material than it consumes.
graphite		Reactor whose heat source is a graphite-moderated reactor that is a nuclear reactor that uses carbon as a neutron moderator, which allows natural uranium to be used as nuclear fuel.
heavyWater		Reactor whose heat source is a pressurized heavy-water reactor (PHWR) that uses heavy water (deuterium oxide D2O) as its coolant and neutron moderator.
lightWater		Reactor whose heat source is a light-water reactor (LWR) that is a type of thermal-neutron reactor that uses normal water, as both its coolant and neutron moderator – furthermore a solid form of fissile elements is used as fuel.
liquidMetal		Reactor whose liquid metal cooled nuclear reactor, liquid metal fast reactor or LMFR is an advanced type of nuclear reactor where the primary coolant is a liquid metal.

literal	value	description
other		Other type of nuclear reactors.

2381

2382 **3.113 (NC) GeothermalUnitKind enumeration**

2383 Kind of geothermal.

2384 Table 192 shows all literals of GeothermalUnitKind.

2385 **Table 192 – Literals of EquipmentReliabilityProfile::GeothermalUnitKind**

literal	value	description
binaryCycle		The moderately hot geothermal water is passed by a secondary fluid with a much lower boiling point than water.
drySteam		Uses geothermal steam of 150 degree Celsius or greater to turn turbines.
flashSteam		Pull deep, high-pressure hot water into lower-pressure tanks and use the resulting flashed steam to drive turbines.
other		Other type of geothermal generating unit.

2386

2387 **3.114 (NC) LogicalOperatorsKind enumeration**

2388 Kinds of logical operators for comparison.

2389 Table 193 shows all literals of LogicalOperatorsKind.

2390 **Table 193 – Literals of EquipmentReliabilityProfile::LogicalOperatorsKind**

literal	value	description
notEqual		Not equal (unlike) comparison operation.
equals		Equals (like) comparison operation.
lessThanOrEquals		Less than or equals comparison operation.
lessThan		Less than comparison operation.
greaterThanOrEquals		Greater than or equals comparison operation.
greaterThan		Greater than comparison operation.

2391

2392 **3.115 (NC) PowerElectricalChemicalUnitKind enumeration**

2393 Kind of power electrical chemical unit.

2394 Table 194 shows all literals of PowerElectricalChemicalUnitKind.

2395 **Table 194 – Literals of EquipmentReliabilityProfile::PowerElectricalChemicalUnitKind**

literal	value	description
electrolyticCell		An electrolytic cell is an electrochemical cell that drives a non-spontaneous redox reaction through the application of electrical energy. Example are the decomposition of water into hydrogen and oxygen.
fuelCell		A fuel cell is an electrochemical cell that converts the chemical energy from a fuel into electricity through an electrochemical reaction of hydrogen fuel with oxygen or another oxidizing agent.
other		Other type of cell used in chemical reactions.

2396

2397 **3.116 UnitMultiplier enumeration**

2398 The unit multipliers defined for the CIM. When applied to unit symbols, the unit symbol is
2399 treated as a derived unit. Regardless of the contents of the unit symbol text, the unit symbol
2400 shall be treated as if it were a single-character unit symbol. Unit symbols should not contain
2401 multipliers, and it should be left to the multiplier to define the multiple for an entire data type.
2402 For example, if a unit symbol is "m2Pers" and the multiplier is "k", then the value is $k(m^{**2}/s)$,
2403 and the multiplier applies to the entire final value, not to any individual part of the value. This
2404 can be conceptualized by substituting a derived unit symbol for the unit type. If one imagines
2405 that the symbol "P" represents the derived unit "m2Pers", then applying the multiplier "k" can
2406 be conceptualized simply as "kP".
2407 For example, the SI unit for mass is "kg" and not "g". If the unit symbol is defined as "kg", then
2408 the multiplier is applied to "kg" as a whole and does not replace the "k" in front of the "g". In
2409 this case, the multiplier of "m" would be used with the unit symbol of "kg" to represent one gram.
2410 As a text string, this violates the instructions in IEC 80000-1. However, because the unit symbol
2411 in CIM is treated as a derived unit instead of as an SI unit, it makes more sense to conceptualize
2412 the "kg" as if it were replaced by one of the proposed replacements for the SI mass symbol. If
2413 one imagines that the "kg" were replaced by a symbol "P", then it is easier to conceptualize the
2414 multiplier "m" as creating the proper unit "mP", and not the forbidden unit "mkg".
2415 Table 195 shows all literals of UnitMultiplier.

2416 **Table 195 – Literals of EquipmentReliabilityProfile::UnitMultiplier**

literal	value	description
none	0	No multiplier or equivalently multiply by 1.
k	3	Kilo 10^{**3} .
M	6	Mega 10^{**6} .

2417

2418 **3.117 UnitSymbol enumeration**

2419 The derived units defined for usage in the CIM. In some cases, the derived unit is equal to an
2420 SI unit. Whenever possible, the standard derived symbol is used instead of the formula for the
2421 derived unit. For example, the unit symbol Farad is defined as "F" instead of "CPerV". In cases
2422 where a standard symbol does not exist for a derived unit, the formula for the unit is used as
2423 the unit symbol. For example, density does not have a standard symbol and so it is represented
2424 as "kgPerm3". With the exception of the "kg", which is an SI unit, the unit symbols do not contain
2425 multipliers and therefore represent the base derived unit to which a multiplier can be applied as
2426 a whole.
2427 Every unit symbol is treated as an unparseable text as if it were a single-letter symbol. The
2428 meaning of each unit symbol is defined by the accompanying descriptive text and not by the
2429 text contents of the unit symbol.
2430 To allow the widest possible range of serializations without requiring special character handling,
2431 several substitutions are made which deviate from the format described in IEC 80000-1. The
2432 division symbol "/" is replaced by the letters "Per". Exponents are written in plain text after the
2433 unit as "m3" instead of being formatted as "m" with a superscript of 3 or introducing a symbol
2434 as in "m^3". The degree symbol "°" is replaced with the letters "deg". Any clarification of the
2435 meaning for a substitution is included in the description for the unit symbol.
2436 Non-SI units are included in list of unit symbols to allow sources of data to be correctly labelled
2437 with their non-SI units (for example, a GPS sensor that is reporting numbers that represent feet
2438 instead of meters). This allows software to use the unit symbol information correctly convert
2439 and scale the raw data of those sources into SI-based units.
2440 The integer values are used for harmonization with IEC 61850.
2441 Table 196 shows all literals of UnitSymbol.

2442

Table 196 – Literals of EquipmentReliabilityProfile::UnitSymbol

literal	value	description
none	0	Dimension less quantity, e.g. count, per unit, etc.
s	4	Time in seconds.
A	5	Current in amperes.
deg	9	Plane angle in degrees.
degC	23	Relative temperature in degrees Celsius. In the SI unit system the symbol is °C. Electric charge is measured in coulomb that has the unit symbol C. To distinguish degree Celsius from coulomb the symbol used in the UML is degC. The reason for not using °C is that the special character ° is difficult to manage in software.
V	29	Electric potential in volts (V/A).
ohm	30	Electric resistance in ohms (V/A).
Hz	33	Frequency in hertz (1/s).
W	38	Real power in watts (J/s). Electrical power may have real and reactive components. The real portion of electrical power (I^2R or $VI\cos(\phi)$), is expressed in Watts. See also apparent power and reactive power.
Pa	39	Pressure in pascals (N/m ²). Note: the absolute or relative measurement of pressure is implied with this entry. See below for more explicit forms.
WPerm2	55	Heat flux density, irradiance, watts per square metre.
VAr	63	Reactive power in volt amperes reactive. The “reactive” or “imaginary” component of electrical power ($VI\sin(\phi)$). (See also real power and apparent power). Note: Different meter designs use different methods to arrive at their results. Some meters may compute reactive power as an arithmetic value, while others compute the value vectorially. The data consumer should determine the method in use and the suitability of the measurement for the intended purpose.
WPers	81	Ramp rate in watts per second.
VPerVAr		Power factor, PF, the ratio of the active power to the apparent power. Note: The sign convention used for power factor will differ between IEC meters and EEI (ANSI) meters. It is assumed that the data consumers understand the type of meter being used and agree on the sign convention in use at any given utility.

2443

2444 3.118 ActivePower datatype

2445 Product of RMS value of the voltage and the RMS value of the in-phase component of the
2446 current.

2447 Table 197 shows all attributes of ActivePower.

2448

Table 197 – Attributes of EquipmentReliabilityProfile::ActivePower

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=M)

name	mult	type	description
unit	0..1	UnitSymbol	(const=W)
value	0..1	Float	

2449

2450 **3.119 ActivePowerChangeRate datatype**

2451 Rate of change of active power per time.

2452 Table 198 shows all attributes of ActivePowerChangeRate.

2453 **Table 198 – Attributes of EquipmentReliabilityProfile::ActivePowerChangeRate**

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=M)
unit	0..1	UnitSymbol	(const=WPers)
value	0..1	Float	

2454

2455 **3.120 AngleDegrees datatype**

2456 Measurement of angle in degrees.

2457 Table 199 shows all attributes of AngleDegrees.

2458 **Table 199 – Attributes of EquipmentReliabilityProfile::AngleDegrees**

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=deg)
multiplier	0..1	UnitMultiplier	(const=none)

2459

2460 **3.121 Frequency datatype**

2461 Cycles per second.

2462 Table 200 shows all attributes of Frequency.

2463 **Table 200 – Attributes of EquipmentReliabilityProfile::Frequency**

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=Hz)
multiplier	0..1	UnitMultiplier	(const=none)

2464

2465 **3.122 Impedance datatype**

2466 Ratio of voltage to current.

2467 Table 201 shows all attributes of Impedance.

2468 **Table 201 – Attributes of EquipmentReliabilityProfile::Impedance**

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=ohm)
multiplier	0..1	UnitMultiplier	(const=none)

2469

2470 **3.123 PerCent datatype**

2471 Percentage on a defined base. For example, specify as 100 to indicate at the defined base.

2472 Table 202 shows all attributes of PerCent.

2473 **Table 202 – Attributes of EquipmentReliabilityProfile::PerCent**

name	mult	type	description
value	0..1	Float	Normally 0 to 100 on a defined base.
unit	0..1	UnitSymbol	(const=none)
multiplier	0..1	UnitMultiplier	(const=none)

2474

2475 **3.124 Reactance datatype**

2476 Reactance (imaginary part of impedance), at rated frequency.

2477 Table 203 shows all attributes of Reactance.

2478 **Table 203 – Attributes of EquipmentReliabilityProfile::Reactance**

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=ohm)
multiplier	0..1	UnitMultiplier	(const=none)

2479

2480 **3.125 Seconds datatype**

2481 Time, in seconds.

2482 Table 204 shows all attributes of Seconds.

2483 **Table 204 – Attributes of EquipmentReliabilityProfile::Seconds**

name	mult	type	description
value	0..1	Float	Time, in seconds
unit	0..1	UnitSymbol	(const=s)
multiplier	0..1	UnitMultiplier	(const=none)

2484

2485 **3.126 VoltagePerReactivePower datatype**

2486 Voltage variation with reactive power.

2487 Table 205 shows all attributes of VoltagePerReactivePower.

2488 **Table 205 – Attributes of EquipmentReliabilityProfile::VoltagePerReactivePower**

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=k)
unit	0..1	UnitSymbol	(const=VPerVAr)
value	0..1	Float	

2489

2490 **3.127 Boolean primitive**

2491 A type with the value space "true" and "false".

2492 **3.128 Decimal primitive**

2493 Decimal is the base-10 notational system for representing real numbers.

2494 **3.129 Duration primitive**

2495 Duration as "PnYnMnDTnHnMnS" which conforms to ISO 8601, where nY expresses a number
2496 of years, nM a number of months, nD a number of days. The letter T separates the date
2497 expression from the time expression and, after it, nH identifies a number of hours, nM a number
2498 of minutes and nS a number of seconds. The number of seconds could be expressed as a
2499 decimal number, but all other numbers are integers.

2500 **3.130 Float primitive**

2501 A floating point number. The range is unspecified and not limited.

2502 **3.131 Integer primitive**

2503 An integer number. The range is unspecified and not limited.

2504 **3.132 String primitive**

2505 A string consisting of a sequence of characters. The character encoding is UTF-8. The string
2506 length is unspecified and unlimited.

2507 **3.133 (NC) CurrentControlFunction**

2508 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2509 Current control function is a function block that calculates the operating point of the controlled
2510 equipment to achieve the target current.

2511 Table 206 shows all attributes of CurrentControlFunction.

2512 **Table 206 – Attributes of EquipmentReliabilityProfile::CurrentControlFunction**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2513

2514 Table 207 shows all association ends of CurrentControlFunction with other classes.

2515 **Table 207 – Association ends of EquipmentReliabilityProfile::CurrentControlFunction**
2516 **with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2517

2518 **3.134 (NC) TCSCCompensationPoint root class**

2519 Compensation point of a TCSC compensator.

2520 Table 208 shows all attributes of TCSCCompensationPoint.

2521

Table 208 – Attributes of EquipmentReliabilityProfile::TCSCCompensationPoint

name	mult	type	description
compensationZ	1..1	Impedance	(NC) The compensation impedance for this compensation point.
mRID	1..1	String	(NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
section	1..1	Integer	(NC) The number of the section.

2522

2523

Table 209 shows all association ends of TCSCCompensationPoint with other classes.

2524

2525

Table 209 – Association ends of EquipmentReliabilityProfile::TCSCCompensationPoint with other classes

mult from	name	mult to	type	description
0..*	ThyristorControlledSeriesCompensator	1..1	ThyristorControlledSeriesCompensator	(NC) TCSC that has different compensation points.

