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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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863 1 Introduction

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

866 2 Application profile specification

867 2.1 Version information

868 The content is generated from UML model file CIM17-2_CGMES31v01_PROF-
869 20v02_NC23v69_MS10v01_DES10v01.eap.

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

- 871 - Title: Equipment Reliability Vocabulary
- 872 - Keyword: ER
- 873 - Description: This vocabulary is describing the equipment reliability profile.
- 874 - Version IRI: <https://ap-voc.cim4.eu/EquipmentReliability/2.3>
- 875 - Version info: 2.3.1
- 876 - Prior version: <http://entsoe.eu/ns/CIM/EquipmentReliability-EU/2.2>
- 877 - Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-
878 7:amd1|file://iec61970cim17v40_iec61968cim13v13a_iec62325cim03v17a.eap|urn:iso:
879 std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-
880 2|file://CIM100_CGMES31v01_501-20v02_NC23v62_MM10v01.eap
- 881 - Identifier: urn:uuid:5f727c5c-b49f-47be-b750-a00fefb7e806

882

883 2.2 Constraints naming convention

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

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

887 where

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

889 rule.Standard: the number of the standard e.g. 301 for 61970-301, 456 for 61970-456, 13 for
890 61968-13. 61970-600 specific constraints refer to 600 although they are related to one or
891 combination of the 61970-450 series profiles. For NC profiles, NC is used.

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

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

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

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

899 2.3 Profile constraints

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

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

- 905 • C:452:ALL:NA:datatypes

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

- 908 • R:452:ALL:NA:exchange

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

- 911 • R:452:ALL:NA:exchange1

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

- 917 • R:452:ALL:NA:exchange2

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

- 926 • R:452:ALL:NA:exchange3

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

- 930 • R:452:ALL:NA:exchange4

931 From the standpoint of the model import used by a data recipient, the document
932 describes a subset of the CIM that importing software shall be able to interpret in order
933 to import exported models. Data providers are free to exceed the minimum requirements
934 described herein as long as their resulting data files are compliant with the CIM Schema
935 and the conventions established in Clause 5. The document, therefore, describes
936 additional classes and class data that, although not required, exporters will, in all
937 likelihood, choose to include in their data files. The additional classes and data are
938 labelled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them
939 from their required counterparts. Please note, however, that data importers could
940 potentially receive data containing instances of any and all classes described by the
941 CIM Schema.

- 942 • R:452:ALL:NA:cardinality

- 943 The cardinality defined in the CIM model shall be followed, unless a more restrictive
944 cardinality is explicitly defined in this document. For instance, the cardinality on the
945 association between VoltageLevel and BaseVoltage indicates that a VoltageLevel shall
946 be associated with one and only one BaseVoltage, but a BaseVoltage can be associated
947 with zero to many VoltageLevels.
- 948 • R:452:ALL:NA:associations
- 949 Associations between classes referenced in this document and classes not referenced
950 here are not required regardless of cardinality.
- 951 • R:452:ALL:IdentifiedObject.name:rule
- 952 The attribute “name” inherited by many classes from the abstract class IdentifiedObject
953 is not required to be unique. It must be a human readable identifier without additional
954 embedded information that would need to be parsed. The attribute is used for purposes
955 such as User Interface and data exchange debugging. The MRID defined in the data
956 exchange format is the only unique and persistent identifier used for this data exchange.
957 The attribute IdentifiedObject.name is, however, always required for CoreEquipment
958 profile and Short Circuit profile.
- 959 • R:452:ALL:IdentifiedObject.description:rule
- 960 The attribute “description” inherited by many classes from the abstract class
961 IdentifiedObject must contain human readable text without additional embedded
962 information that would need to be parsed.
- 963 • R:452:ALL:NA:uniqueIdentifier
- 964 All IdentifiedObject-s shall have a persistent and globally unique identifier (Master
965 Resource Identifier - mRID).
- 966 • R:452:ALL:NA:unitMultiplier
- 967 For exchange of attributes defined using CIM Data Types (ActivePower, Susceptance,
968 etc.) a unit multiplier of 1 is used if the UnitMultiplier specified in this document is “none”.
- 969 • C:452:ALL:IdentifiedObject.name:stringLength
- 970 The string IdentifiedObject.name has a maximum of 128 characters.
- 971 • C:452:ALL:IdentifiedObject.description:stringLength
- 972 The string IdentifiedObject.description is maximum 256 characters.
- 973 • C:452:ALL:NA:float
- 974 An attribute that is defined as float (e.g. has a type Float or a type which is a Datatype
975 with .value attribute of type Float) shall support ISO/IEC 60559:2020 for floating-point
976 arithmetic using single precision floating point. A single precision float supports 7
977 significant digits where the significant digits are described as an integer, or a decimal
978 number with 6 decimal digits. Two float values are equal when the significant with 7
979 digits are identical, e.g. 1234567 is equal 1.234567E6 and so are 1.2345678 and
980 1.234567E0.
- 981 • R:NC:ER:AreaDispatchableUnit:interconnection

982 In cases where the AreaDispatchingUnit is providing dispatch support for a control area
983 outside its location it shall refer to TieCorridor that refers to ControlArea. Otherwise, the
984 AreaDispatchingUnit shall refer to SchedulingArea.

985 • C:NC:ER:AreaDispatchableUnit:associations

986 The AreaDispatchableUnit shall be associated with either GeneratingUnit,
987 PowerElectronicsUnit, EnergyConsumer, ScheduleResource or HydroPump.

988 • C:NC:ER:EnergyComponent:associations

989 The EnergyComponent shall be associated with either GeneratingUnit,
990 PowerElectronicsUnit, EnergyConsumer or HydroPump.

991 • R:NC:ER:VoltageAngleLimit:AngleReferenceTerminal

992 Due to the nature of the exchange and requirements it is allowed that the association
993 VoltageAngleLimit.AngleReferenceTerminal provides a dangling reference. This occurs
994 when the referenced Terminal is in another MAS. Validation of this association is only
995 performed when all dangling references are completed.

996 • R:NC:ALL:NA:serialization

997 The profiles are defined in the EnterpriseArchitect application and have multiple artifacts
998 that describe them. The main artifacts are:

- 999 1) the EAP file (EnterpriseArchitect project file),
- 1000 2) the profiles' specification document and
- 1001 3) the application profiles (RDFS and SHACL).

1002 Due to the complexity of the profiles, there are various cross profile associations that,
1003 from profiling and profile maintenance point of view, it is not practical to include the
1004 complete inheritance structure in all profiles. If this is done the documentation provided
1005 for all profiles would also include duplicated information on the description of classes
1006 defined in other profiles. The following cases are often observed in profiles:

- 1007 ○ Case 1: An association end refers to an abstract class
- 1008 ○ Case 2: An abstract class (stereotyped with "Description") has an association
1009 (direction to another class)
- 1010 ○ Case 3: An abstract class (not stereotyped with "Description") has an
1011 association (direction to another class)
- 1012 ○ Case 4: An abstract class has attributes and subclasses are not in the profile

1013 In all cases, the datasets shall only include the subtypes of the abstract classes with
1014 the related properties (i.e. association or attributes) defined in the profile. The
1015 information is taken from either canonical model or the profiles where complete
1016 (expected) inheritance structure for the related abstract class is described. SHACL
1017 based constraints include constraints only for the concrete classes that are subtypes of
1018 the abstract class in the profile, and this can be used to inform which are the concrete
1019 classes expected in a dataset that conforms to this profile.

1020 It should be taken into account that this approach deviates from MVAL5 (IEC 61970-
1021 600-1:2021), which creates multiple inheritance at serialization. For instance, with this
1022 more explicit exchange the serialization of the association between abstract class
1023 Equipment and abstract class Circuit for a PowerTransformer will be serialized as
1024 follows:

- 1025 ○ for association

1026 <cim:PowerTransformer rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">

1027 <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>

1028 </cim:PowerTransformer>

1029 ○ for attribute

1030 <cim:ACLineSegment rdf:about="_04f681aa-6999-4fb3-9775-aca5eb7ceff">

1031 <cim:Equipment.inService>true</cim:Equipment.inService>

1032 </cim:ACLineSegment>

1033 The usage of rdf:ID or rdf:about depends on the stereotype of the class. rdf:about is
1034 used if the class has the stereotype "Description".

1035 An example of not allowed serialization, as the Equipment is an abstract class

1036 <cim:Equipment rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">

1037 <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>

1038 </cim:Equipment>

1039 ● C:NC:ER:HydroPowerPlant:operatingMode

1040 The SynchronousMachine.operatingMode of all SynchronousMachine objects part of a
1041 HydroPowerPlant shall be consistent.

1042 ● C:NC:ER:Circuit:associations

1043 The Circuit shall be associated with either Equipment or Terminal.

1044 ● C:NC:ER:FunctionOutputVariable.PropertyReference:value

1045 The value of the association end FunctionOutputVariable.PropertyReference shall be
1046 one of the values published in the skos:ConceptScheme
1047 <https://energy.referencedata.eu/PropertyReference/>.

1048

1049 2.4 Metadata

1050 ENTSO-E agreed to extend the header and metadata definitions by IEC 61970-552 Ed2. This
1051 new header definitions rely on W3C recommendations which are used worldwide and are
1052 positively recognised by the European Commission. The new definitions of the header mainly
1053 use Provenance ontology (PROV-O), Time Ontology and Data Catalog Vocabulary (DCAT). The
1054 global new header applicable for this profile is included in the metadata and document header
1055 specification document.

1056 The header vocabulary contains all attributes defined in IEC 61970-552. This is done only for
1057 the purpose of having one vocabulary for header and to ensure transition for data exchanges
1058 that are using IEC 61970-552:2016 header. This profile does not use IEC 61970-552:2016
1059 header attributes and relies only on the extended attributes.

1060 2.4.1 Constraints

1061 The identification of the constraints related to the metadata follows the same convention for
1062 naming of the constraints as for profile constraints.

1063 ● R:NC:ALL:wasAttributedTo:usage

1064 The prov:wasAttributedTo should normally be the “X” EIC code of the actor or their URI
1065 (prov:Agent).

1066

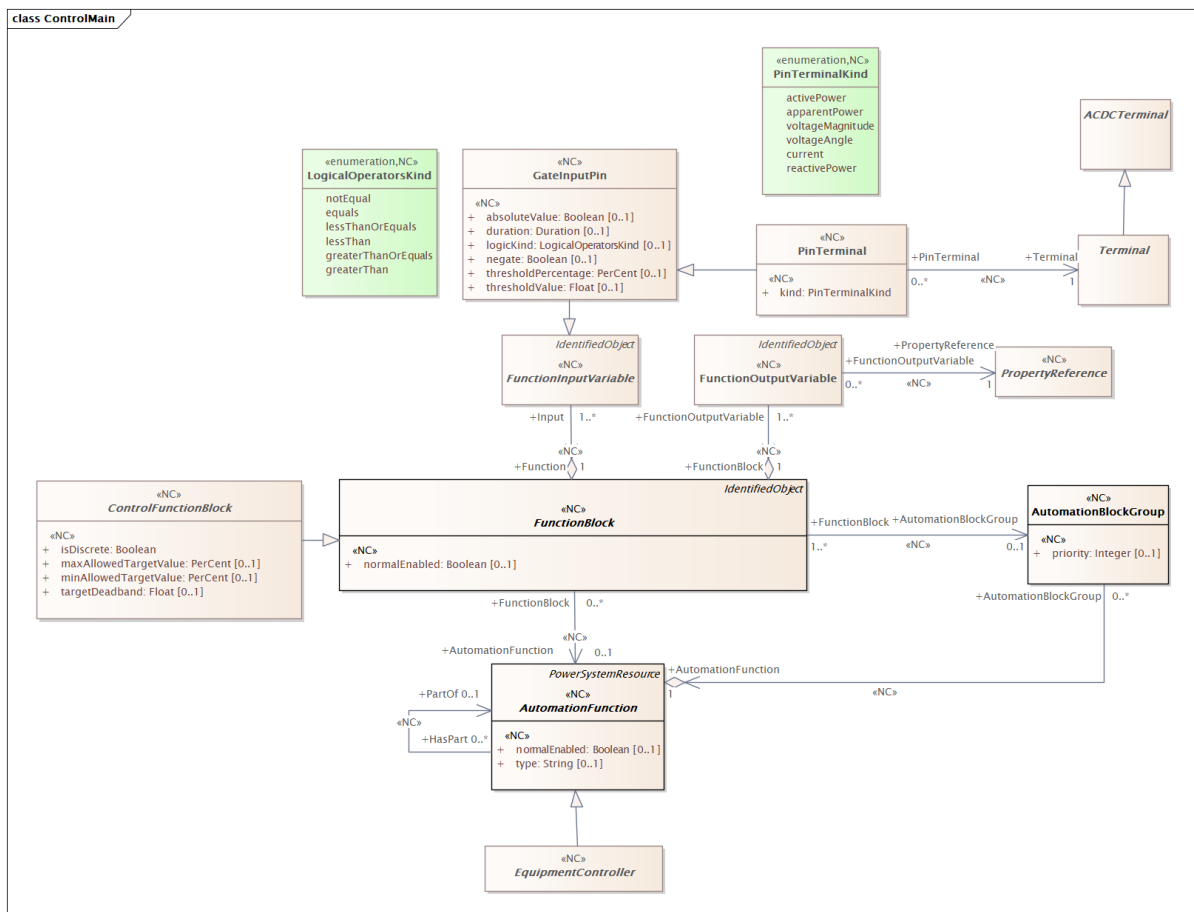
1067 **2.4.2 Reference metadata**

1068 The header defined for this profile requires availability of a set of reference metadata. For
1069 instance, the attribute prov:wasGeneratedBy requires a reference to an activity which produced
1070 the model or the related process. The activities are defined as reference metadata and their
1071 identifiers are referenced from the header to enable the receiving entity to retrieve the “static”
1072 (reference) information that it is not modified frequently. This approach imposes a requirement
1073 that both the sending entity and the receiving entity have access to a unique version of the
1074 reference metadata. Therefore, each business process shall define which reference metadata
1075 is used and where it is located.

1076 **3 Detailed Profile Specification**

1077 **3.1 General**

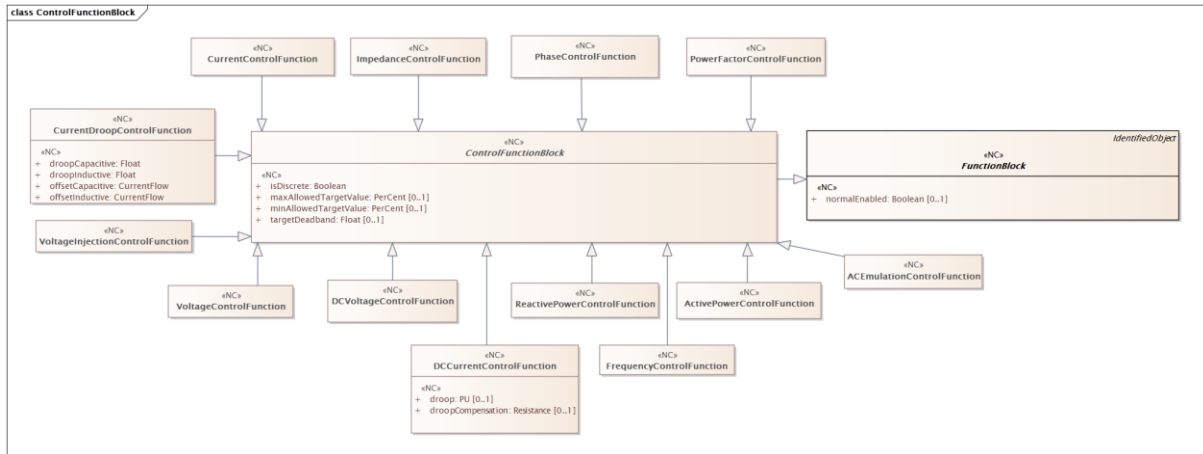
1078 This package contains equipment reliability profile.