2526

2527

3.135 (NC) StaticVarCompensator

2528

Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2529

2530

2531

2532

A facility for providing variable and controllable shunt reactive power. The SVC typically consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched capacitor arms.

2533

2534

2535

2536

2537

The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage control mode, the output of the SVC will be proportional to the deviation of voltage at the controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion. If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.

2538

Table 210 – Attributes of EquipmentReliabilityProfile::StaticVarCompensator

name	mult	type	description
slope	1..1	VoltagePerReactivePower	(NC) inherited from: FACTSEquipment
ratedI	0..1	CurrentFlow	(NC) inherited from: FACTSEquipment
ratedU	0..1	Voltage	(NC) inherited from: FACTSEquipment
ratedC	0..1	Reactance	(NC) inherited from: FACTSEquipment
ratedL	0..1	Reactance	(NC) inherited from: FACTSEquipment
minC	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxC	0..1	Reactance	(NC) inherited from: FACTSEquipment
minL	0..1	Reactance	(NC) inherited from: FACTSEquipment
maxL	0..1	Reactance	(NC) inherited from: FACTSEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject

name	mult	type	description
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2539

2540

Table 211 shows all association ends of StaticVarCompensator with other classes.

2541

Table 211 – Association ends of EquipmentReliabilityProfile::StaticVarCompensator with other classes

2542

mult from	name	mult to	type	description
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2543

2544

3.136 (NC) LossCurve

2545

Inheritance path = [Curve](#) : [IdentifiedObject](#)

2546

Represents the losses in the equipment due to operation position.

2547

Table 212 shows all attributes of LossCurve.

2548

Table 212 – Attributes of EquipmentReliabilityProfile::LossCurve

name	mult	type	description
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2549

2550

Table 213 shows all association ends of LossCurve with other classes.

2551

Table 213 – Association ends of EquipmentReliabilityProfile::LossCurve with other classes

2552

mult from	name	mult to	type	description
0..*	FACTSEquipment	0..1	FACTSEquipment	(NC) The FACTS equipment which has a loss curve.

2553

2554

3.137 (Description) DCSwitch

2555

Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :

2556

[IdentifiedObject](#)

2557 A switch within the DC system.

2558 Table 214 shows all attributes of DCSwitch.

2559 **Table 214 – Attributes of EquipmentReliabilityProfile::DCSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2560

2561 Table 215 shows all association ends of DCSwitch with other classes.

2562 **Table 215 – Association ends of EquipmentReliabilityProfile::DCSwitch with other**
2563 **classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2564

2565 3.138 (abstract) DCConductingEquipment

2566 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2567 The parts of the DC power system that are designed to carry current or that are conductively

2568 connected through DC terminals.

2569 Table 216 shows all attributes of DCConductingEquipment.

2570 **Table 216 – Attributes of EquipmentReliabilityProfile::DCConductingEquipment**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) The maximum continuous current carrying capacity in amps governed by the device material and construction. The attribute shall be a positive value.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2571

2572 Table 217 shows all association ends of DCConductingEquipment with other classes.

2573 **Table 217 – Association ends of EquipmentReliabilityProfile::DCConductingEquipment**
2574 **with other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2575

2576 **3.139 (Description) DCDisconnector**2577 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2578 A disconnector within a DC system.

2579 Table 218 shows all attributes of DCDisconnector.

2581 **Table 218 – Attributes of EquipmentReliabilityProfile::DCDisconnector**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2582

2583 Table 219 shows all association ends of DCDisconnector with other classes.

2584 **Table 219 – Association ends of EquipmentReliabilityProfile::DCDisconnector with other classes**

2585

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2586

2587 **3.140 (Description) DCBreaker**2588 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2589 A breaker within a DC system.

2590 Table 220 shows all attributes of DCBreaker.

2592 **Table 220 – Attributes of EquipmentReliabilityProfile::DCBreaker**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2593

2594 Table 221 shows all association ends of DCBreaker with other classes.

2595 **Table 221 – Association ends of EquipmentReliabilityProfile::DCBreaker with other classes**

2596

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2597

2598 **3.141 (Description) DCGround**2599 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2600 [IdentifiedObject](#)

2601 A ground within a DC system.

2602 Table 222 shows all attributes of DCGround.

2603

Table 222 – Attributes of EquipmentReliabilityProfile::DCGround

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2604

2605 Table 223 shows all association ends of DCGround with other classes.

2606 **Table 223 – Association ends of EquipmentReliabilityProfile::DCGround with other classes**
2607

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2608

2609 **3.142 (Description) DCBusbar**2610 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2611 [IdentifiedObject](#)

2612 A busbar within a DC system.

2613 Table 224 shows all attributes of DCBusbar.

2614

Table 224 – Attributes of EquipmentReliabilityProfile::DCBusbar

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2615

2616 Table 225 shows all association ends of DCBusbar with other classes.

2617 **Table 225 – Association ends of EquipmentReliabilityProfile::DCBusbar with other classes**
2618

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2619

2620 **3.143 (Description) DCShunt**

2621 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2622 [IdentifiedObject](#)

2623 A shunt device within the DC system, typically used for filtering. Needed for transient and short
2624 circuit studies.

2625 Table 226 shows all attributes of DCShunt.

2626 **Table 226 – Attributes of EquipmentReliabilityProfile::DCShunt**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2627

2628 Table 227 shows all association ends of DCShunt with other classes.

2629 **Table 227 – Association ends of EquipmentReliabilityProfile::DCShunt with other
2630 classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2631

2632 **3.144 (Description) DCSeriesDevice**

2633 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2634 [IdentifiedObject](#)

2635 A series device within the DC system, typically a reactor used for filtering or smoothing. Needed
2636 for transient and short circuit studies.

2637 Table 228 shows all attributes of DCSeriesDevice.

2638 **Table 228 – Attributes of EquipmentReliabilityProfile::DCSeriesDevice**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2639

2640 Table 229 shows all association ends of DCSeriesDevice with other classes.

2641 **Table 229 – Association ends of EquipmentReliabilityProfile::DCSeriesDevice with other
2642 classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2643

2644 **3.145 (Description) DCLineSegment**

2645 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2646 [IdentifiedObject](#)

2647 A wire or combination of wires not insulated from one another, with consistent electrical
2648 characteristics, used to carry direct current between points in the DC region of the power
2649 system.

2650 Table 230 shows all attributes of DCLineSegment.

2651

Table 230 – Attributes of EquipmentReliabilityProfile::DCLineSegment

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2652

2653 Table 231 shows all association ends of DCLineSegment with other classes.

2654 **Table 231 – Association ends of EquipmentReliabilityProfile::DCLineSegment with other**
2655 **classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2656

2657 **3.146 (Description) DCChopper**

2658 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2659 [IdentifiedObject](#)

2660 Low resistance equipment used in the internal DC circuit to balance voltages. It has typically
2661 positive and negative pole terminals and a ground.

2662 Table 232 shows all attributes of DCChopper.

2663

Table 232 – Attributes of EquipmentReliabilityProfile::DCChopper

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2664

2665 Table 233 shows all association ends of DCChopper with other classes.

2666 **Table 233 – Association ends of EquipmentReliabilityProfile::DCChopper with other**
2667 **classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2668

2669 3.147 (Description) TieFlow

2670 Inheritance path = [IdentifiedObject](#)

2671 Defines the structure (in terms of location and direction) of the net interchange constraint for a
2672 control area. This constraint may be used by either AGC or power flow.

2673 Table 234 shows all attributes of TieFlow.

2674 **Table 234 – Attributes of EquipmentReliabilityProfile::TieFlow**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2675

2676 Table 235 shows all association ends of TieFlow with other classes.

2677 **Table 235 – Association ends of EquipmentReliabilityProfile::TieFlow with other classes**

mult from	name	mult to	type	description
0..*	TieCorridor	0..1	TieCorridor	(NC) Tie corridor which has the tie flow.

2678

2679 3.148 (NC) PowerPlantController

2680 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2681 [IdentifiedObject](#)

2682 Power plant controller is controlling the equipment of a power plant.

2683 Table 236 shows all attributes of PowerPlantController.

2684 **Table 236 – Attributes of EquipmentReliabilityProfile::PowerPlantController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2685

2686 Table 237 shows all association ends of PowerPlantController with other classes.

2687 **Table 237 – Association ends of EquipmentReliabilityProfile::PowerPlantController with**
2688 **other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2689

2690 3.149 (NC) TCSCController

2691 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2692 [IdentifiedObject](#)

2693 TCSC controller is controlling the equipment to optimize the performance of the TCSC.

2694 Table 238 shows all attributes of TCSCController.

2695

Table 238 – Attributes of EquipmentReliabilityProfile::TCSCController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2696

2697 Table 239 shows all association ends of TCSCController with other classes.

2698 **Table 239 – Association ends of EquipmentReliabilityProfile::TCSCController with other**
2699 **classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2700

2701 3.150 (NC) DCCurrentControlFunction

2702 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2703 DC current control function is a function block that calculates the operating point of the
2704 controlled equipment to achieve the target current.

2705 Table 240 shows all attributes of DCCurrentControlFunction.

2706

Table 240 – Attributes of EquipmentReliabilityProfile::DCCurrentControlFunction

name	mult	type	description
droop	0..1	PU	(NC) Droop constant. The pu value is obtained as $D [kV/MW] \times S_b / U_{bdc}$. The attribute shall be a positive value.
droopCompensation	0..1	Resistance	(NC) Compensation constant. Used to compensate for voltage drop when controlling voltage at a distant bus. The attribute shall be a positive value.
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2707

2708

Table 241 shows all association ends of DCCurrentControlFunction with other classes.

2709

2710

Table 241 – Association ends of EquipmentReliabilityProfile::DCCurrentControlFunction with other classes

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2711

2712 3.151 (NC) DCVoltageControlFunction

2713 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2714 DC voltage control function is a function block that calculate the operating point of the controlled equipment to achieve the target voltage.

2715 Table 242 shows all attributes of DCVoltageControlFunction.

2717

Table 242 – Attributes of EquipmentReliabilityProfile::DCVoltageControlFunction

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2718

2719

Table 243 shows all association ends of DCVoltageControlFunction with other classes.

2720

2721

Table 243 – Association ends of EquipmentReliabilityProfile::DCVoltageControlFunction with other classes

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2722

2723 3.152 (NC) PhaseControlFunction

2724 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2725 Phase control function is a function block that calculate the operating point of the controlled
2726 equipment to achieve the target voltage.
2727 Table 244 shows all attributes of PhaseControlFunction.

2728 **Table 244 – Attributes of EquipmentReliabilityProfile::PhaseControlFunction**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2729

2730 Table 245 shows all association ends of PhaseControlFunction with other classes.

2731 **Table 245 – Association ends of EquipmentReliabilityProfile::PhaseControlFunction**
2732 **with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2733

2734 3.153 (NC) RampingPrincipleKind enumeration

2735 Kind of ramping principle.

2736 Table 246 shows all literals of RampingPrincipleKind.

2737 **Table 246 – Literals of EquipmentReliabilityProfile::RampingPrincipleKind**

literal	value	description
fiveMinutes		Five minutes ramping principle. Ramping starts five minutes before the schedule time point and ends five minutes after. For instance, if the schedule time point is 19:30h it starts at 19:25h and ends at 19:35h.
fifteenMinutes		Fifteen minutes ramping principle. Ramping starts 15 minutes before the schedule time point and ends 15 minutes after. For instance, if the schedule time point is 19:30h it starts at 19:15h and ends at 19:45h.
continuous		Continuous ramping principle is applied between two scheduled time point. For instance, from 10 MW to 70 MW over one hour the change is 1 MW/min.
tenMinutes		Ten minutes ramping principle. Ramping starts 10 minutes before the schedule time point and ends 10 minutes after. For instance, if the schedule time point is 19:30h it starts at 19:20h and ends at 19:40h.

literal	value	description
maxContinuous		Maximum continuous ramping principle. The schedule is kept as long as possible and the maximum ramping rate is used to get from one point to another, symmetrically around the schedule time points. For example, there is 40 MW change in the schedule the maximum ramp rate is 20 MW/min the ramping starts 1 min before (e.g. 19:29h) and finishes 1 min after (e.g. 19:31h).

2738

2739 **3.154 (NC) DirectCurrentCircuit**2740 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2741 A direct current circuit is a circuit consists of direct current equipment.

2742 Table 247 shows all attributes of DirectCurrentCircuit.

2743 **Table 247 – Attributes of EquipmentReliabilityProfile::DirectCurrentCircuit**

name	mult	type	description
positiveFlowIn	1..1	Boolean	(NC) inherited from: Circuit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2744

2745 Table 248 shows all association ends of DirectCurrentCircuit with other classes.

2746 **Table 248 – Association ends of EquipmentReliabilityProfile::DirectCurrentCircuit with other classes**

2747

mult from	name	mult to	type	description
0..1	IdentifyingTerminal	0..1	Terminal	(NC) inherited from: Circuit

2748

2749 **3.155 (NC) OverlappingZone**2750 Inheritance path = [IdentifiedObject](#)

2751 A collection of all the overlapping cross border assessed elements which have the same sets of impacted and impacting regions.

2752 Table 249 shows all attributes of OverlappingZone.

2754 **Table 249 – Attributes of EquipmentReliabilityProfile::OverlappingZone**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2755

2756 **3.156 (NC) TapChangerController**2757 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2758

2759 Tap changer controller is an equipment controller that controls a tap changer, e.g. how the
2760 voltage at the end of a line varies with the load level and compensation of the voltage drop by
2761 tap adjustment.
2762 Table 250 shows all attributes of TapChangerController.