1079

1080 **Figure 1 – Class diagram EquipmentReliabilityProfile::ControlMain**

1081 Figure 1: The diagram shows main structure of the control related classes.



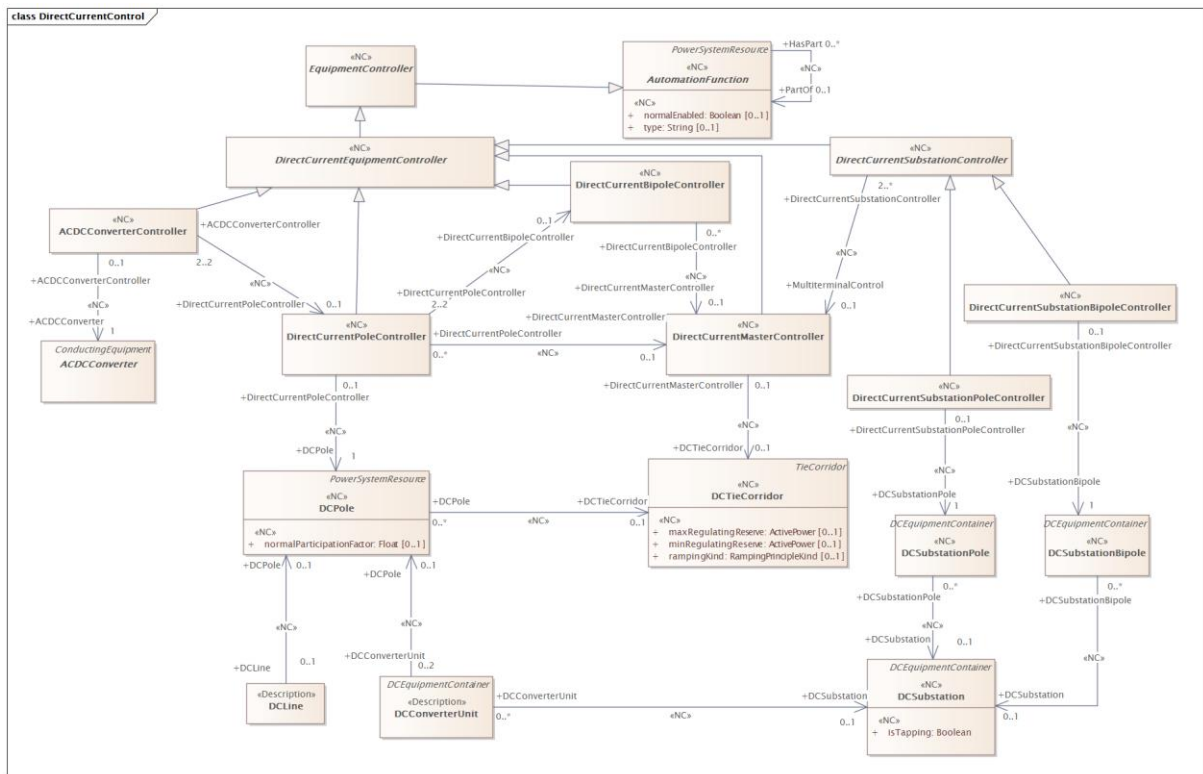
1082

1083

Figure 2 – Class diagram EquipmentReliabilityProfile::ControlFunctionBlock

1084

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



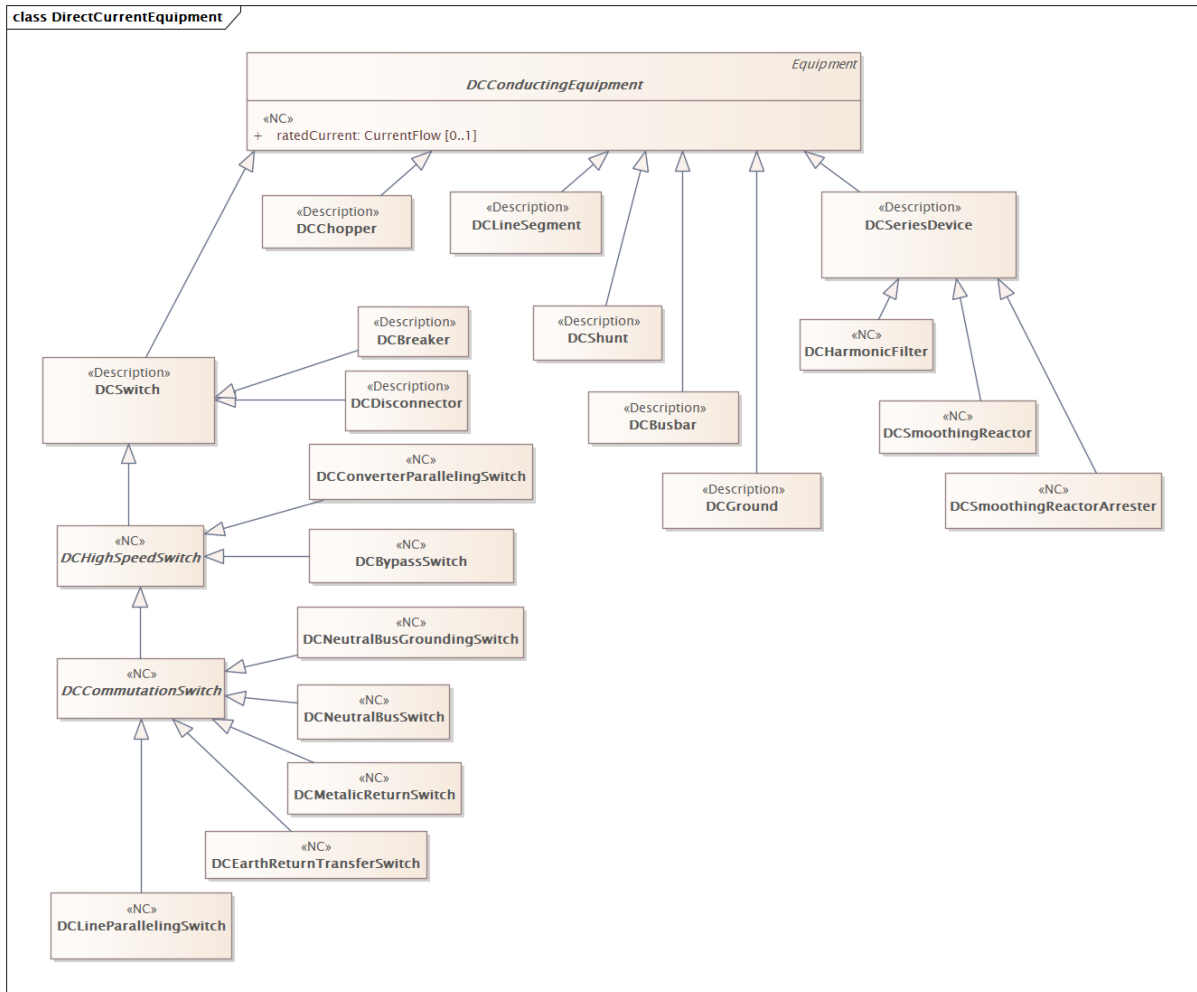
1085

1086

Figure 3 – Class diagram EquipmentReliabilityProfile::DirectCurrentControl

1087

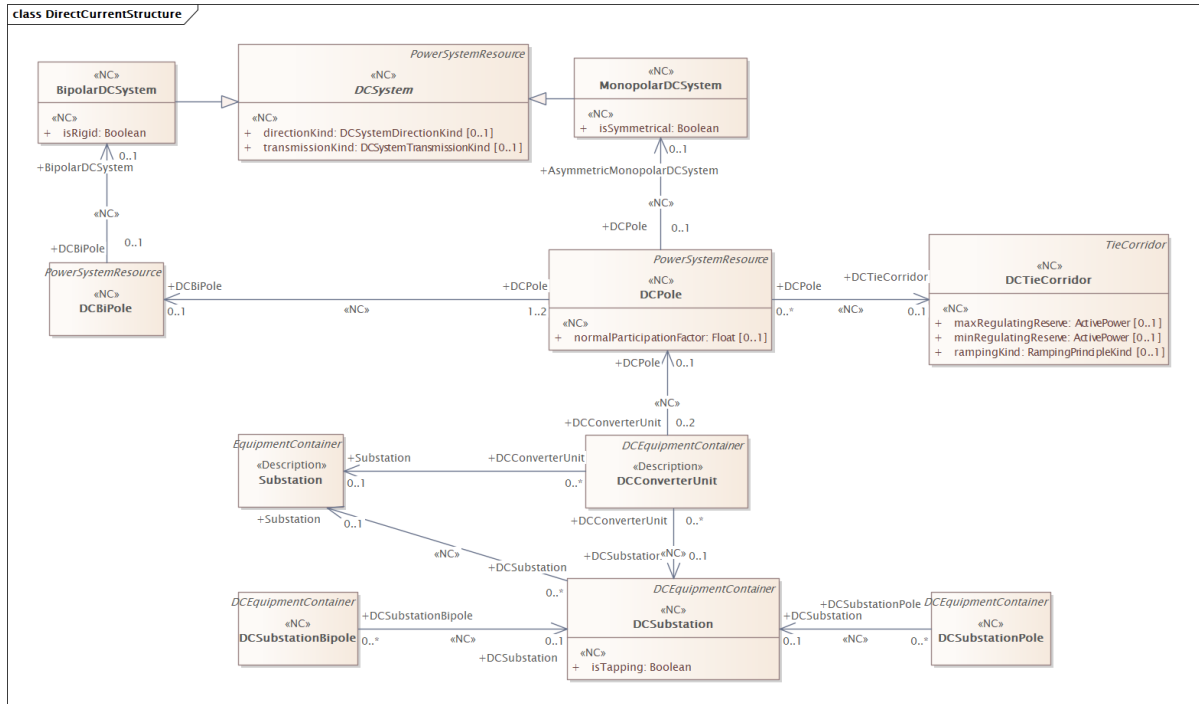
Figure 3: The diagram contains classes related to direct current control.



1088

1089 **Figure 4 – Class diagram EquipmentReliabilityProfile::DirectCurrentEquipment**

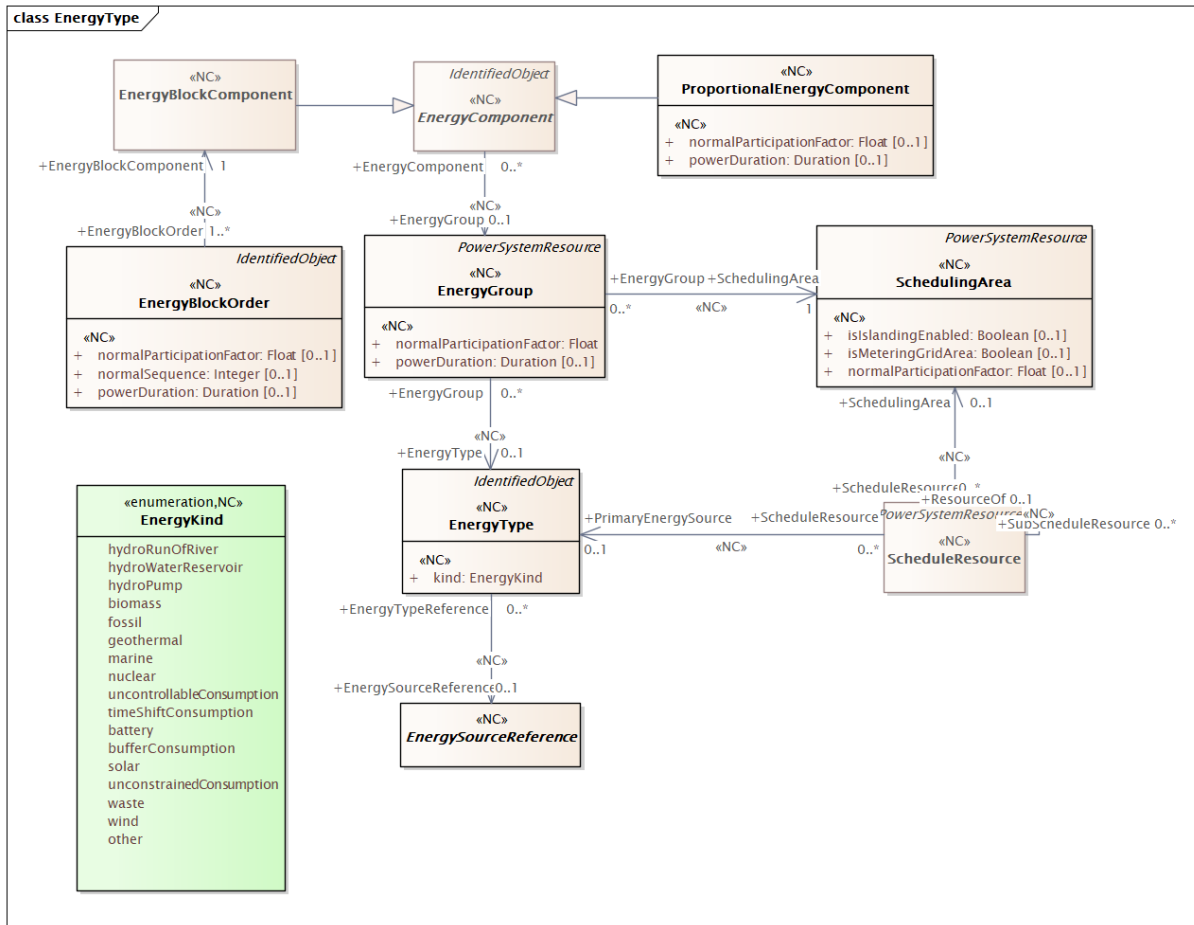
1090 Figure 4: The diagram shows the DC equipment model.