2763 **Table 250 – Attributes of EquipmentReliabilityProfile::TapChangerController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2764
2765 Table 251 shows all association ends of TapChangerController with other classes.

2766 **Table 251 – Association ends of EquipmentReliabilityProfile::TapChangerController**
2767 **with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2768

2769 3.157 (NC) CurrentDroopControlFunction

2770 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)
2771 Current droop control function is a function block that calculates the operating point of the
2772 controlled equipment to achieve the target current.
2773 Table 252 shows all attributes of CurrentDroopControlFunction.

2774 **Table 252 – Attributes of EquipmentReliabilityProfile::CurrentDroopControlFunction**

name	mult	type	description
offsetInductive	1..1	CurrentFlow	(NC) Offset in capacitive region.
droopInductive	1..1	Float	(NC) Droop in inductive region. The unit is V/A.
offsetCapacitive	1..1	CurrentFlow	(NC) Offset in capacitive region.
droopCapacitive	1..1	Float	(NC) Droop in capacitive region. The unit is V/A.
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2775

2776 Table 253 shows all association ends of CurrentDroopControlFunction with other classes.

2777
2778**Table 253 – Association ends of
EquipmentReliabilityProfile::CurrentDroopControlFunction with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2779

2780 3.158 (NC) VoltageInjectionControlFunction2781 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)2782 Voltage injection control function is a function block that calculates the operating point of the
2783 controlled equipment to achieve the target voltage injection. The controlled point is the Terminal
2784 with sequenceNumber =1.

2785 Table 254 shows all attributes of VoltageInjectionControlFunction.

2786 Table 254 – Attributes of EquipmentReliabilityProfile::VoltageInjectionControlFunction

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2787

2788 Table 255 shows all association ends of VoltageInjectionControlFunction with other classes.

2789

2790

**Table 255 – Association ends of
EquipmentReliabilityProfile::VoltageInjectionControlFunction with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

2791

2792 3.159 (NC) SSSCController2793 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2794 [IdentifiedObject](#)

2795 The controller of a Static synchronous series compensator (SSSC).

2796 Table 256 shows all attributes of SSSCController.

2797 Table 256 – Attributes of EquipmentReliabilityProfile::SSSCController

name	mult	type	description
minInjectionU	1..1	Voltage	(NC) Minimum voltage that the device can inject.
maxInjectionU	1..1	Voltage	(NC) Maximum voltage that the device can inject.

name	mult	type	description
maxLimitI	0..1	CurrentFlow	(NC) Maximum operating current limit applied for the controller and used by any of the available control functions.
minLimitI	0..1	CurrentFlow	(NC) Minimum operating current limit applied for the controller and used by any of the available control functions.
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2798

2799

Table 257 shows all association ends of SSSCController with other classes.

2800

Table 257 – Association ends of EquipmentReliabilityProfile::SSSCController with other classes

2801

mult from	name	mult to	type	description
0..*	SSSCSimulationSettings	0..1	SSSCSimulationSettings	(NC) The simulation settings that apply for this controller.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2802

2803 3.160 (NC) CurrentDroopOverride root class

2804 Current droop override uses the following logic:

2805 - When the current exceeds a threshold the device executes the following transitions: 1) When
2806 injecting an inductive voltage or in monitoring mode the device tends to inject a voltage
2807 proportional to the difference between the line current and the aforementioned threshold. 2)
2808 When injecting a capacitive voltage the device transitions to monitoring mode.

2809 - If the aforementioned proportional voltage is lower than the initial one, the voltage injection
2810 remains unchanged.

2811 Current droop override is not applied when the device operates in currentDroop mode.

2812 Table 258 shows all attributes of CurrentDroopOverride.

2813

Table 258 – Attributes of EquipmentReliabilityProfile::CurrentDroopOverride

name	mult	type	description
droopCapacitive	1..1	Float	(NC) Droop in capacitive region. The unit is V/A.
droopInductive	1..1	Float	(NC) Droop in inductive region. The unit is V/A.
offsetCapacitiveI	1..1	CurrentFlow	(NC) Offset in capacitive region.
offsetInductiveI	1..1	CurrentFlow	(NC) Offset in capacitive region.
mRID	1..1	String	(NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

2814

2815

Table 259 shows all association ends of CurrentDroopOverride with other classes.

2816

Table 259 – Association ends of EquipmentReliabilityProfile::CurrentDroopOverride with other classes

2817

mult from	name	mult to	type	description
0..1	SSSCController	1..1	SSSCController	(NC) The SSSC controller to which this CurrentDroopOverride applies to.

2818

3.161 CurrentFlow datatype

2819

Electrical current with sign convention: positive flow is out of the conducting equipment into the connectivity node. Can be both AC and DC.

2821

2822

Table 260 shows all attributes of CurrentFlow.

2823

Table 260 – Attributes of EquipmentReliabilityProfile::CurrentFlow

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=none)
unit	0..1	UnitSymbol	(const=A)
value	0..1	Float	

2824

3.162 Voltage datatype

2825

Electrical voltage, can be both AC and DC.

2826

2827

Table 261 shows all attributes of Voltage.

2828

Table 261 – Attributes of EquipmentReliabilityProfile::Voltage

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=k)
unit	0..1	UnitSymbol	(const=V)
value	0..1	Float	

2829

3.163 PU datatype

2830

Per Unit - a positive or negative value referred to a defined base. Values typically range from -10 to +10.

2831

2832

Table 262 shows all attributes of PU.

2833

Table 262 – Attributes of EquipmentReliabilityProfile::PU

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=none)
multiplier	0..1	UnitMultiplier	(const=none)

2834

3.164 Resistance datatype

2835

Resistance (real part of impedance).

2836

2837

Table 263 shows all attributes of Resistance.

2838

2839

Table 263 – Attributes of EquipmentReliabilityProfile::Resistance

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=ohm)
multiplier	0..1	UnitMultiplier	(const=none)

2840

3.165 (abstract) SynchronousMachine root class

2842 An electromechanical device that operates with shaft rotating synchronously with the network.
2843 It is a single machine operating either as a generator or synchronous condenser or pump.

3.166 ReactiveCapabilityCurve

2845 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2846 Reactive power rating envelope versus the synchronous machine's active power, in both the
2847 generating and motoring modes. For each active power value there is a corresponding high and
2848 low reactive power limit value. Typically there will be a separate curve for each coolant
2849 condition, such as hydrogen pressure. The Y1 axis values represent reactive minimum and the
2850 Y2 axis values represent reactive maximum.

2851 Table 264 shows all attributes of ReactiveCapabilityCurve.

2852

Table 264 – Attributes of EquipmentReliabilityProfile::ReactiveCapabilityCurve

name	mult	type	description
referenceVoltage	1..1	Voltage	(NC) The reference voltage for which the capability curve is valid.
coolantTemperature	0..1	Temperature	The machine's coolant temperature (e.g., ambient air or stator circulating water).
hydrogenPressure	0..1	Pressure	The hydrogen coolant pressure.
operatingMode	0..1	SynchronousMachineOperatingMode	(NC) The operating mode of synchronous machine for which the reactive capability curve is valid for. In case the attribute is not provided it is assumed that the reactive capability curve covers all possible operating modes of the synchronous machine.
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2853

2854 Table 265 shows all association ends of ReactiveCapabilityCurve with other classes.

2855 **Table 265 – Association ends of EquipmentReliabilityProfile::ReactiveCapabilityCurve**
2856 **with other classes**

mult from	name	mult to	type	description
0..*	SynchronousMachine2	0..1	SynchronousMachine	(NC) Synchronous machine using this curve.
0..*	EquivalentInjection2	0..1	EquivalentInjection	(NC) The equivalent injection using this reactive capability curve.

2857

2858 3.167 Temperature datatype

2859 Value of temperature in degrees Celsius.

2860 Table 266 shows all attributes of Temperature.

2861 **Table 266 – Attributes of EquipmentReliabilityProfile::Temperature**

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=none)
unit	0..1	UnitSymbol	(const=degC)
value	0..1	Float	

2862

2863 3.168 Pressure datatype

2864 Pressure in pascals.

2865 Table 267 shows all attributes of Pressure.

2866 **Table 267 – Attributes of EquipmentReliabilityProfile::Pressure**

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=Pa)
multiplier	0..1	UnitMultiplier	(const=k)

2867

2868 3.169 (abstract) VsConverter root class

2869 DC side of the voltage source converter (VSC).

2870 3.170 VsCapabilityCurve

2871 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2872 The P-Q capability curve for a voltage source converter, with P on X-axis and Qmin and Qmax on Y1-axis and Y2-axis.

2874 Table 268 shows all attributes of VsCapabilityCurve.

2875 **Table 268 – Attributes of EquipmentReliabilityProfile::VsCapabilityCurve**

name	mult	type	description
referenceVoltage	1..1	Voltage	(NC) The reference voltage for which the capability curve is valid.
curveStyle	1..1	CurveStyle	inherited from: Curve
xMultiplier	0..1	UnitMultiplier	inherited from: Curve
xUnit	1..1	UnitSymbol	inherited from: Curve
y1Multiplier	0..1	UnitMultiplier	inherited from: Curve
y1Unit	0..1	UnitSymbol	inherited from: Curve

name	mult	type	description
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2876

2877

Table 269 shows all association ends of VsCapabilityCurve with other classes.

2878

Table 269 – Association ends of EquipmentReliabilityProfile::VsCapabilityCurve with other classes

2879

mult from	name	mult to	type	description
0..*	VsConverter	1..1	VsConverter	(NC) Converter with this capability curve.

2880

2881 3.171 (Description) EquivalentInjection root class

2882 This class represents equivalent injections (generation or load). Voltage regulation is allowed
2883 only at the point of connection.

2884 Table 270 shows all association ends of EquivalentInjection with other classes.

2885 **Table 270 – Association ends of EquipmentReliabilityProfile::EquivalentInjection with**
2886 **other classes**

mult from	name	mult to	type	description
0..*	InjectionController	0..1	InjectionController	(NC) Injection controller which controls the equivalent injection.

2887

2888 3.172 (NC) SSSCSimulationSettings root class

2889 SSSC control simulation settings used by the algorithm for power flow calculations.

2890 Table 271 shows all attributes of SSSCSimulationSettings.

2891 **Table 271 – Attributes of EquipmentReliabilityProfile::SSSCSimulationSettings**

name	mult	type	description
deltaX	1..1	Reactance	(NC) Reactance delta for the solution algorithm. The solution "outer-loop" algorithm is based on a secant method which needs two initial points. The second point is calculated from the first one by either adding or subtracting this "delta". The "seed" is assumed to be 0 ohms.
maxIterations	1..1	Integer	(NC) Maximum number of iterations before claiming an open line condition. The algorithm uses it to assess if a line is really open by making sure low-currents are observed on various consecutive iterations.
maxMismatch	1..1	Voltage	(NC) Maximum mismatch tolerance of voltage target value. If mismatch is lower, convergence is claimed. It is only used for voltageInjection and currentDroop control modes.
maxCorrectionX	1..1	Reactance	(NC) Maximum value of the reactance correction applied between iterations of the power flow

name	mult	type	description
			calculation algorithm for the purpose of achieving control target value.
isEstimateDLDVSensitive	1..1	Boolean	(NC) Defines if the estimate is considering the dl/dV sensitivity (true) instead of the secant algorithm (false).
mRID	1..1	String	(NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

2892

2893 **3.173 (NC) RotatingMachineController**2894 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2895 [IdentifiedObject](#)2896 Rotating machine controller is controlling the equipment which may be used as a generator or
2897 motor.

2898 Table 272 shows all attributes of RotatingMachineController.

2899 **Table 272 – Attributes of EquipmentReliabilityProfile::RotatingMachineController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2900

2901 Table 273 shows all association ends of RotatingMachineController with other classes.

2902

2903

**Table 273 – Association ends of
EquipmentReliabilityProfile::RotatingMachineController with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2904

2905 **3.174 (NC) InjectionController**2906 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2907 [IdentifiedObject](#)2908 Injection controller is controlling the equipment which represents an injection or an external
2909 network.

2910 Table 274 shows all attributes of InjectionController.

2911 **Table 274 – Attributes of EquipmentReliabilityProfile::InjectionController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2912

2913

Table 275 shows all association ends of InjectionController with other classes.

2914

Table 275 – Association ends of EquipmentReliabilityProfile::InjectionController with other classes

2915

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

2916

2917

3.175 (abstract) ACDCConverter

2918

Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2919

2920

A unit with valves for three phases, together with unit control equipment, essential protective and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for conversion.

2921

2922

2923

Table 276 shows all attributes of ACDCConverter.

2924

Table 276 – Attributes of EquipmentReliabilityProfile::ACDCConverter

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2925

2926

Table 277 shows all association ends of ACDCConverter with other classes.

2927

Table 277 – Association ends of EquipmentReliabilityProfile::ACDCConverter with other classes

2928

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

2929

2930

3.176 Reservoir

2931

Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2932

A water storage facility within a hydro system, including: ponds, lakes, lagoons, and rivers. The storage is usually behind some type of dam.

2933

2934

Table 278 shows all attributes of Reservoir.

2935

Table 278 – Attributes of EquipmentReliabilityProfile::Reservoir

name	mult	type	description
normalEnergyStorage	0..1	RealEnergy	(NC) Normal amount of energy available in the storage.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2936

2937

3.177 (Description) HydroPowerPlant root class

2938 A hydro power station which can generate or pump. When generating, the generator turbines
2939 receive water from an upper reservoir. When pumping, the pumps receive their water from a
2940 lower reservoir.

2941 Table 279 shows all association ends of HydroPowerPlant with other classes.

2942

Table 279 – Association ends of EquipmentReliabilityProfile::HydroPowerPlant with other classes

2943

mult from	name	mult to	type	description
0..*	Reservoir	0..1	Reservoir	Generators discharge water to or pumps are supplied water from a downstream reservoir.

2944

2945

3.178 (NC) InfeedLimit

2946 Inheritance path = [OperationalLimit](#) : [IdentifiedObject](#)

2947 Infeed limit set constraints fed in to the network by two or more terminals.

2948 Table 280 shows all attributes of InfeedLimit.

2949

Table 280 – Attributes of EquipmentReliabilityProfile::InfeedLimit

name	mult	type	description
normalValueW	0..1	ActivePower	(NC) The normal value of active power limit. The attribute shall be a positive value or zero.
normalValueA	0..1	CurrentFlow	(NC) The normal current limit. The attribute shall be a positive value or zero.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2950

2951

Table 281 shows all association ends of InfeedLimit with other classes.

2952

Table 281 – Association ends of EquipmentReliabilityProfile::InfeedLimit with other classes

2953

mult from	name	mult to	type	description
1..*	OperationalLimitType	1..1	OperationalLimitType	inherited from: OperationalLimit
1..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

2954

2955 **3.179 (NC) InfeedTerminal root class**

2956 Infeed terminal defines the terminals that are linked to an infeed limit.

2957 Table 282 shows all attributes of InfeedTerminal.

2958

Table 282 – Attributes of EquipmentReliabilityProfile::InfeedTerminal

name	mult	type	description
mRID	1..1	String	(NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

2959

2960 Table 283 shows all association ends of InfeedTerminal with other classes.

Table 283 – Association ends of EquipmentReliabilityProfile::InfeedTerminal with other classes

2961

2962

mult from	name	mult to	type	description
0..*	ACDCTerminal	1..1	ACDCTerminal	(NC) ACDCTerminal which is connected to an infeed terminal.
0..*	InfeedConstraint	1..1	InfeedLimit	(NC) Infeed constraint which belongs to an infeed terminal.

2963

2964 **3.180 (NC) FuelStorage**2965 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2966 Fuel storage. e.g. pile of coal that can be shared between multiple thermal generating units.

2967 Table 284 shows all attributes of FuelStorage.

2968

Table 284 – Attributes of EquipmentReliabilityProfile::FuelStorage

name	mult	type	description
normalEnergyStorage	0..1	RealEnergy	(NC) Normal amount of energy available in the storage.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2969

2970 **3.181 (Description) FossilFuel root class**

2971 The fossil fuel consumed by the non-nuclear thermal generating unit. For example, coal, oil, gas, etc. These are the specific fuels that the generating unit can consume.

2972 Table 285 shows all association ends of FossilFuel with other classes.

2973

2974 **Table 285 – Association ends of EquipmentReliabilityProfile::FossilFuel with other**
2975 **classes**

mult from	name	mult to	type	description
0..*	FuelStorage	0..1	FuelStorage	(NC) Fuel storage that store fossil fuels.

2976

2977 **3.182 (NC) ACTieCorridor**

2978 Inheritance path = [TieCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2979 A collection of one or more AC tie lines that connect two different control areas.

2980 Table 286 shows all attributes of ACTieCorridor.

2981

Table 286 – Attributes of EquipmentReliabilityProfile::ACTieCorridor

name	mult	type	description
delayRegulatingReserve	0..1	Seconds	(NC) inherited from: TieCorridor
maxRegulatingReserveRamp	0..1	Float	(NC) inherited from: TieCorridor
thresholdRegulatingReserve	0..1	ActivePower	(NC) inherited from: TieCorridor
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2982

2983 Table 287 shows all association ends of ACTieCorridor with other classes.

2984 **Table 287 – Association ends of EquipmentReliabilityProfile::ACTieCorridor with other**
2985 **classes**

mult from	name	mult to	type	description
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) inherited from: TieCorridor
0..*	BiddingZoneBorder	0..1	BiddingZoneBorder	(NC) inherited from: TieCorridor

2986

2987 **3.183 (NC) PowerCapacity root class**

2988 Power capacity defines the capacity in regard to generation, consumption and transmission
2989 (import and export) for a relevant power system resource, e.g. bidding zone, including maximum
2990 and minimum electrical power capacity and any capacity allocation.

2991 **3.184 (NC) PowerShiftKeyStrategy**

2992 Inheritance path = [IdentifiedObject](#)

2993 Strategy of the power shift key.

2994 Table 288 shows all attributes of PowerShiftKeyStrategy.

2995

Table 288 – Attributes of EquipmentReliabilityProfile::PowerShiftKeyStrategy

name	mult	type	description
powerShiftKey	0..1	PowerShiftKeyKind	(NC) Power shift keys strategy gives instruction on how the value (Active power) is going to be distributed inside the relevant bidding zone.

name	mult	type	description
method	0..1	ShiftMethodKind	(NC) Shift method used for the power shift strategy.
normalParticipationFactor	0..1	Float	(NC) Normal participation factor describing the entities part of the power shift strategy. Must be a positive value.
powerBlockKind	0..1	PowerBlockKind	(NC) Power block kind creates block (one or more) of power shift key strategy to address increase and/or decrease of power for a given scheduling area.
dispatchableUnitOnly	0..1	Boolean	(NC) If true, only dispatchable units are included in the power shift key strategy. A unit is considered dispatchable if it is associated with an area dispatchable unit that is linked to the same scheduling area as the power shift key strategy. Exceptions are done for units that are included in explicit or distributed strategies.
normalEnabled	0..1	Boolean	(NC) If true, the assessed element shall be considered under normal operating conditions.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2996

2997

Table 289 shows all association ends of PowerShiftKeyStrategy with other classes.

2998

2999

Table 289 – Association ends of EquipmentReliabilityProfile::PowerShiftKeyStrategy with other classes

mult from	name	mult to	type	description
0..*	SchedulingArea	0..1	SchedulingArea	(NC) Scheduling area associated with power shift key strategy.

3000

3.185 (NC) ShiftMethodKind enumeration

3002 Kind of shift method. Describes the way a power schedule should be distributed amongst
3003 production and consumption. e.g. Type of generating and load shift key.

3004 Table 290 shows all literals of ShiftMethodKind.

3005

Table 290 – Literals of EquipmentReliabilityProfile::ShiftMethodKind

literal	value	description
shared		Power schedule shift (distribution) is done by a shared fraction e.g. A two unit with the participation factor 60 and 40 will distribute a 10 MW schedule by 6 and 4 MW.
priority		Power schedule shift (distribution) is done by a shared fraction prioritizing the unit e.g. A two unit with the participation factor 60 and 40 will distribute a 10 MW increased schedule by first filling the highest participation factor (priority) until max economy power or maximum power allowed by the unit before it starts filling the next on the list. e.g. The unit with 60 will be getting its maximum shared first. The same logic applies with reducing the schedule. e.g. The 60

literal	value	description
		participation factor unit will be reduced to its min economy factor or minimum power.

3006

3007 **3.186 (NC) PowerShiftKeyKind enumeration**

3008 Kind of generating and load shift keys strategy.

3009 Table 291 shows all literals of PowerShiftKeyKind.

3010

Table 291 – Literals of EquipmentReliabilityProfile::PowerShiftKeyKind

literal	value	description
explicitInstruction		The distribution is done according to the individual participation factor on the unit.
explicitDistribution		The distribution is explicitly done according to the power shift key distribution in the power bid Schedule.
generatorsFlat		Flat adjustment, equal amount of power, on all active generators. e.g. 100 MW increase adjustment on 4 generators, it means that each of them get increased 25 MW, as long as no other constraints are violated.
consumptionsFlat		Flat adjustment, equal amount of power, on all active consumption units (Energy Consumers and Power Electronics like FlexibleEnergyUnit). e.g. 100 MW decrease adjustment on 4 loads, it means that each of them get reduced 25 MW, as long as no other constraints are violated.
generatorsPmax		The distribution is relative to the maximum p of the generator.
generatorsP		The distribution is based on the generators active power in the given case.
consumptionsP		The distribution is based on the consumptions active power in the given case.
generatorsAndConsumptionsP		The distribution is based on the generator and consumption active power in the given case.
generatorsRemainingCapacity		The distribution is based on the remaining capacity for generators in the given case.
nonConformLoadP		The distribution is based on the non conform load active power in the given case.
storageP		The distribution is based on the batteries and any operating hydro pumps active power in the given case.
storageFlat		Flat adjustment, equal amount of power, on all the batteries and any operating hydro pumps. e.g. 100 MW increase or decrease adjustment on 4 batteries, it means that each of them get increased or reduced 25 MW, as long as no other constraints are violated.
generatorsPmin		The distribution is relative to the minimum p of the generator.
generatorsUsedCapacity		The distribution is based on the used capacity, the difference between the minimum operation and operating p (GeneratingUnit.minOperatingP)

3011

3012 **3.187 (NC) PowerBlockKind enumeration**

3013 Power block kind describes the increase and/or decrease of power.

3014 Table 292 shows all literals of PowerBlockKind.

3015 **Table 292 – Literals of EquipmentReliabilityProfile::PowerBlockKind**

literal	value	description
powerIncrease		Increase in the power. The block represents action for increased power.
powerDecrease		Decrease in the power. The block represents action for decreased power.
powerIncreaseAndDecrease		Increase and decrease in the power. The block represents action for increased and decreased power.

3016

3017 **3.188 (NC) EnergyGroup**

3018 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3019 An energy group is an aggregation of energy components which have the same energy characteristic, e.g. fuel type and technology. It can be used to allocate energy.

3020 Table 293 shows all attributes of EnergyGroup.

3022 **Table 293 – Attributes of EquipmentReliabilityProfile::EnergyGroup**

name	mult	type	description
normalParticipationFactor	1..1	Float	(NC) Normal participation factor for the power group in relation to scheduling area. Must be a positive value.
powerDuration	0..1	Duration	(NC) Duration for the active power.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3023

3024 Table 294 shows all association ends of EnergyGroup with other classes.

3025 **Table 294 – Association ends of EquipmentReliabilityProfile::EnergyGroup with other classes**

3026

mult from	name	mult to	type	description
0..*	EnergyType	0..1	EnergyType	(NC) The energy type that the energy group are defined by.
0..*	SchedulingArea	1..1	SchedulingArea	(NC) The scheduling area that has this energy group.

3027

3028 **3.189 (NC) EnergyKind enumeration**

3029 Categories of energy used for energy groups.

3030 Table 295 shows all literals of EnergyKind.

3031 **Table 295 – Literals of EquipmentReliabilityProfile::EnergyKind**

literal	value	description
hydroRunOfRiver		Hydro run of river.
hydroWaterReservoir		Hydro water reservoir.
hydroPump		Hydro pump.

literal	value	description
biomass		Biomass.
fossil		Fossil.
geothermal		Geothermal.
marine		Marine.
nuclear		Nuclear.
uncontrollableConsumption		Consumption where there is no flexibility and it is measurable and under possibility to provide a forecast. e.g. TV, indoor lightning.
timeShiftConsumption		Operation can be shifted in time but can have a deadline e.g. washing machine, dishwasher.
battery		Battery storage.
bufferConsumption		Flexibility in operation but bound to some buffering capability e.g. battery, electrical vehicle, cooling system, freezer.
solar		Solar.
unconstrainedConsumption		Consumption is not constrained by any buffer and provides full flexibility. It is difficult to measure and to provide forecast. The consumption can be provided by local production. e.g. gas generator, diesel generator wood fire, etc.
waste		Waste.
wind		Wind.
other		Other.

3032

3033 **3.190 (abstract,NC) EnergySourceReference root class**

3034 An energy source reference refers to a set of fuel types characteristic for reporting, e.g.
3035 European Energy Certificate System (EECS). The kind of energy should be possible to be linked
3036 with different type of energy forecast, e.g. wind production for a given area based on wind
3037 forecast.

3038 **3.191 (NC) DCHarmonicFilter**

3039 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3040 [PowerSystemResource](#) : [IdentifiedObject](#)

3041 DC harmonic filter (IEC 60633) is a filter which, in conjunction with the DC reactor(s) and with
3042 the DC surge capacitor(s), if any, serves the primary function of reducing (current or voltage)
3043 ripple on the DC transmission line and/or earth electrode line.

3044 Table 296 shows all attributes of DCHarmonicFilter.

3045

Table 296 – Attributes of EquipmentReliabilityProfile::DCHarmonicFilter

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3046

3047 Table 297 shows all association ends of DCHarmonicFilter with other classes.

3048 **Table 297 – Association ends of EquipmentReliabilityProfile::DCHarmonicFilter with**
3049 **other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3050

3051 **3.192 (NC) DC Smoothing Reactor**

3052 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3053 [PowerSystemResource](#) : [IdentifiedObject](#)

3054 Reactor (IEC 60633) connected in series with a converter unit or converter units on the DC side
3055 for the primary purpose of smoothing the direct current and reducing current transients.