1091

1092 **Figure 5 – Class diagram EquipmentReliabilityProfile::DirectCurrentStructure**

1093 Figure 5: The diagram contains classes related to direct current structure.

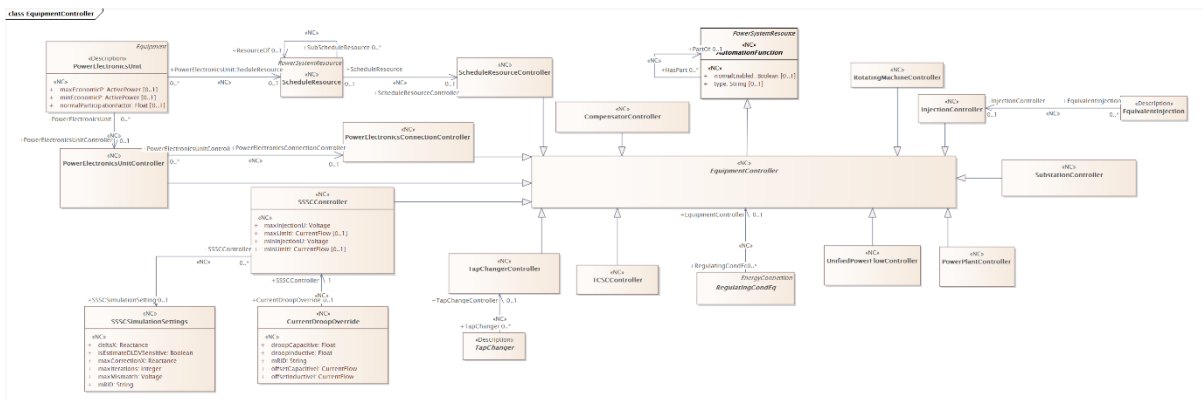


1094

Figure 6 – Class diagram EquipmentReliabilityProfile::EnergyType

1095

1096 Figure 6:

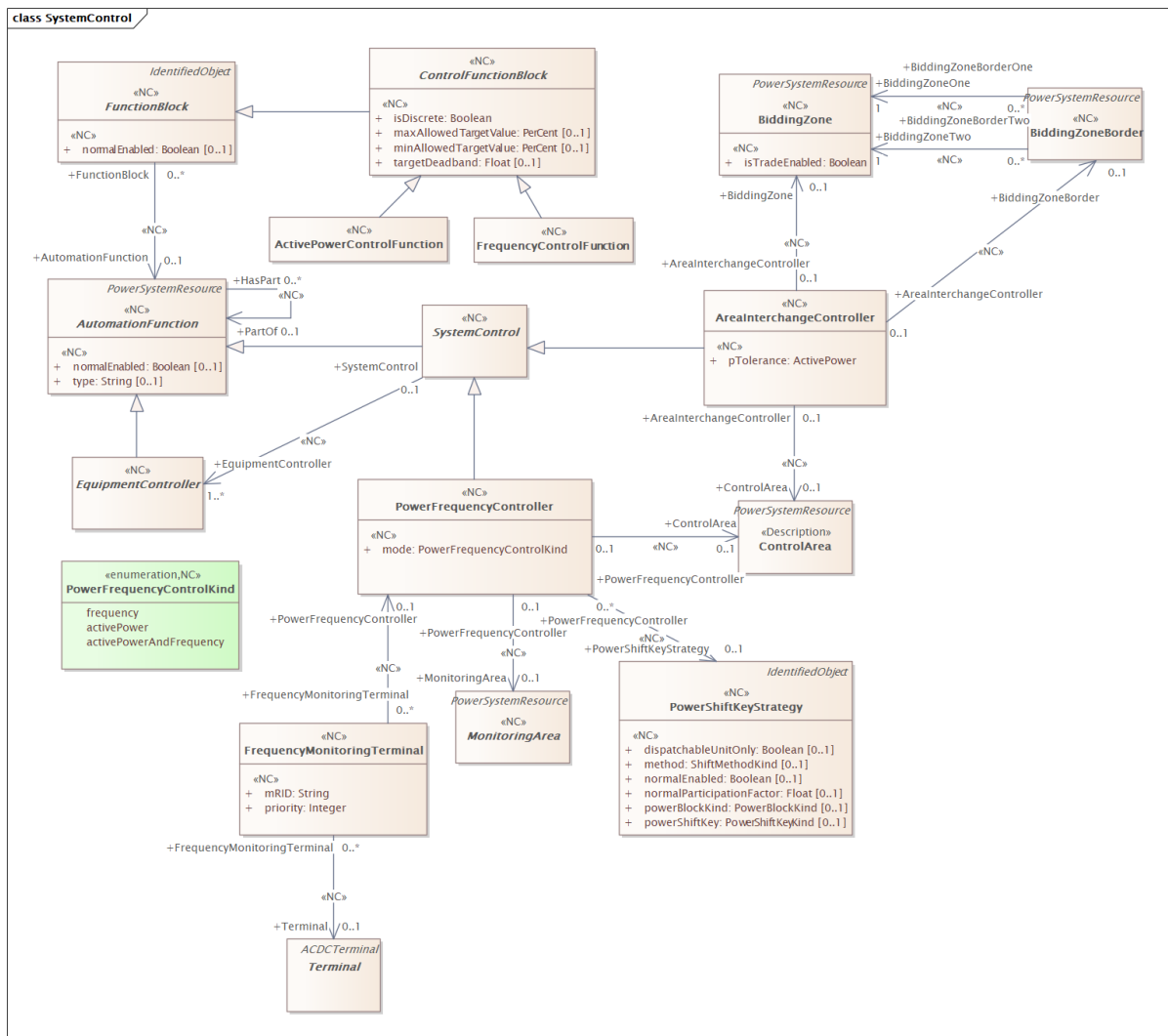


1097

Figure 7 – Class diagram EquipmentReliabilityProfile::EquipmentController

1098

1099 Figure 7: The diagram shows equipment controller related classes.