3056 Table 298 shows all attributes of DC Smoothing Reactor.

3057 **Table 298 – Attributes of EquipmentReliabilityProfile::DC Smoothing Reactor**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3058

3059 Table 299 shows all association ends of DC Smoothing Reactor with other classes.

3060 **Table 299 – Association ends of EquipmentReliabilityProfile::DC Smoothing Reactor with**
3061 **other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3062

3063 **3.193 (NC) DC Smoothing Reactor Arrester**

3064 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3065 [PowerSystemResource](#) : [IdentifiedObject](#)

3066 Arrester (IEC 60633) connected between the terminals of a smoothing reactor.

3067 Table 300 shows all attributes of DC Smoothing Reactor Arrester.

3068 **Table 300 – Attributes of EquipmentReliabilityProfile::DC Smoothing Reactor Arrester**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3069

3070 Table 301 shows all association ends of DC Smoothing Reactor Arrester with other classes.

3071
3072**Table 301 – Association ends of
EquipmentReliabilityProfile::DCSmoothingReactorArrester with other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3073

3.194 (abstract,NC) DCHighSpeedSwitch

Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

High-speed DC switch (IEC 60633) is a type of switchgear used on a DC scheme, required to open or close rapidly (< 1 s), including in some cases the need to commutate load current into a parallel conducting path, but with no requirement to interrupt fault or load current. DC switchgear is usually based on a single-phase unit of an AC circuit-breaker, appropriately modified for their DC applications. Their capabilities to perform faster opening and closing than disconnect switches are used but the function of breaking short-circuit currents is not required. Table 302 shows all attributes of DCHighSpeedSwitch.

3084

Table 302 – Attributes of EquipmentReliabilityProfile::DCHighSpeedSwitch

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3085

3086

Table 303 shows all association ends of DCHighSpeedSwitch with other classes.

3087

3088

Table 303 – Association ends of EquipmentReliabilityProfile::DCHighSpeedSwitch with other classes

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3089

3.195 (abstract,NC) DCCommutationSwitch

Inheritance path = [DCHighSpeedSwitch](#) : [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

DC commutation switch (IEC 60633) is a type of high-speed DC switch specifically designed to commutate load current into an alternative parallel current path.

Table 304 shows all attributes of DCCommutationSwitch.

3096

Table 304 – Attributes of EquipmentReliabilityProfile::DCCommutationSwitch

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject

name	mult	type	description
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3097

3098

Table 305 shows all association ends of DCCommutationSwitch with other classes.

3099

3100

Table 305 – Association ends of EquipmentReliabilityProfile::DCCommutationSwitch with other classes

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3101

3102

3.196 (NC) DCConverterParallelingSwitch

3103

Inheritance path = [DCHighSpeedSwitch](#) : [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3104

3105

Converter paralleling switch (IEC 60633) is a high-speed DC switch connected in series with each converter at the DC terminal in DC schemes where two or more converters are connected in parallel onto a common pole conductor, designed to allow additional converter(s) to be connected in parallel or disconnected without affecting the load current in the other converter.

3106

3107

3108

3109

Table 306 shows all attributes of DCConverterParallelingSwitch.

3110

Table 306 – Attributes of EquipmentReliabilityProfile::DCConverterParallelingSwitch

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3111

3112

Table 307 shows all association ends of DCConverterParallelingSwitch with other classes.

3113

3114

Table 307 – Association ends of EquipmentReliabilityProfile::DCConverterParallelingSwitch with other classes

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3115

3116

3.197 (NC) DCBypassSwitch

3117

Inheritance path = [DCHighSpeedSwitch](#) : [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3118

3119

By-pass switch (IEC 60633) is a high-speed DC switch connected across each converter valve group in DC schemes using more than one independent converter per pole, designed to close rapidly to bypass a converter group that is being taken out of service and commute the current back into a valve group that is being taken back in service. A by-pass switch may also be used for prolonged shunting of the bridge(s).

3120

3121

3122

3123

3124

Table 308 shows all attributes of DCBypassSwitch.

3125 **Table 308 – Attributes of EquipmentReliabilityProfile::DCBypassSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3126

3127

Table 309 shows all association ends of DCBypassSwitch with other classes.

3128

3129

Table 309 – Association ends of EquipmentReliabilityProfile::DCBypassSwitch with other classes

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3130

3131 **3.198 (NC) DCNeutralBusGroundingSwitch**3132 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3133 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)3134 Neutral bus grounding switch (IEC 60633) or a neutral bus earthing switch is a DC commutation
3135 switch connected from the neutral bus to the station earth mat on a bipolar DC scheme,
3136 designed to provide a temporary earth connection in the event of an open circuit fault on the
3137 electrode line until the imbalance of current between the two poles can be reduced to a safe
3138 minimum level or the electrode line connection can be restored.

3139 Table 310 shows all attributes of DCNeutralBusGroundingSwitch.

3140 **Table 310 – Attributes of EquipmentReliabilityProfile::DCNeutralBusGroundingSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3141

3142

Table 311 shows all association ends of DCNeutralBusGroundingSwitch with other classes.

3143

3144

Table 311 – Association ends of EquipmentReliabilityProfile::DCNeutralBusGroundingSwitch with other classes

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3145

3146 **3.199 (NC) DCNeutralBusSwitch**

3147 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3148 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3149 Neutral bus switch (IEC 60633) is a DC commutation switch connected in series with the neutral
3150 bus on a bipolar DC scheme, designed to commutate current out of the pole conductor or neutral
3151 bus and into the electrode line or dedicated metallic return conductor or earth in response to a
3152 fault in a converter or neutral bus.

3153 Table 312 shows all attributes of DCNeutralBusSwitch.

3154 **Table 312 – Attributes of EquipmentReliabilityProfile::DCNeutralBusSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3155

3156 Table 313 shows all association ends of DCNeutralBusSwitch with other classes.

3157 **Table 313 – Association ends of EquipmentReliabilityProfile::DCNeutralBusSwitch with
3158 other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3159

3160 **3.200 (NC) DCMetallicReturnSwitch**

3161 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3162 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3163 Metallic return transfer switch (IEC 60633) is a DC commutation switch used to transfer DC
3164 current from an earth return path to a metallic return path. Although the term "metallic return
3165 transfer breaker" has been widely used in the industry for many years, it is misleading since
3166 such switches have no ability to interrupt fault current.

3167 Table 314 shows all attributes of DCMetallicReturnSwitch.

3168 **Table 314 – Attributes of EquipmentReliabilityProfile::DCMetallicReturnSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3169

3170 Table 315 shows all association ends of DCMetallicReturnSwitch with other classes.

3171 **Table 315 – Association ends of EquipmentReliabilityProfile::DCMetalicReturnSwitch**
3172 **with other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3173

3174 **3.201 (NC) DCEarthReturnTransferSwitch**

3175 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3176 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3177 Earth return transfer switch (IEC 60633) DC commutation switch used to transfer DC current
3178 from a metallic return path to an earth return path. In some applications, this function is
3179 performed by a by-pass switch. Although the term "earth return transfer breaker" has been
3180 widely used in the industry for many years, it is misleading since such switches have no ability
3181 to interrupt fault current.

3182 Table 316 shows all attributes of DCEarthReturnTransferSwitch.

3183 **Table 316 – Attributes of EquipmentReliabilityProfile::DCEarthReturnTransferSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3184

3185 Table 317 shows all association ends of DCEarthReturnTransferSwitch with other classes.

3186 **Table 317 – Association ends of**
3187 **EquipmentReliabilityProfile::DCEarthReturnTransferSwitch with other classes**

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3188

3189 **3.202 (NC) DCLineParallelingSwitch**

3190 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3191 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3192 Line paralleling switch (IEC 60633) DC commutation switch placed in series with one or more
3193 high-voltage pole conductors, allowing two or more lines to be connected in parallel or to revert
3194 to single-line operation while conducting load current.

3195 Table 318 shows all attributes of DCLineParallelingSwitch.

3196 **Table 318 – Attributes of EquipmentReliabilityProfile::DCLineParallelingSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NC) inherited from: DCConductingEquipment
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject

name	mult	type	description
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3197

3198

Table 319 shows all association ends of DCLineParallelingSwitch with other classes.

3199

3200

Table 319 – Association ends of EquipmentReliabilityProfile::DCLineParallelingSwitch with other classes

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3201

3202

3.203 (abstract,NC) DirectCurrentEquipmentController

3203

Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3204

3205

Direct current equipment controller used to control different parts of the hierarchical structure of the DC control system defined by IEC 60633.

3206

3207

Table 320 shows all attributes of DirectCurrentEquipmentController.

3208

3209

Table 320 – Attributes of EquipmentReliabilityProfile::DirectCurrentEquipmentController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3210

3211

Table 321 shows all association ends of DirectCurrentEquipmentController with other classes.

3212

3213

Table 321 – Association ends of EquipmentReliabilityProfile::DirectCurrentEquipmentController with other classes

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3214

3215

3.204 (NC) ACDCConverterController

3216

Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3217

3218

ACDC converter unit control. According to IEC 60633, it is the control system used for the controlling, monitoring and protection of a single converter unit.

3219

3220

Table 322 shows all attributes of ACDCConverterController.

3221

Table 322 – Attributes of EquipmentReliabilityProfile::ACDCConverterController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3222

3223

Table 323 shows all association ends of ACDCConverterController with other classes.

3224

3225

Table 323 – Association ends of EquipmentReliabilityProfile::ACDCConverterController with other classes

mult from	name	mult to	type	description
0..1	ACDCConverter	1..1	ACDCConverter	(NC) ACDC converter controlled by the direct current controller.
2..2	DirectCurrentPoleController	0..1	DirectCurrentPoleController	(NC) DC pole controller that controls this ACDC controller.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3226

3227

3.205 (NC) DirectCurrentPoleController

3228

Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3229

3230

DC system pole control, which is the control system of a pole in accordance with IEC 60633.

3231

Table 324 shows all attributes of DirectCurrentPoleController.

3232

Table 324 – Attributes of EquipmentReliabilityProfile::DirectCurrentPoleController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3233

3234

Table 325 shows all association ends of DirectCurrentPoleController with other classes.

3235

3236

Table 325 – Association ends of EquipmentReliabilityProfile::DirectCurrentPoleController with other classes

mult from	name	mult to	type	description
0..1	DCPole	1..1	DCPole	(NC) DC pole that is controlled by a DC pole controller.
0..*	DirectCurrentMasterController	0..1	DirectCurrentMasterController	(NC) DC master controller that has a DC pole controller.
2..2	DirectCurrentBipoleController	0..1	DirectCurrentBipoleController	(NC) DC bipole controller that controls this DC pole controller.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3237

3238 **3.206 (NC) DirectCurrentBipoleController**

3239 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3240 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3241 DC system bipole control that is the control system of a bipole in accordance with IEC 60633.

3242 Table 326 shows all attributes of DirectCurrentBipoleController.

3243 **Table 326 – Attributes of EquipmentReliabilityProfile::DirectCurrentBipoleController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3244

3245 Table 327 shows all association ends of DirectCurrentBipoleController with other classes.

3246 **Table 327 – Association ends of**
3247 **EquipmentReliabilityProfile::DirectCurrentBipoleController with other classes**

mult from	name	mult to	type	description
0..*	DirectCurrentMasterController	0..1	DirectCurrentMasterController	(NC) Direct current master controller which has direct current bipole controllers.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3248

3249 **3.207 (abstract,NC) DirectCurrentSubstationController**

3250 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3251 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3252 Control system used for the controlling, monitoring and protection within a DC substation (IEC
3253 60633). A DC substation control may be implemented at the bipole and/or pole level and may
3254 be referred to as local control.

3255 Table 328 shows all attributes of DirectCurrentSubstationController.

3256 **Table 328 – Attributes of**
3257 **EquipmentReliabilityProfile::DirectCurrentSubstationController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3258

3259 Table 329 shows all association ends of DirectCurrentSubstationController with other classes.

3260
3261

**Table 329 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSubstationController with other classes**

mult from	name	mult to	type	description
2..*	MultiterminalControl	0..1	DirectCurrentMasterController	(NC) Multiterminal control that controls more than two DC substation controllers.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3262

3.208 (NC) DirectCurrentSubstationPoleController

Inheritance path = [DirectCurrentSubstationController](#) : [DirectCurrentEquipmentController](#) : [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3265 Control system of a substation pole (IEC 60633).

3266 Table 330 shows all attributes of DirectCurrentSubstationPoleController.

3268
3269

**Table 330 – Attributes of
EquipmentReliabilityProfile::DirectCurrentSubstationPoleController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3270

3271 Table 331 shows all association ends of DirectCurrentSubstationPoleController with other
3272 classes.

3273
3274

**Table 331 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSubstationPoleController with other classes**

mult from	name	mult to	type	description
0..1	DCSubstationPole	1..1	DCSubstationPole	(NC) DC substation pole that is controlled by a DC substation pole controller.
2..*	MultiterminalControl	0..1	DirectCurrentMasterController	(NC) inherited from: DirectCurrentSubstationController
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3275

3.209 (NC) DirectCurrentSubstationBipoleController

Inheritance path = [DirectCurrentSubstationController](#) : [DirectCurrentEquipmentController](#) : [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3277 Control system of a substation bipole (IEC 60633).

3278 Table 332 shows all attributes of DirectCurrentSubstationBipoleController.

3281
3282

**Table 332 – Attributes of
EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction

name	mult	type	description
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3283

3284

3285

Table 333 shows all association ends of `DirectCurrentSubstationBipoleController` with other classes.

3286

3287

3288

**Table 333 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController with other
classes**

mult from	name	mult to	type	description
0..1	DCSubstationBipole	1..1	DCSubstationBipole	(NC) DC substation bipole that is controlled by a DC substation bipole controller.
2..*	MultiterminalControl	0..1	DirectCurrentMasterController	(NC) inherited from: DirectCurrentSubstationController
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3289

3290

3.210 (NC) DCSubstation

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3299

Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

DC substation or DC converter station (IEC 60633) is part of an DC system which consists of one or more converter units installed in a single location together with buildings, reactors, filters, reactive power supply, control, monitoring, protective, measuring and auxiliary equipment. A DC substation forming part of an DC transmission system may be referred to as an DC transmission substation.

Table 334 shows all attributes of `DCSubstation`.