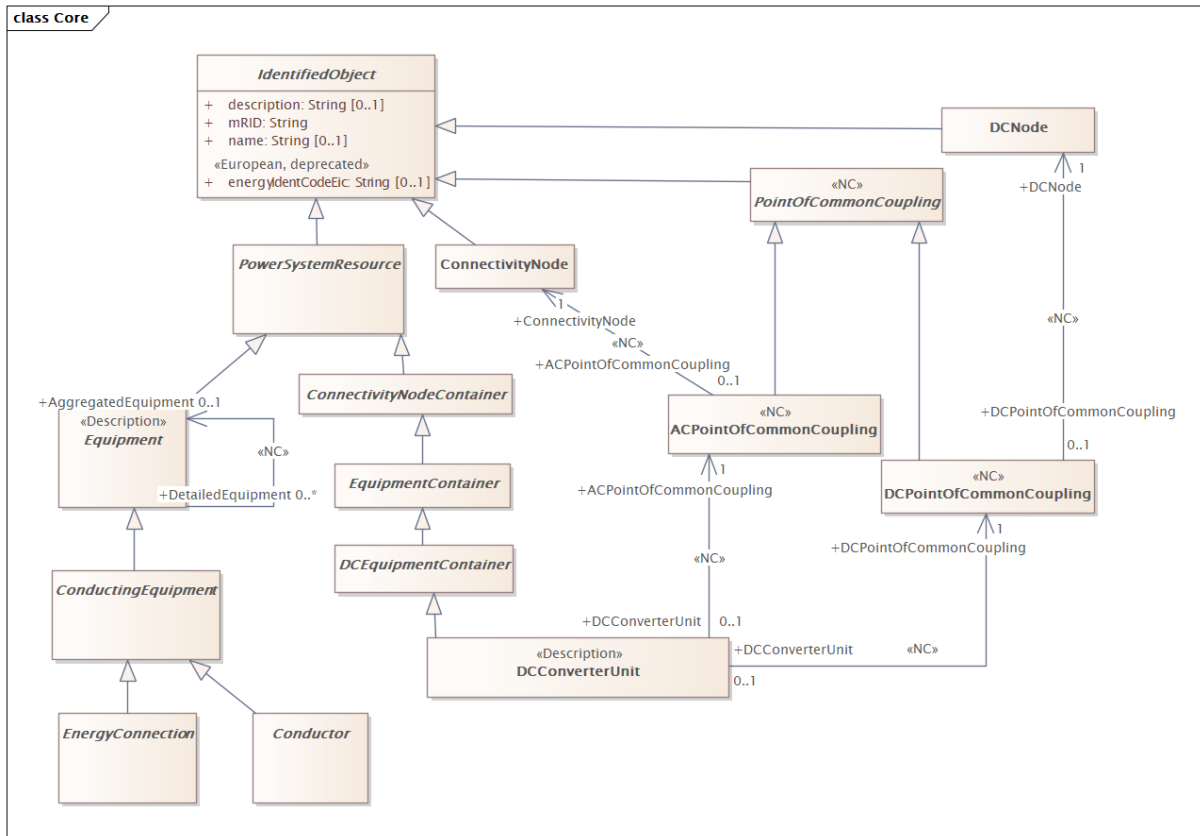
1100

1101

Figure 8 – Class diagram EquipmentReliabilityProfile::SystemControl

1102

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



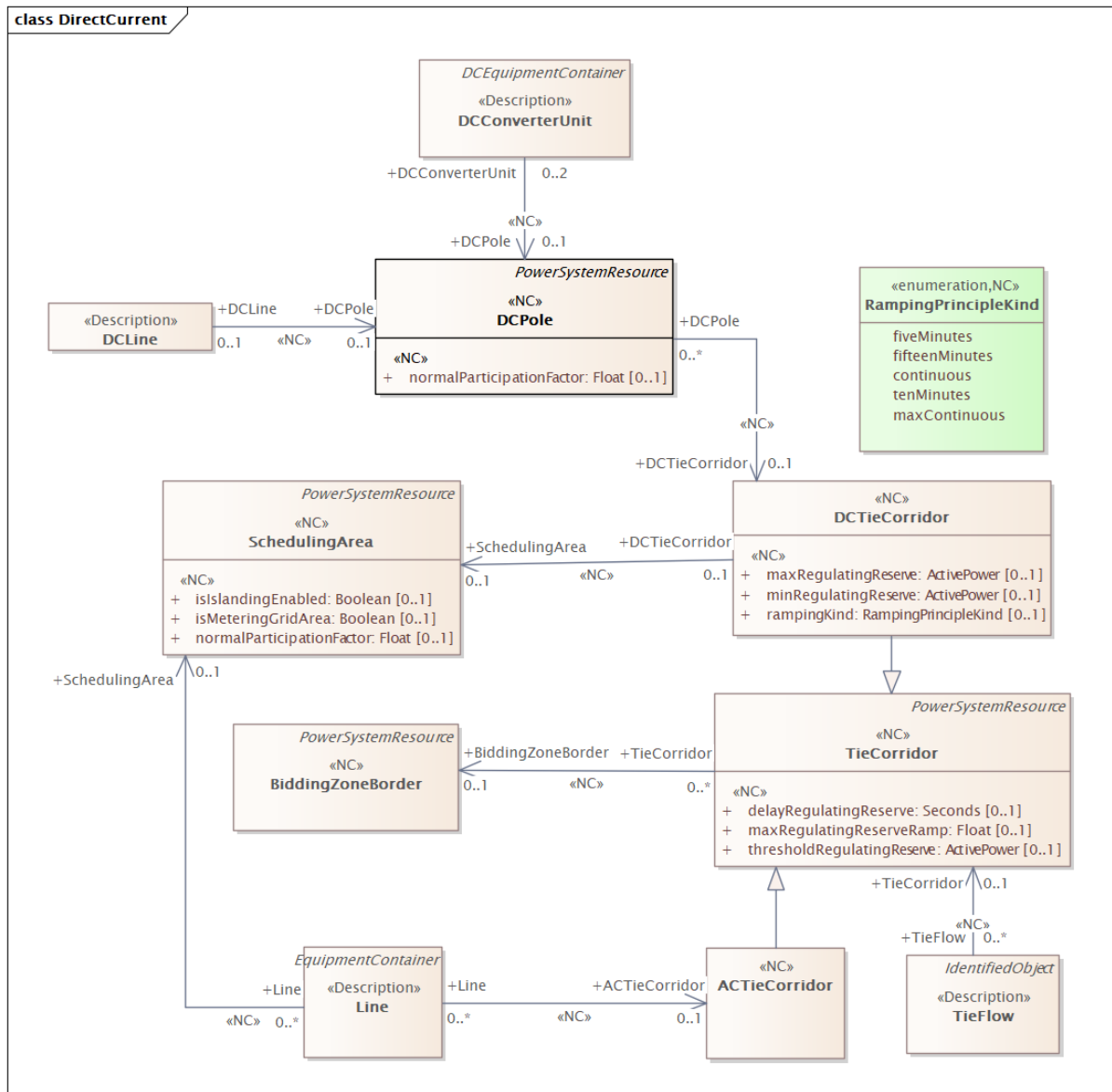
1103

1104

Figure 9 – Class diagram EquipmentReliabilityProfile::Core

1105

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



1106

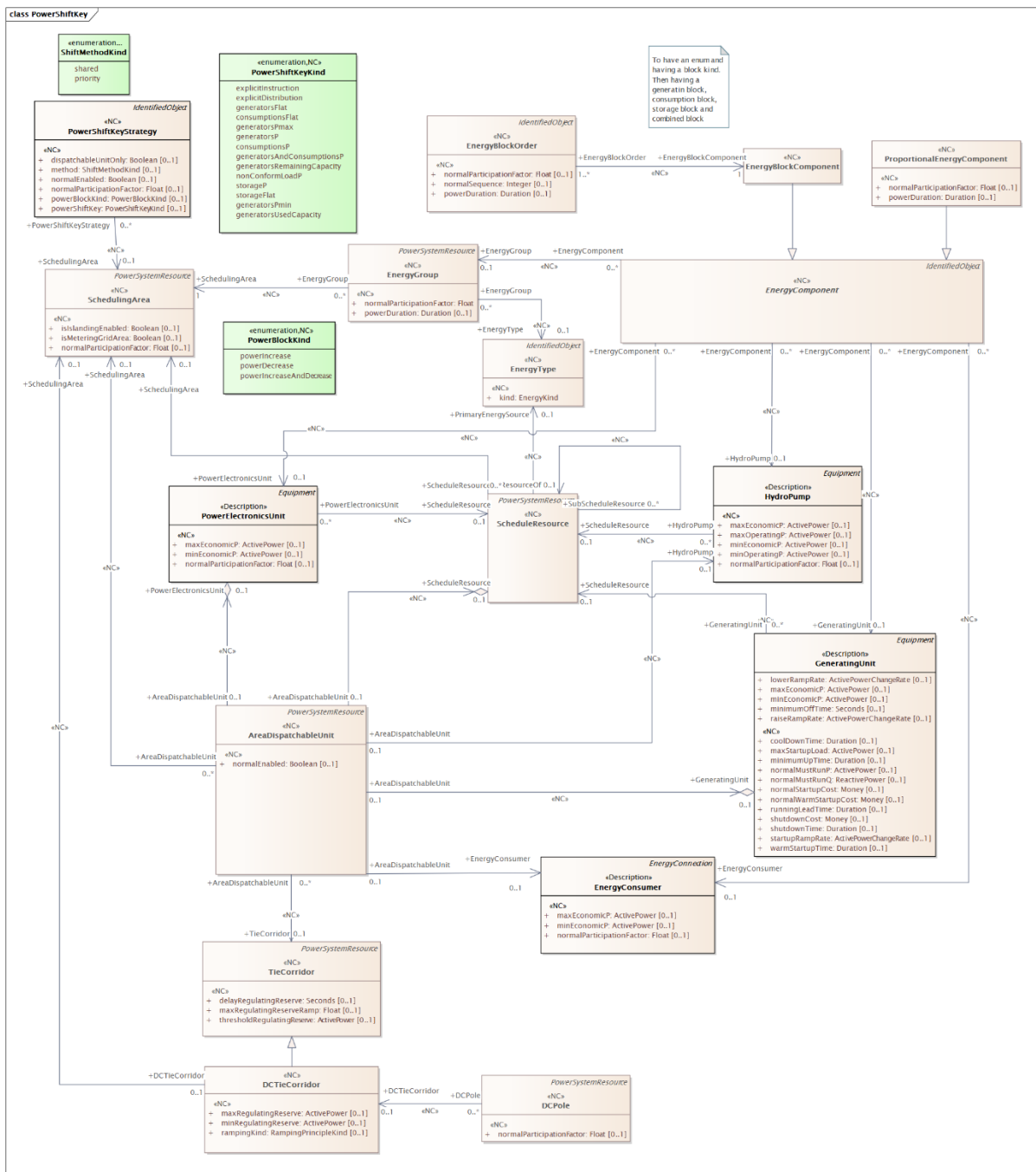
1107

Figure 10 – Class diagram EquipmentReliabilityProfile::DirectCurrent

1108

Figure 10: The diagram shows direct current related classes.