Table 334 – Attributes of EquipmentReliabilityProfile::DCSubstation

name	mult	type	description
isTapping	1..1	Boolean	(NC) DC tapping substation (IEC 60633) is a DC substation, mainly used for inversion, with a rating which is a small fraction of that of the rectifier(s) in the system.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3300

3301

Table 335 shows all association ends of `DCSubstation` with other classes.

3302 **Table 335 – Association ends of EquipmentReliabilityProfile::DCSubstation with other**
3303 **classes**

mult from	name	mult to	type	description
0..*	Substation	0..1	Substation	(NC) Substation that contains this DC substation.

3304

3305 **3.211 (NC) DCSubstationPole**

3306 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3307 [PowerSystemResource](#) : [IdentifiedObject](#)

3308 Part of an DC system pole (IEC 60633) which is contained within a DC substation.

3309 Table 336 shows all attributes of DCSubstationPole.

3310 **Table 336 – Attributes of EquipmentReliabilityProfile::DCSubstationPole**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3311

3312 Table 337 shows all association ends of DCSubstationPole with other classes.

3313 **Table 337 – Association ends of EquipmentReliabilityProfile::DCSubstationPole with**
3314 **other classes**

mult from	name	mult to	type	description
0..*	DCSubstation	0..1	DCSubstation	(NC) DC substation that contains this DC substation pole part.

3315

3316 **3.212 (NC) DCSubstationBipole**

3317 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3318 [PowerSystemResource](#) : [IdentifiedObject](#)

3319 Part of a bipolar DC system (IEC 60633) contained within a DC substation.

3320 Table 338 shows all attributes of DCSubstationBipole.

3321 **Table 338 – Attributes of EquipmentReliabilityProfile::DCSubstationBipole**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3322

3323 Table 339 shows all association ends of DCSubstationBipole with other classes.

3324 **Table 339 – Association ends of EquipmentReliabilityProfile::DCSubstationBipole with**
3325 **other classes**

mult from	name	mult to	type	description
0..*	DCSubstation	0..1	DCSubstation	(NC) DC substation that contains this DC substation bipole part.

3326

3327 3.213 (abstract,NC) DCSystem

3328 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3329 Electrical power system which transfers energy in the form of direct current between two or
3330 more AC buses (defined in IEC 60633).

3331 Table 340 shows all attributes of DCSystem.

3332

Table 340 – Attributes of EquipmentReliabilityProfile::DCSystem

name	mult	type	description
directionKind	0..1	DCSystemDirectionKind	(NC) Direction kind of the DC system.
transmissionKind	0..1	DCSystemTransmissionKind	(NC) Transmission kind of the DC system.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3333

3334 3.214 (NC) BipolarDCSystem

3335 Inheritance path = [DCSystem](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3336 Bipolar DC system (IEC 60633) consists of two poles of opposite polarity with respect to earth.
3337 The overhead lines, if any, of the two poles may be carried on common or separate towers.

3338 Table 341 shows all attributes of BipolarDCSystem.

3339

Table 341 – Attributes of EquipmentReliabilityProfile::BipolarDCSystem

name	mult	type	description
isRigid	1..1	Boolean	(NC) If true, the bipolar DC system is a rigid DC current bipolar system (IEC 60633). It is a bipolar DC system without neutral connection between both converter stations. Since only two (pole) conductors exist, no unbalance current between both poles is possible. In case of interruption of power transfer of one converter pole, the current of the other pole has to be interrupted as well (at least for a limited time to allow reconfiguration of the DC circuit).
directionKind	0..1	DCSystemDirectionKind	(NC) inherited from: DCSystem
transmissionKind	0..1	DCSystemTransmissionKind	(NC) inherited from: DCSystem
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3340

3341 **3.215 (NC) MonopolarDCSystem**3342 Inheritance path = [DCSystem](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3343 Monopolar DC system (IEC 60633) is a DC system with only one pole.

3344 Table 342 shows all attributes of MonopolarDCSystem.

3345 **Table 342 – Attributes of EquipmentReliabilityProfile::MonopolarDCSystem**

name	mult	type	description
isSymmetrical	1..1	Boolean	(NC) if true, the monopolar DC system is symmetrical monopolar DC system (IEC 60633). It is a DC system with only one symmetrical monopole. A symmetrical monopole is part of an DC system consisting of all the equipment in the DC substations and the interconnecting transmission lines, if any, which during normal operation exhibits equal and opposite direct voltage polarities with respect to earth but without series connection of converters in each converter station. The term "symmetrical monopole" is used even though there are two polarities with DC voltages, because with only one converter it is not possible to provide the redundancy which is normally associated with the term "bipole".
directionKind	0..1	DCSystemDirectionKind	(NC) inherited from: DCSystem
transmissionKind	0..1	DCSystemTransmissionKind	(NC) inherited from: DCSystem
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3346

3347 **3.216 (NC) DCBiPole**3348 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3349 DC system bipole (IEC 60633), which is part of an DC system consisting of two independently operable DC system poles, which during normal operation, exhibit opposite direct voltage polarities with respect to earth.

3350 Table 343 shows all attributes of DCBiPole.

3351 **Table 343 – Attributes of EquipmentReliabilityProfile::DCBiPole**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3352

3353 Table 344 shows all association ends of DCBiPole with other classes.

3356 **Table 344 – Association ends of EquipmentReliabilityProfile::DCBiPole with other**
3357 **classes**

mult from	name	mult to	type	description
0..1	BipolarDCSystem	0..1	BipolarDCSystem	(NC) Bipolar DC system that has this DC bipole.

3358

3359 **3.217 (abstract,NC) PointOfCommonCoupling**

3360 Inheritance path = [IdentifiedObject](#)

3361 Point of Common Coupling (PCC) refers to the location where multiple electrical sources or
3362 loads are electrically connected and provide a reference point where the voltages and currents
3363 from different parts of the system are considered to be common. The PCC is used to support
3364 system analysis, control, and monitoring, as it provides a reference for understanding the
3365 interactions and power flow between various components within the system. It is also relevant
3366 to define the requirement and responsibility between different actors in operating a power
3367 system.

3368 Table 345 shows all attributes of PointOfCommonCoupling.

3369 **Table 345 – Attributes of EquipmentReliabilityProfile::PointOfCommonCoupling**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3370

3371 **3.218 (NC) ACPointOfCommonCoupling**

3372 Inheritance path = [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3373 Point of interconnection of the DC converter station to the adjacent AC system (IEC 60633).

3374 Table 346 shows all attributes of ACPointOfCommonCoupling.

3375 **Table 346 – Attributes of EquipmentReliabilityProfile::ACPointOfCommonCoupling**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3376

3377 Table 347 shows all association ends of ACPointOfCommonCoupling with other classes.

3378 **Table 347 – Association ends of**
3379 **EquipmentReliabilityProfile::ACPointOfCommonCoupling with other classes**

mult from	name	mult to	type	description
0..1	ConnectivityNode	1..1	ConnectivityNode	(NC) Connectivity node which is a point of common coupling AC.

3380

3381 **3.219 (NC) DCPointOfCommonCoupling**3382 Inheritance path = [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3383 Point of interconnection of the DC converter station to the DC transmission line (IEC 60633).

3384 Table 348 shows all attributes of DCPointOfCommonCoupling.

3385 **Table 348 – Attributes of EquipmentReliabilityProfile::DCPointOfCommonCoupling**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3386

3387 Table 349 shows all association ends of DCPointOfCommonCoupling with other classes.

3388 **Table 349 – Association ends of**
3389 **EquipmentReliabilityProfile::DCPointOfCommonCoupling with other classes**

mult from	name	mult to	type	description
0..1	DCNode	1..1	DCNode	(NC) The DCNode that is a point of common coupling DC.

3390

3391 **3.220 ConnectivityNode**3392 Inheritance path = [IdentifiedObject](#)

3393 Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.

3394 Table 350 shows all attributes of ConnectivityNode.

3396 **Table 350 – Attributes of EquipmentReliabilityProfile::ConnectivityNode**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3397

3398 **3.221 DCNode**3399 Inheritance path = [IdentifiedObject](#)

3400 DC nodes are points where terminals of DC conducting equipment are connected together with zero impedance.

3401 Table 351 shows all attributes of DCNode.

3403 **Table 351 – Attributes of EquipmentReliabilityProfile::DCNode**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3404

3405 **3.222 (NC) AutomationBlockGroup root class**

3406 Grouping of function block that are operated with the same priority as settings.

3407 Table 352 shows all attributes of AutomationBlockGroup.

3408 **Table 352 – Attributes of EquipmentReliabilityProfile::AutomationBlockGroup**

name	mult	type	description
priority	0..1	Integer	(NC) Value 0 means ignore priority. 1 means the highest priority, 2 is the second highest priority.

3409

3410 Table 353 shows all association ends of AutomationBlockGroup with other classes.

3411 **Table 353 – Association ends of EquipmentReliabilityProfile::AutomationBlockGroup**
3412 **with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	1..1	AutomationFunction	(NC) Automation function which has automation block group.

3413

3414 **3.223 (NC) FrequencyControlFunction**3415 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

3416 Frequency control function is a function block that calculate the operating point of the controlled equipment to achieve the target frequency.

3418 Table 354 shows all attributes of FrequencyControlFunction.

3419 **Table 354 – Attributes of EquipmentReliabilityProfile::FrequencyControlFunction**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3420

3421 Table 355 shows all association ends of FrequencyControlFunction with other classes.

3422 **Table 355 – Association ends of EquipmentReliabilityProfile::FrequencyControlFunction**
3423 **with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

3424

3425 **3.224 (abstract,NC) SystemControl**3426 Inheritance path = [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)3427 System control is the management and regulation of various parameters within the electrical
3428 grid to ensure its stable and reliable operation. The primary goal of system control is to maintain
3429 the balance between electricity generation and consumption, while also managing factors such
3430 as voltage, frequency, and power quality. This involves the use of control devices, automation,
3431 and monitoring systems to respond to changes in the grid and maintain its overall stability.3432 This serves as Integrated AC and DC control system (IEC 60633) which governs the integrated
3433 operation of AC and DC systems of a power system.

3434 Table 356 shows all attributes of SystemControl.

3435 **Table 356 – Attributes of EquipmentReliabilityProfile::SystemControl**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3436

3437 Table 357 shows all association ends of SystemControl with other classes.

3438 **Table 357 – Association ends of EquipmentReliabilityProfile::SystemControl with other
3439 classes**

mult from	name	mult to	type	description
0..1	EquipmentController	1..*	EquipmentController	(NC) Equipment controller controls by this system control
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3440

3441 **3.225 (NC) AreaInterchangeController**3442 Inheritance path = [SystemControl](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3443 [IdentifiedObject](#)

3444 Area interchange control is set to control active power of an area.

3445 Table 358 shows all attributes of AreaInterchangeController.

3446 **Table 358 – Attributes of EquipmentReliabilityProfile::AreaInterchangeController**

name	mult	type	description
pTolerance	1..1	ActivePower	(NC) Active power net interchange tolerance. The attribute shall be a positive value or zero.
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3447

3448 Table 359 shows all association ends of AreaInterchangeController with other classes.

3449 **Table 359 – Association ends of EquipmentReliabilityProfile::AreaInterchangeController**
3450 **with other classes**

mult from	name	mult to	type	description
0..1	BiddingZone	0..1	BiddingZone	(NC) Bidding zone which has an area interchange controller.
0..1	BiddingZoneBorder	0..1	BiddingZoneBorder	(NC) Bidding zone border that has an area interchange controller.
0..1	ControlArea	0..1	ControlArea	(NC) Control area that has a area interchange controller.
0..1	EquipmentController	1..*	EquipmentController	(NC) inherited from: SystemControl
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3451

3452 **3.226 (NC) PowerFrequencyController**

3453 Inheritance path = [SystemControl](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3454 [IdentifiedObject](#)

3455 Power frequency controller is controlling the active power balance as typically done by the
3456 secondary control. If an unbalance between the scheduled active power values of each
3457 generation unit and the loads plus losses occurs, primary control will adapt (increase/decrease)
3458 the active power production of each unit (depending on the power shift key strategy), leading
3459 to an over- or under-frequency situation. The secondary frequency controller will then control
3460 the frequency back to its nominal value, re- establishing a cost-efficient generation delivered
3461 by each unit.

3462 Table 360 shows all attributes of PowerFrequencyController.

3463 **Table 360 – Attributes of EquipmentReliabilityProfile::PowerFrequencyController**

name	mult	type	description
mode	1..1	PowerFrequencyControl Kind	(NC) Mode of the power frequency controller.
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3464

3465 Table 361 shows all association ends of PowerFrequencyController with other classes.

3466 **Table 361 – Association ends of**
3467 **EquipmentReliabilityProfile::PowerFrequencyController with other classes**

mult from	name	mult to	type	description
0..1	ControlArea	0..1	ControlArea	(NC) Control area which has a power frequency controller.
0..*	PowerShiftKeyStrategy	0..1	PowerShiftKeyStrategy	(NC) Power shift key strategy for this power frequency controller.
0..1	MonitoringArea	0..1	MonitoringArea	(NC) Monitoring area that has this power frequency controller.

mult from	name	mult to	type	description
0..1	EquipmentController	1..*	EquipmentController	(NC) inherited from: SystemControl
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3468

3469 **3.227 (NC) PowerFrequencyControlKind enumeration**

3470 Kinds of power frequency control modes.

3471 Table 362 shows all literals of PowerFrequencyControlKind.

3472 **Table 362 – Literals of EquipmentReliabilityProfile::PowerFrequencyControlKind**

literal	value	description
frequency		Frequency control mode.
activePower		Active power control mode.
activePowerAndFrequency		Active power and frequency control mode.

3473

3474 **3.228 (abstract,NC) MonitoringArea**3475 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3476 A coherent part of the interconnected electrical power system, that includes the system operators' responsibility area and the surrounding parts of other system operators' responsibility area, that need to be monitored for security assessment.

3478 Table 363 shows all attributes of MonitoringArea.

3479

3480 **Table 363 – Attributes of EquipmentReliabilityProfile::MonitoringArea**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3481

3482 **3.229 (NC) FrequencyMonitoringTerminal root class**

3483 Frequency monitoring terminal provides location in the model where the frequency is monitored for the purpose of power frequency control.

3484 Table 364 shows all attributes of FrequencyMonitoringTerminal.

3486 **Table 364 – Attributes of EquipmentReliabilityProfile::FrequencyMonitoringTerminal**

name	mult	type	description
mRID	1..1	String	(NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
priority	1..1	Integer	(NC) Value 0 means ignore priority. 1 means the highest priority, 2 is the second highest priority.

3487

3488 Table 365 shows all association ends of FrequencyMonitoringTerminal with other classes.

3489

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**Table 365 – Association ends of
EquipmentReliabilityProfile::FrequencyMonitoringTerminal with other classes**

mult from	name	mult to	type	description
0..*	Terminal	0..1	Terminal	(NC) The terminal for this frequency monitoring terminal.
0..*	PowerFrequencyController	0..1	PowerFrequencyController	(NC) Power frequency controller that has this frequency monitoring terminal.

3491

3.230 (NC) PowerElectronicsUnitController

3493 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

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Power electronics unit controller is controlling the equipment to optimize the power electronics unit.

Table 366 shows all attributes of PowerElectronicsUnitController.

Table 366 – Attributes of EquipmentReliabilityProfile::PowerElectronicsUnitController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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Table 367 shows all association ends of PowerElectronicsUnitController with other classes.

**Table 367 – Association ends of
EquipmentReliabilityProfile::PowerElectronicsUnitController with other classes**

mult from	name	mult to	type	description
0..*	PowerElectronicsConnectionController	0..1	PowerElectronicsConnectionController	(NC) Power electronics connection controller for the power electronics unit controller.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3503

3.231 (NC) ScheduleResourceController

3505 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3506

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3509

Schedule resource controller is controlling the equipment to optimize the schedule resource.

Table 368 shows all attributes of ScheduleResourceController.

Table 368 – Attributes of EquipmentReliabilityProfile::ScheduleResourceController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3510

3511 Table 369 shows all association ends of ScheduleResourceController with other classes.

3512

3513

**Table 369 – Association ends of
EquipmentReliabilityProfile::ScheduleResourceController with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3514

3.232 (NC) PowerElectronicsConnectionController

Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

Power electronics connection controller is controlling the equipment to optimize the power electronics connection.

Table 370 shows all attributes of PowerElectronicsConnectionController.

3521

3522

**Table 370 – Attributes of
EquipmentReliabilityProfile::PowerElectronicsConnectionController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction
normalEnabled	0..1	Boolean	(NC) inherited from: AutomationFunction
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3523

Table 371 shows all association ends of PowerElectronicsConnectionController with other classes.

3526

3527

**Table 371 – Association ends of
EquipmentReliabilityProfile::PowerElectronicsConnectionController with other classes**

mult from	name	mult to	type	description
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3528

3.233 (NC) DCSystemDirectionKind enumeration

Direction kinds of the DC system.

Table 372 shows all literals of DCSystemDirectionKind.

3532

Table 372 – Literals of EquipmentReliabilityProfile::DCSystemDirectionKind

literal	value	description
unidirectional		Unidirectional DC system used for the transfer of energy in only one direction. According to IEC 60633, most DC systems are inherently bidirectional. However, some systems may be optimized to transmit power in only one preferred direction. Such systems may still be considered as "bidirectional".
bidirectional		Bidirectional DC system used for the transfer of energy in either direction. According to IEC 60633 a multiterminal DC system is bidirectional if one or more substations are bidirectional.

3533

3.234 (NC) DCSystemTransmissionKind enumeration

3535 DC system transmission kind.

3536 Table 373 shows all literals of DCSystemTransmissionKind.

3537

Table 373 – Literals of EquipmentReliabilityProfile::DCSystemTransmissionKind

literal	value	description
twoTerminal		Two-terminal DC transmission system (IEC 60633), consisting of two DC substations and the connecting DC transmission line(s).
multiTerminal		Multiterminal DC transmission system (IEC 60633) consisting of more than two separated DC substations and the interconnecting DC transmission lines.
backToBack		DC back-to-back system (IEC 60633) is a DC system which transfers energy between AC buses at the same location.

3538

3.235 ReactivePower datatype

3540 Product of RMS value of the voltage and the RMS value of the quadrature component of the current.

3542 Table 374 shows all attributes of ReactivePower.

3543

Table 374 – Attributes of EquipmentReliabilityProfile::ReactivePower

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=VAr)
multiplier	0..1	UnitMultiplier	(const=M)

3544

3.236 (abstract) Conductor3546 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3548 Combination of conducting material with consistent electrical characteristics, building a single electrical system, used to carry current between points in the power system.

3550 Table 375 shows all attributes of Conductor.

3551

Table 375 – Attributes of EquipmentReliabilityProfile::Conductor

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3552

3553

Table 376 shows all association ends of Conductor with other classes.

3554

Table 376 – Association ends of EquipmentReliabilityProfile::Conductor with other classes

3555

mult from	name	mult to	type	description
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3556

3.237 (NC) CoordinatedCapacityCalculator

Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

3558

3559

3560

A role that coordinates and executes the task of calculating transmission capacity.

3561

Table 377 shows all attributes of CoordinatedCapacityCalculator.

3562

Table 377 – Attributes of EquipmentReliabilityProfile::CoordinatedCapacityCalculator

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3563

3564

Table 378 shows all association ends of CoordinatedCapacityCalculator with other classes.

3565

Table 378 – Association ends of EquipmentReliabilityProfile::CoordinatedCapacityCalculator with other classes

3566

mult from	name	mult to	type	description
0..*	Organisation	0..1	Organisation	inherited from: OrganisationRole

3567

3.238 (NC) ACEmulationControlFunction

Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

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The AC emulation control function is used when AC emulation model is activated for a DC system. It consists in computing the active power set point of the DC system as a function of the voltage angle difference between both points of common coupling with the AC network in order to mimic the behavior of an AC transmission line. This control mode enables the automatic adjustment of the active power reference following variations of the AC system operational point.

The setpoint of the DC system is calculated by $P_{setpoint} = Pref + K_{dc} * (angle1 - angle2)$, where

- 3577 - Pref is the existing active power setpoint;
 3578 - Kdc is the control system gain and
 3579 - angle1 and angle2 are the phase angle measurement (measured at points of common coupling
 3580 with the AC network) respectively at the side 1 and 2 of the DC system.
 3581 Table 379 shows all attributes of ACEmulationControlFunction.

3582 **Table 379 – Attributes of EquipmentReliabilityProfile::ACEmulationControlFunction**

name	mult	type	description
isDiscrete	1..1	Boolean	(NC) inherited from: ControlFunctionBlock
targetDeadband	0..1	Float	(NC) inherited from: ControlFunctionBlock
maxAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
minAllowedTargetValue	0..1	PerCent	(NC) inherited from: ControlFunctionBlock
normalEnabled	0..1	Boolean	(NC) inherited from: FunctionBlock
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3583

3584 Table 380 shows all association ends of ACEmulationControlFunction with other classes.

3585

3586

**Table 380 – Association ends of
EquipmentReliabilityProfile::ACEmulationControlFunction with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	0..1	AutomationFunction	(NC) inherited from: FunctionBlock
1..*	AutomationBlockGroup	0..1	AutomationBlockGroup	(NC) inherited from: FunctionBlock

3587

3588 **3.239 (NC) EquivalentGeneratingUnit**

3589 Inheritance path = [GeneratingUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3590 An indivisible set of installations which can generate electrical energy such that the frequency
 3591 of the generated voltage, the generator speed and the frequency of network voltage are in a
 3592 constant ratio and thus in synchronism. This is often referred as synchronous power-generating
 3593 module.

3594 Table 381 shows all attributes of EquivalentGeneratingUnit.

3595

Table 381 – Attributes of EquipmentReliabilityProfile::EquivalentGeneratingUnit

name	mult	type	description
maxEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
maxStartupLoad	0..1	ActivePower	(NC) inherited from: GeneratingUnit
minEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
shutdownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
lowerRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
raiseRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
minimumOffTime	0..1	Seconds	inherited from: GeneratingUnit
warmStartupTime	0..1	Duration	(NC) inherited from: GeneratingUnit
coolDownTime	0..1	Duration	(NC) inherited from: GeneratingUnit

name	mult	type	description
startupRampRate	0..1	ActivePowerChangeRate	(NC) inherited from: GeneratingUnit
normalMustRunP	0..1	ActivePower	(NC) inherited from: GeneratingUnit
runningLeadTime	0..1	Duration	(NC) inherited from: GeneratingUnit
minimumUpTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalStartupCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
normalWarmStartupCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
normalMustRunQ	0..1	ReactivePower	(NC) inherited from: GeneratingUnit
maxRampDownCountPerDay	0..1	Integer	(NC) inherited from: GeneratingUnit
rampLockTime	0..1	Duration	(NC) inherited from: GeneratingUnit
costCurrency	0..1	Currency	(NC) inherited from: GeneratingUnit
normalShutdownCost	0..1	Decimal	(NC) inherited from: GeneratingUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3596

3597

Table 382 shows all association ends of EquivalentGeneratingUnit with other classes.

3598

Table 382 – Association ends of EquipmentReliabilityProfile::EquivalentGeneratingUnit with other classes

3599

mult from	name	mult to	type	description
0..*	EquivalentPowerPlant	0..1	EquivalentPowerPlant	(NC) Equivalent power plant that has this equivalent generating unit.
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: GeneratingUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3600

3601

3.240 ExternalNetworkInjection

3602

Inheritance path = [RegulatingCondEq](#) : [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

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3604

This class represents the external network and it is used for IEC 60909 calculations.

3605

Table 383 shows all attributes of ExternalNetworkInjection.

3606

Table 383 – Attributes of EquipmentReliabilityProfile::ExternalNetworkInjection

name	mult	type	description
maxP	1..1	ActivePower	Maximum active power of the injection.
maxQ	1..1	ReactivePower	Maximum reactive power limit. It is used for modelling of infeed for load flow exchange and not for short circuit modelling.
minP	1..1	ActivePower	Minimum active power of the injection.
minQ	1..1	ReactivePower	Minimum reactive power limit. It is used for modelling of infeed for load flow exchange and not for short circuit modelling.

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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Table 384 shows all association ends of ExternalNetworkInjection with other classes.

3609

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Table 384 – Association ends of EquipmentReliabilityProfile::ExternalNetworkInjection with other classes

mult from	name	mult to	type	description
0..*	EquivalentGeneratingUnit	0..1	EquivalentGeneratingUnit	(NC) Equivalent generating unit that has this external network injection.
0..*	EquipmentController	0..1	EquipmentController	(NC) inherited from: RegulatingCondEq
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3611

3612

3.241 (abstract,NC) Plant

3613

Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3614

A Plant is a collection of equipment for purposes of generation.

3615

Table 385 shows all attributes of Plant.

3616

Table 385 – Attributes of EquipmentReliabilityProfile::Plant

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3617

3618

3.242 (NC) EquivalentPowerElectronicsUnit

3619

Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3620

3621

An equivalent unit or ensemble of units generating electricity, which is either non-synchronously connected to the network or connected through power electronics, and that also has a single connection point to a transmission system, distribution system including closed distribution system or an equivalent representation of a HVDC system. This is often referred as power park module.

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3623

Table 386 shows all attributes of EquivalentPowerElectronicsUnit.

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Table 386 – Attributes of EquipmentReliabilityProfile::EquivalentPowerElectronicsUnit

name	mult	type	description
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3628

3629

Table 387 shows all association ends of EquivalentPowerElectronicsUnit with other classes.

3630

3631

**Table 387 – Association ends of
EquipmentReliabilityProfile::EquivalentPowerElectronicsUnit with other classes**

mult from	name	mult to	type	description
0..*	EquivalentPowerPlant	0..1	EquivalentPowerPlant	(NC) Equivalent power plan that has this equivalent power electronics unit.
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3632

3633

3.243 (NC) EquivalentPowerPlant

3634

Inheritance path = [Plant](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3635

Collection of equivalent equipment for purposes of generation.

3636

Table 388 shows all attributes of EquivalentPowerPlant.

3637

Table 388 – Attributes of EquipmentReliabilityProfile::EquivalentPowerPlant

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3638

3639

3.244 (NC) MobileElectricalUnit

3640

Inheritance path = [BatteryUnit](#) : [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

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3642

A MobileElectricalUnit represents a persistent power system resource that can act as a source or sink of electrical energy within the grid. It is designed to interface with the grid through defined connection points for charging or discharging, while the physical energy storage asset associated with it (e.g., an electric vehicle or battery trailer) may be mobile.

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The MobileElectricalUnit abstracts the system-side functionality of mobile energy storage, independent of specific assets or charging events. It typically stores electrical energy in batteries or equivalent storage media and supports flexible, temporary, or location-variable integration into the power system.

3650

Examples include, but are not limited to:

3651

- Electric vehicles (EVs)

3652

- Electrically powered ferries

3653

- Trailer-based battery storage units

- 3654 - Mobile battery systems for backup or temporary grid support
 3655 - This concept supports consistent modeling of mobile energy systems in grid studies by treating the grid-facing connection as a stable power system element, while the associated physical unit is managed as an asset.
 3656
 3657
 3658 Table 389 shows all attributes of MobileElectricalUnit.