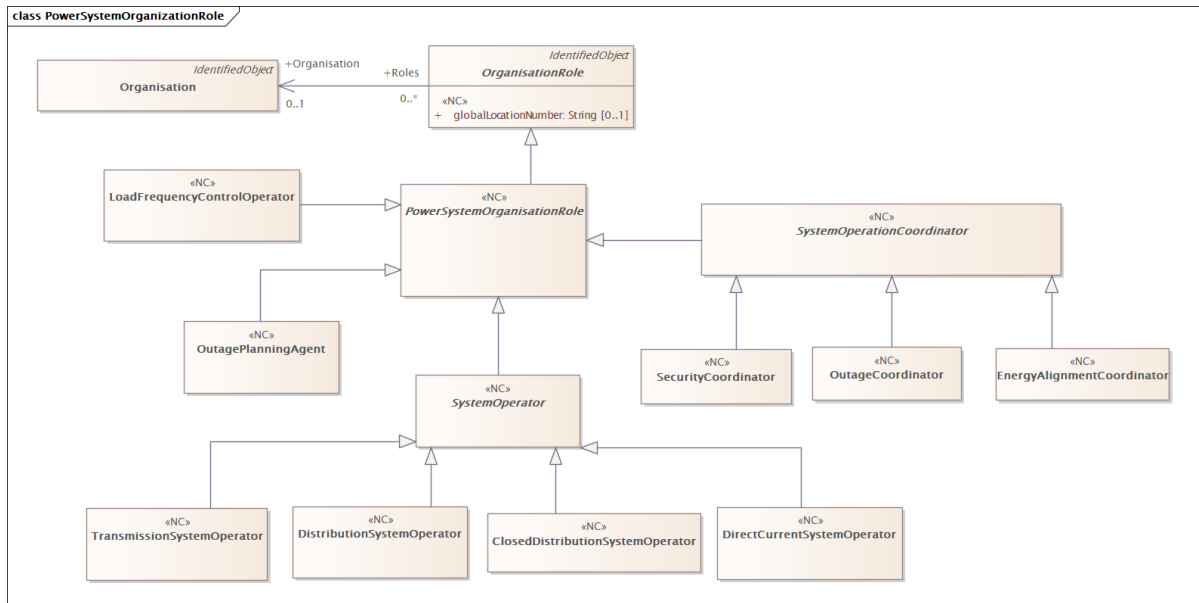
1114 Figure 12: The diagram shows Controllers and FACTS related classes.



1115

1116 Figure 13 – Class diagram EquipmentReliabilityProfile::PowerShiftKey

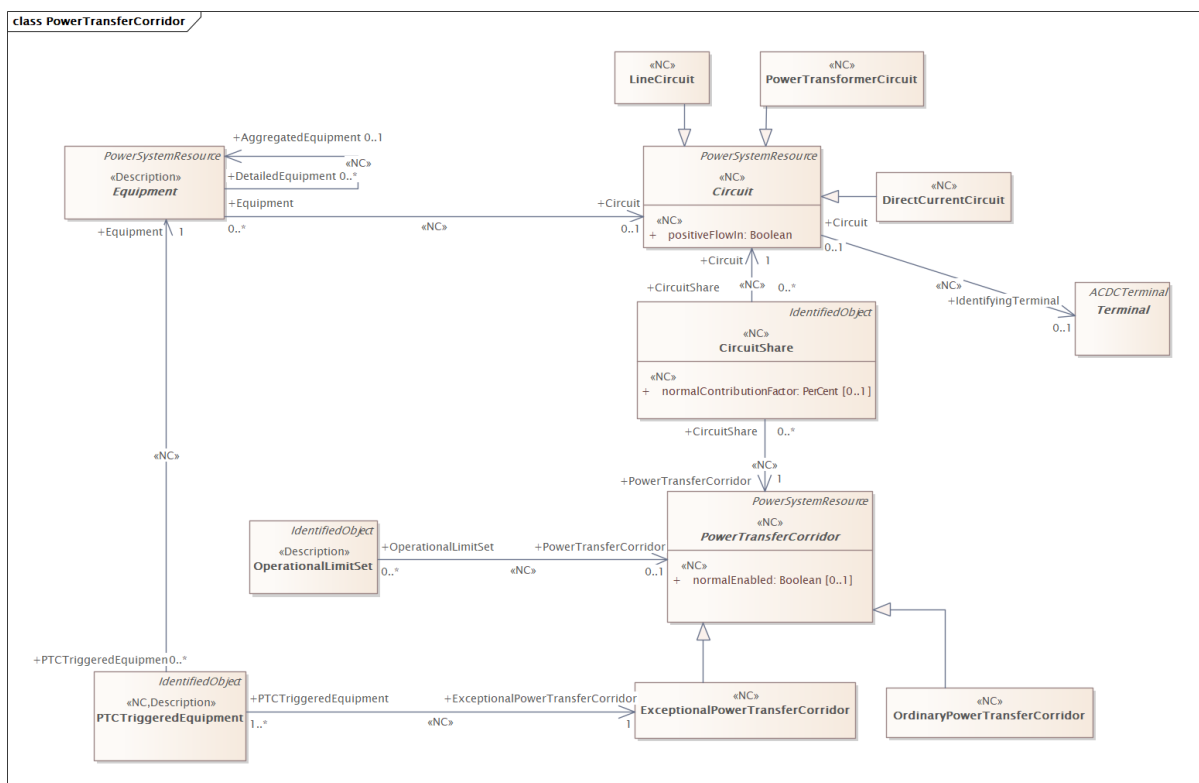
1117 Figure 13: The diagram shows generation and load shift keys related classes.



1118

1119 **Figure 14 – Class diagram EquipmentReliabilityProfile::PowerSystemOrganizationRole**

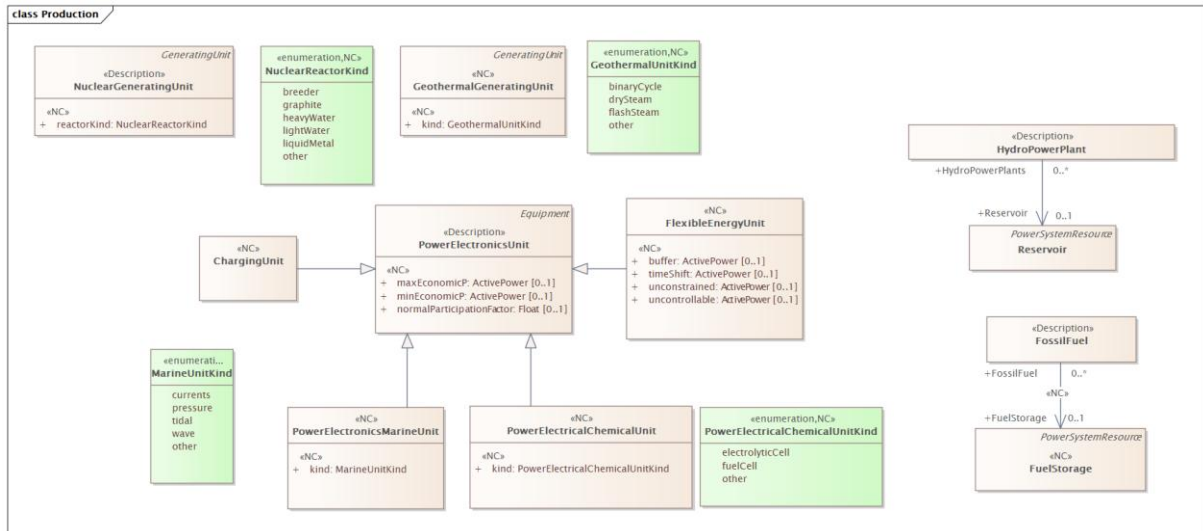
1120 Figure 14: The diagram shows power system organisation role related classes.



1121

1122 **Figure 15 – Class diagram EquipmentReliabilityProfile::PowerTransferCorridor**