3659 **Table 389 – Attributes of EquipmentReliabilityProfile::MobileElectricalUnit**

name	mult	type	description
ratedE	1..1	RealEnergy	inherited from: BatteryUnit
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3660

3661 Table 390 shows all association ends of MobileElectricalUnit with other classes.

3662 **Table 390 – Association ends of EquipmentReliabilityProfile::MobileElectricalUnit with other classes**

3663

mult from	name	mult to	type	description
0..*	ElectricalChargingUnit	0..1	ElectricalChargingUnit	Electrical charging unit that has a mobile electrical unit.
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3664

3665 3.245 BatteryUnit

3666 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3667 An electrochemical energy storage device.

3668 Table 391 shows all attributes of BatteryUnit.

3670 **Table 391 – Attributes of EquipmentReliabilityProfile::BatteryUnit**

name	mult	type	description
ratedE	1..1	RealEnergy	Full energy storage capacity of the battery. The attribute shall be a positive value.
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject

name	mult	type	description
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3671

3672

Table 392 shows all association ends of BatteryUnit with other classes.

3673

Table 392 – Association ends of EquipmentReliabilityProfile::BatteryUnit with other classes

3674

mult from	name	mult to	type	description
0..*	ScheduleResource	0..1	ScheduleResource	(NC) inherited from: PowerElectronicsUnit
0..*	PowerElectronicsUnitController	0..1	PowerElectronicsUnitController	(NC) inherited from: PowerElectronicsUnit
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3675

3676

3.246 RealEnergy datatype

3677

Real electrical energy.

3678

Table 393 shows all attributes of RealEnergy.

3679

Table 393 – Attributes of EquipmentReliabilityProfile::RealEnergy

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=M)
unit	0..1	UnitSymbol	(const=Wh)
value	0..1	Float	

3680

3681

3.247 SynchronousMachineOperatingMode enumeration

3682

Synchronous machine operating mode.

3683

Table 394 shows all literals of SynchronousMachineOperatingMode.

3684

Table 394 – Literals of

3685

EquipmentReliabilityProfile::SynchronousMachineOperatingMode

literal	value	description
generator		Operating as generator.
condenser		Operating as condenser.
motor		Operating as motor.

3686

3687

3.248 (NC) SchedulingAreaExchangePoint root class

3688

Combination of scheduling area and one or more energy exchange point to define the relevant exchange point for a given scheduling area.

3689

3690

Table 395 shows all attributes of SchedulingAreaExchangePoint.

3691 **Table 395 – Attributes of EquipmentReliabilityProfile::SchedulingAreaExchangePoint**

name	mult	type	description
mRID	1..1	String	Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

3692

3693 Table 396 shows all association ends of SchedulingAreaExchangePoint with other classes.

3694

3695 **Table 396 – Association ends of EquipmentReliabilityProfile::SchedulingAreaExchangePoint with other classes**

mult from	name	mult to	type	description
0..*	EnergyExchangePoint	1..1	EnergyExchangePoint	(NC) The energy exchange point associated with the scheduling area.
0..*	SchedulingArea	1..1	SchedulingArea	(NC) The scheduling area that has a scheduling area exchange point.

3696

3697 **3.249 (NC) SecondarySubstation**3698 Inheritance path = [Substation](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3700 A SecondarySubstation is a substation that is either supplied by or serves a primary substation. It is responsible for transforming, distributing, or aggregating power to and from installations such as homes, industrial facilities, or prosumer sites.

3702 A secondary substation supports bidirectional power flows, enabling both consumption and injection of energy within the distribution network.

3705 It typically includes transformers, switchgear, protection, and measurement equipment, and may be equipped for remote monitoring or autonomous control

3707 Table 397 shows all attributes of SecondarySubstation.

3708 **Table 397 – Attributes of EquipmentReliabilityProfile::SecondarySubstation**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3709

3710 Table 398 shows all association ends of SecondarySubstation with other classes.

3711 **Table 398 – Association ends of EquipmentReliabilityProfile::SecondarySubstation with other classes**

3712

mult from	name	mult to	type	description
0..*	SubSchedulingArea	0..1	SubSchedulingArea	(NC) The subscheduling area that has the secondary substation connected.

mult from	name	mult to	type	description
0..1	PrimarySubstation	0..1	Substation	(NC) The primary substation that serves the secondary substation.
0..*	SchedulingArea	0..1	SchedulingArea	(NC) inherited from: Substation

3713

3714 **3.250 (NC) EdgeSchedulingArea**3715 Inheritance path = [SubSchedulingArea](#) : [SchedulingArea](#) : [PowerSystemResource](#) :
3716 [IdentifiedObject](#)3717 An EdgeSchedulingArea is a electrical area that is part of a SubSchedulingArea with one or
3718 more Installations connected.3719 It serves as the smallest energy level scheduling, forecasting and aggregated measurement
3720 used for coordinating energy production, consumption, and storage across its constituent
3721 connections.3722 An EdgeSchedulingArea may represent physical locations with multiple grid connection, such
3723 as a shopping mall, university campus, industrial facility, or private microgrid that are normally
3724 connected to the grid.

3725 Table 399 shows all attributes of EdgeSchedulingArea.

3726

Table 399 – Attributes of EquipmentReliabilityProfile::EdgeSchedulingArea

name	mult	type	description
isIslandingEnabled	0..1	Boolean	(NC) inherited from: SchedulingArea
isMeteringGridArea	0..1	Boolean	(NC) inherited from: SchedulingArea
normalParticipationFactor	0..1	Float	(NC) inherited from: SchedulingArea
type	0..1	String	(NC) inherited from: SchedulingArea
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3727

3728 Table 400 shows all association ends of EdgeSchedulingArea with other classes.

Table 400 – Association ends of EquipmentReliabilityProfile::EdgeSchedulingArea with other classes

3729

3730

mult from	name	mult to	type	description
0..*	EnergyCoordinationRegion	0..1	EnergyCoordinationRegion	(NC) inherited from: SchedulingArea
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) inherited from: SchedulingArea
0..*	SystemOperator	0..1	SystemOperator	(NC) inherited from: SchedulingArea
0..*	SynchronousArea	0..1	SynchronousArea	(NC) inherited from: SchedulingArea
0..*	BiddingZone	0..1	BiddingZone	(NC) inherited from: SchedulingArea
1..*	ControlArea	0..1	ControlArea	(NC) inherited from: SchedulingArea
0..*	PowerCapacity	0..1	PowerCapacity	(NC) inherited from: SchedulingArea
0..*	PartOf	0..1	SchedulingArea	(NC) inherited from: SchedulingArea

3731

3732 **3.251 (NC) Installation**3733 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)3734 An Installation represents a functionally integrated system at a premises or facility that is
3735 connected to an energy infrastructure, but is not itself an energy device (e.g., generator, load,
3736 or storage).3737 It serves as a system-level abstraction of the internal infrastructure—such as intake cable,
3738 switchboards, internal cabling, distribution panels, protection devices, and auxiliary equipment
3739—that enables and constraints the connection to one or more energy connections (electrical,
3740 thermal, gas, etc.).3741 Installations are typically owned and operated by the site holder, not the utility, and exist within
3742 buildings, industrial sites, or campus.

3743 Table 401 shows all attributes of Installation.

3744 **Table 401 – Attributes of EquipmentReliabilityProfile::Installation**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3745

3746 Table 402 shows all association ends of Installation with other classes.

3747 **Table 402 – Association ends of EquipmentReliabilityProfile::Installation with other
3748 classes**

mult from	name	mult to	type	description
0..1	EnergyConnection	0..1	EnergyConnection	(NC) The energy connection that is connected to the installation.
0..*	EdgeSchedulingArea	0..1	EdgeSchedulingArea	(NC) The edge scheduling area for this installation.
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

3749

3750 **3.252 (NC) SubControlArea**3751 Inheritance path = [ControlArea](#) : [PowerSystemResource](#) : [IdentifiedObject](#)3752 A SubControlArea representing the operational control domain within a higher-level control
3753 area. It is typically operated by a Distribution System Operator (DSO) and covers the
3754 monitoring, control, scheduling, and application of operational limits for distribution system
3755 resources and exchanges at its boundary.

3756 Table 403 shows all attributes of SubControlArea.

3757 **Table 403 – Attributes of EquipmentReliabilityProfile::SubControlArea**

name	mult	type	description
areaType	0..1	String	(NC) inherited from: ControlArea
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3758

3759

Table 404 shows all association ends of SubControlArea with other classes.

3760

3761

Table 404 – Association ends of EquipmentReliabilityProfile::SubControlArea with other classes

mult from	name	mult to	type	description
0..*	OutageCoordinationRegion	0..1	OutageCoordinationRegion	(NC) inherited from: ControlArea
0..*	SystemOperator	0..1	SystemOperator	(NC) inherited from: ControlArea
0..*	PartOf	0..1	ControlArea	(NC) inherited from: ControlArea

3762

3763

3.253 (NC) EdgeControlArea

3764

Inheritance path = [SubControlArea](#) : [ControlArea](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3765

An EdgeControlArea representing the local, site-level (edge) operational domain that coordinates one or more Installations and their connections. It is typically operated by an edge operator (e.g., a person/company operating a campus, mall, microgrid, or prosumer cluster) and supports local monitoring, control, scheduling, and limits—both islanded and grid-connected.

3766

3767

3768

3769

3770

Table 405 shows all attributes of EdgeControlArea.

3771

Table 405 – Attributes of EquipmentReliabilityProfile::EdgeControlArea

name	mult	type	description
areaType	0..1	String	(NC) inherited from: ControlArea
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3772

3773

Table 406 shows all association ends of EdgeControlArea with other classes.

3774

3775

Table 406 – Association ends of EquipmentReliabilityProfile::EdgeControlArea with other classes

mult from	name	mult to	type	description
0..*	OutageCoordinationRegion	0..1	OutageCoordinationRegion	(NC) inherited from: ControlArea
0..*	SystemOperator	0..1	SystemOperator	(NC) inherited from: ControlArea
0..*	PartOf	0..1	ControlArea	(NC) inherited from: ControlArea

3776

3777

3.254 (NC) GridConnectionPoint

3778

Inheritance path = [ACPointOfCommonCoupling](#) : [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3779

A GridConnectionPoint is a Point of Common Coupling (PCC) that defines the contractual and operational interface between a grid operator (e.g., TSO, DSO, or CDSO) and a connecting entity, such as a person, company, prosumer, or facility operator.

3780

3781

3782

It represents the electrical location at which the connection agreement—as defined by applicable grid connection codes (e.g., EU RfG, DCC, HVDC)—is enacted, establishing the technical, legal, and compliance boundaries for power exchange between the public grid and the connected installation or energy system.

3783

3784

3785

3786 All operational conditions required by regulation—such as voltage and frequency ranges, fault
3787 ride-through capabilities, power quality limits, and observability—are applicable at this point.
3788 The GridConnectionPoint may support bidirectional power flow, and is typically associated with
3789 metering, disconnection, and protection devices, but is independent of voltage level or specific
3790 technology.

3791 Table 407 shows all attributes of GridConnectionPoint.

3792 **Table 407 – Attributes of EquipmentReliabilityProfile::GridConnectionPoint**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3793

3794 Table 408 shows all association ends of GridConnectionPoint with other classes.

3795 **Table 408 – Association ends of EquipmentReliabilityProfile::GridConnectionPoint with**
3796 **other classes**

mult from	name	mult to	type	description
0..1	ConnectivityNode	1..1	ConnectivityNode	(NC) inherited from: ACPointOfCommonCoupling

3797

3798 **3.255 (NC) EnergyExchangePoint**

3799 Inheritance path = [ACPointOfCommonCoupling](#) : [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3800 An EnergyExchangePoint is a PointOfCommonCoupling that defines the electrical and
3801 operational interface between two independent adjacent grid operators —such as two TSOs, a
3802 TSO and a DSO, or two DSOs—who are responsible for coordinated operation of
3803 interconnected power systems.

3804 It marks the electrical boundary point at which the energy exchange agreement between the
3805 two grid operators is enacted, and where power flows, balancing responsibilities, and
3806 observability requirements are formally managed. Operational conditions defined by applicable
3807 regulation—such as exchange capacity, frequency and voltage support, fault ride-through,
3808 protection coordination, and metering—can be defined at this point and in some cases enforced
3809 at this point.

3810 It supports bidirectional power flow and may be associated with operational requirements such
3811 as balancing, frequency and voltage control, telemetry, protection coordination, and energy
3812 accounting.

3813 Table 409 shows all attributes of EnergyExchangePoint.

3814 **Table 409 – Attributes of EquipmentReliabilityProfile::EnergyExchangePoint**

name	mult	type	description
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3815

3816 Table 410 shows all association ends of EnergyExchangePoint with other classes.

3817 **Table 410 – Association ends of EquipmentReliabilityProfile::EnergyExchangePoint**
3818 **with other classes**

mult from	name	mult to	type	description
0..1	ConnectivityNode	1..1	ConnectivityNode	(NC) inherited from: ACPointOfCommonCoupling

3819

3820

3821

3822

Annex A(informative): Sample data**3823 A.1 General**

3824 This Annex is designed to illustrate the profile by using fragments of sample data. It is not meant
3825 to be a complete set of examples covering all possibilities of using the profile. Defining a
3826 complete set of test data is considered a separate activity to be performed for the purpose of
3827 setting up interoperability testing and conformity related to this profile.

3828 A.2 Sample instance data

3829 Test data files are available in the CIM EG SharePoint.