1123 Figure 15: The diagram shows power transfer corridor related classes.



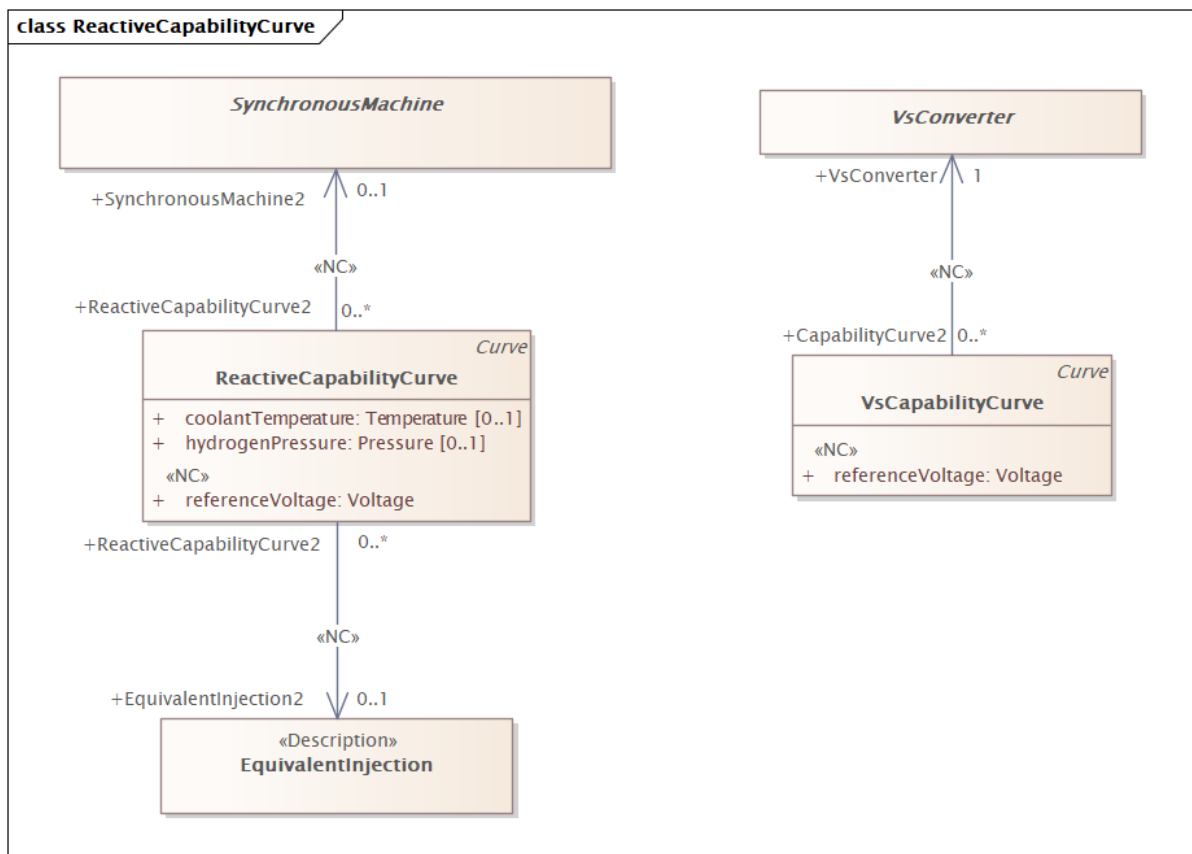
1124

1125

Figure 16 – Class diagram EquipmentReliabilityProfile::Production

1126

Figure 16: The diagram shows production related classes.



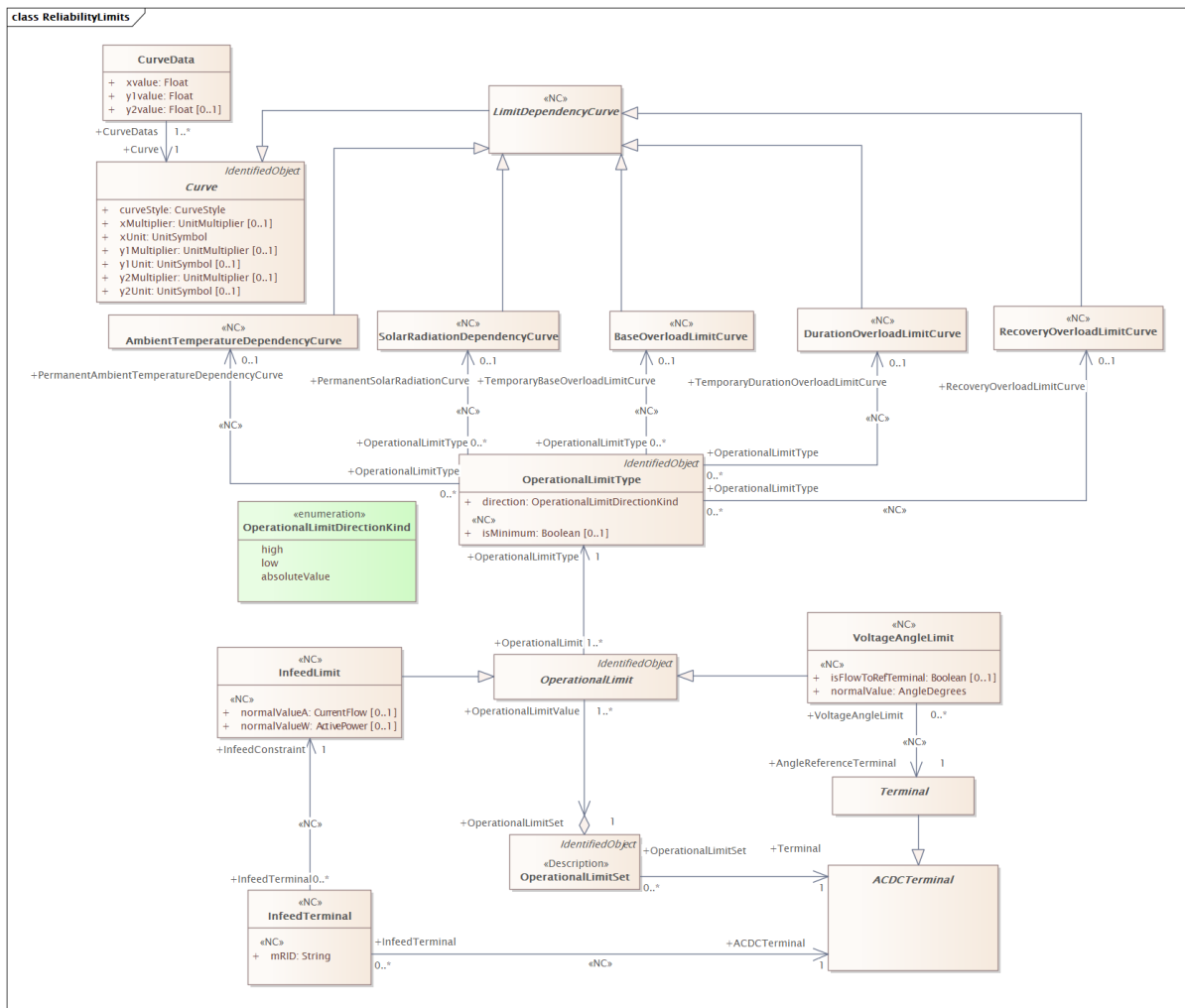
1127

1128

Figure 17 – Class diagram EquipmentReliabilityProfile::ReactiveCapabilityCurve

1129

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



1130
1131 **Figure 18 – Class diagram EquipmentReliabilityProfile::ReliabilityLimits**

1132 Figure 18: The diagram contains main classes related to the reliability limits.

1133 **3.2 (NC) OrdinaryPowerTransferCorridor**

1134 Inheritance path = [PowerTransferCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1135 Power transfer corridor defined for normal operating network.

1136 Table 1 shows all attributes of OrdinaryPowerTransferCorridor.

1137 **Table 1 – 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

1138
1139 **3.3 Organisation**

1140 Inheritance path = [IdentifiedObject](#)

1141 Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.
1142 Table 2 shows all attributes of Organisation.

1143 **Table 2 – 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

1144

1145 3.4 (abstract) OrganisationRole

1146 Inheritance path = [IdentifiedObject](#)

1147 Identifies a way in which an organisation may participate in the utility enterprise (e.g., customer,
1148 manufacturer, etc).

1149 Table 3 shows all attributes of OrganisationRole.

1150 **Table 3 – 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

1151

1152 Table 4 shows all association ends of OrganisationRole with other classes.

1153 **Table 4 – Association ends of EquipmentReliabilityProfile::OrganisationRole with other**
1154 **classes**

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

1155

1156 3.5 (NC) OutageCoordinationRegion

1157 Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1158 A region that has a common organisation or service responsible for outage planning and
1159 coordination and its impact on grid operation.

1160 Table 5 shows all attributes of OutageCoordinationRegion.

1161 **Table 5 – 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

1162

1163 Table 6 shows all association ends of OutageCoordinationRegion with other classes.

1164 **Table 6 – Association ends of EquipmentReliabilityProfile::OutageCoordinationRegion**
1165 **with other classes**

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.
0..*	OverlappingZone	0..1	OverlappingZone	(NC) inherited from: Region

1166

1167 **3.6 (NC) OutageCoordinator**1168 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
1169 [OrganisationRole](#) : [IdentifiedObject](#)1170 A role that coordinates the planned availability status of relevant power system equipment to
1171 meet the need by the asset owner or operator and the security of the power system.

1172 Table 7 shows all attributes of OutageCoordinator.

1173 **Table 7 – 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

1174

1175 Table 8 shows all association ends of OutageCoordinator with other classes.

1176 **Table 8 – Association ends of EquipmentReliabilityProfile::OutageCoordinator with**
1177 **other classes**

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

1178

1179 **3.7 (NC) OutagePlanningAgent**1180 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)1181 An entity with the task of planning the availability status of a relevant power generating module,
1182 a relevant demand facility or a relevant grid element.

1183 Table 9 shows all attributes of OutagePlanningAgent.

1184 **Table 9 – 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

1185

1186 Table 10 shows all association ends of OutagePlanningAgent with other classes.

1187 **Table 10 – Association ends of EquipmentReliabilityProfile::OutagePlanningAgent with**
1188 **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

1189

1190 3.8 (NC) PinTerminal

1191 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

1192 Input pin associated with a Terminal. It is used for comparison.

1193 Table 11 shows all attributes of PinTerminal.

1194 **Table 11 – 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

1195

1196 Table 12 shows all association ends of PinTerminal with other classes.

1197 **Table 12 – Association ends of EquipmentReliabilityProfile::PinTerminal with other**
1198 **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

1199

1200 3.9 (NC) PowerElectricalChemicalUnit

1201 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1202 [IdentifiedObject](#)

1203 A unit capable of either generating electrical energy from chemical reactions or using electrical
1204 energy to cause chemical reactions.

1205 Table 13 shows all attributes of PowerElectricalChemicalUnit.

1206 **Table 13 – 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

1207

1208 Table 14 shows all association ends of PowerElectricalChemicalUnit with other classes.

1209 **Table 14 – Association ends of**
1210 **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

1211

1212 3.10 (NC) PowerElectronicsMarineUnit

1213 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1214 [IdentifiedObject](#)

1215 A unit that capture energy from marine sources, e.g. waves, for generating electrical power.

1216 Table 15 shows all attributes of PowerElectronicsMarineUnit.

1217 **Table 15 – 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

1218

1219 Table 16 shows all association ends of PowerElectronicsMarineUnit with other classes.

1220

1221 **Table 16 – 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

1222

1223 **3.11 (Description) PowerElectronicsUnit**1224 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1225 A generating unit or battery or aggregation that connects to the AC network using power electronics rather than rotating machines.

1226 Table 17 shows all attributes of PowerElectronicsUnit.

1228 **Table 17 – 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.

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

1229

1230 Table 18 shows all association ends of PowerElectronicsUnit with other classes.

1231 **Table 18 – Association ends of EquipmentReliabilityProfile::PowerElectronicsUnit with**
1232 **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.
0..*	Circuit	0..1	Circuit	(NC) inherited from: Equipment
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1233

1234 3.12 (NC) PowerFactorControlFunction

1235 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

1236 Power factor control function is a function block that calculates the operating point of the
1237 controlled equipment to achieve the target power factor.

1238 Table 19 shows all attributes of PowerFactorControlFunction.

1239 **Table 19 – 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

1240

1241 Table 20 shows all association ends of PowerFactorControlFunction with other classes.

1242 **Table 20 – Association ends of**
1243 **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

1244

1245 **3.13 (abstract,NC) PowerSystemOrganisationRole**1246 Inheritance path = [OrganisationRole](#) : [IdentifiedObject](#)

1247 A role that is responsible for the functional operational of a power system resource.

1248 Table 21 shows all attributes of PowerSystemOrganisationRole.

1249 **Table 21 – 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

1250

1251 Table 22 shows all association ends of PowerSystemOrganisationRole with other classes.

1252 **Table 22 – Association ends of**
1253 **EquipmentReliabilityProfile::PowerSystemOrganisationRole with other classes**

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

1254

1255 **3.14 (abstract) PowerSystemResource**1256 Inheritance path = [IdentifiedObject](#)

1257 A power system resource (PSR) can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.

1261 Table 23 shows all attributes of PowerSystemResource.

1262 **Table 23 – 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

1263

1264 **3.15 (abstract,NC) PowerTransferCorridor**1265 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1266 A power transfer corridor is defined as a set of circuits (transmission lines or transformers) separating two portions of the power system, or a subset of circuits exposed to a substantial portion of the transmission exchange between two parts of the system.

1269 Table 24 shows all attributes of PowerTransferCorridor.

1270 **Table 24 – 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

name	mult	type	description
			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

1271

1272 **3.16 (NC) PowerTransformerCircuit**1273 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1274 A power transformer circuit is a circuit that has at least one PowerTransformer and may or may not include related switching and/or auxiliary equipment.

1275 Table 25 shows all attributes of PowerTransformerCircuit.

1277 **Table 25 – 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

1278

1279 Table 26 shows all association ends of PowerTransformerCircuit with other classes.

1280 **Table 26 – Association ends of EquipmentReliabilityProfile::PowerTransformerCircuit with other classes**

1281

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

1282

1283 **3.17 (abstract,NC) PropertyReference root class**

1284 The reference to a class and one of its properties.

1285 **3.18 (NC) ProportionalEnergyComponent**1286 Inheritance path = [EnergyComponent](#) : [IdentifiedObject](#)

1287 Serves for grouping components within an energy group, with proportional energy allocation to all components.

1288 Table 27 shows all attributes of ProportionalEnergyComponent.

1290 **Table 27 – 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

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

1291
1292 Table 28 shows all association ends of ProportionalEnergyComponent with other classes.

1293 **Table 28 – Association ends of**
1294 **EquipmentReliabilityProfile::ProportionalEnergyComponent 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..*	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

1295
1296 **3.19 (NC,Description) PTCTriggeredEquipment**

1297 Inheritance path = [IdentifiedObject](#)
1298 Power Transfer Corridor triggered equipment connects the equipment that will create the
1299 exceptional power transfer corridor when taking out of service. e.g. A system with three lines
1300 gets an exceptional power transfer corridor when one of the lines is taken out of service.
1301 Table 29 shows all attributes of PTCTriggeredEquipment.

1302 **Table 29 – 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

1303
1304 Table 30 shows all association ends of PTCTriggeredEquipment with other classes.

1305 **Table 30 – Association ends of EquipmentReliabilityProfile::PTCTriggeredEquipment**
1306 **with other classes**

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

1307
1308 **3.20 (NC) ReactivePowerControlFunction**

1309 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)
1310 Reactive power control function is a function block that calculate the operating point of the
1311 controlled equipment to achieve the target reactive power.
1312 Table 31 shows all attributes of ReactivePowerControlFunction.

1313 **Table 31 – 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

1314

1315 Table 32 shows all association ends of ReactivePowerControlFunction with other classes.

1316

1317 **Table 32 – Association ends of 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

1318

1319 **3.21 (NC) RecoveryOverloadLimitCurve**1320 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1321 The relation between the recovery time and an overload limit.

1322 Table 33 shows all attributes of RecoveryOverloadLimitCurve.

1323 **Table 33 – 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
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

1324

1325 **3.22 (abstract,NC) Region**1326 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1327 A region where the system operator belongs to.

1328 Table 34 shows all attributes of Region.

1329 **Table 34 – 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

1330

1331 Table 35 shows all association ends of Region with other classes.

1332 **Table 35 – 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.

1333

1334 3.23 (abstract) RegulatingCondEq

1335 Inheritance path = [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) :
1336 [PowerSystemResource](#) : [IdentifiedObject](#)

1337 A type of conducting equipment that can regulate a quantity (i.e. voltage or flow) at a specific
1338 point in the network.

1339 Table 36 shows all attributes of RegulatingCondEq.

1340 **Table 36 – 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

1341

1342 Table 37 shows all association ends of RegulatingCondEq with other classes.

1343 **Table 37 – Association ends of EquipmentReliabilityProfile::RegulatingCondEq with
1344 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

1345

1346 3.24 (NC) ScheduleResource

1347 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1348 A schedule resource is a market-based method for handling participation of small units,
1349 particularly located on the lower voltage level that is controlled by a Distributed System
1350 Operator (DSO). It is a collection of units that can operate in the market by providing bids, offers
1351 and a resulting committed operational schedule for the collection.

1352 Table 38 shows all attributes of ScheduleResource.

1353 **Table 38 – 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

1354

1355 Table 39 shows all association ends of ScheduleResource with other classes.

1356 **Table 39 – Association ends of EquipmentReliabilityProfile::ScheduleResource with**
1357 **other classes**

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

1358

1359 3.25 (NC) SchedulingArea

1360 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1361 An area where production and/or consumption of energy can be forecasted, scheduled and
1362 measured. The area is operated by only one system operator, typically a Transmission System
1363 Operator (TSO). The area can consist of a sub area, which has the same definition as the main
1364 area, but it can be operated by another system operator (typically Distributed System Operator
1365 (DSO) or a Closed Distributed System Operator (CDSO)). This includes microgrid concept. A
1366 substation is the smallest grouping that can be included in the area. The area size should be
1367 considered in terms of the possibility of accumulated reading (settlement metering) and the
1368 capability of operating as an island.

1369 Table 40 shows all attributes of SchedulingArea.

1370 **Table 40 – 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.

name	mult	type	description
			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

1371

1372

Table 41 shows all association ends of SchedulingArea with other classes.

1373

Table 41 – Association ends of EquipmentReliabilityProfile::SchedulingArea with other classes

1374

mult from	name	mult to	type	description
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..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) The load frequency control area which has this scheduling area.
0..*	EnergyCoordinationRegion	0..1	EnergyCoordinationRegion	(NC) The energy coordination region that has this scheduling area.
1..*	ControlArea	0..1	ControlArea	(NC) The control area for this scheduling area.
1..*	BiddingZone	1..1	BiddingZone	(NC) The bidding zone related to this scheduling area.

1375

1376

3.26 (abstract) ACDCTerminal root class

1377

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

1378

1379

3.27 (NC) ActivePowerControlFunction

1380

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

1381

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

1382

1383

Table 42 shows all attributes of ActivePowerControlFunction.

1384

Table 42 – 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

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

1385

1386

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

1387

1388

**Table 43 – 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

1389

1390

3.28 (NC) AmbientTemperatureDependencyCurve

1391

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

1392

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

1393

1394

Table 44 shows all attributes of AmbientTemperatureDependencyCurve.

1395

1396

**Table 44 – 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
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

1397

1398

3.29 (NC) AreaDispatchableUnit

1399

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

1400

Allocates a given producing or consuming unit, including direct current corridor and collection of units, to a given control area (through the scheduling area) for supporting the control of the given area through dispatch instruction.

1401

1402

1403

Table 45 shows all attributes of AreaDispatchableUnit.

1404

Table 45 – 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,

name	mult	type	description
			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

1405
1406

Table 46 shows all association ends of AreaDispatchableUnit with other classes.

1407
1408

Table 46 – Association ends of EquipmentReliabilityProfile::AreaDispatchableUnit with 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	EnergyConsumer	0..1	EnergyConsumer	Energy consumer for this area dispatchable unit.
0..1	HydroPump	0..1	HydroPump	(NC) Hydro Pump which is associated with the area dispatchable unit.
0..*	TieCorridor	0..1	TieCorridor	(NC) Tie Corridor which belongs to the Area Dispatchable Unit.

1409

1410 3.30 (abstract,NC) AutomationFunction

1411 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1412 Automation function is a collection of functional block or other automation function that can be
1413 executed as a work cycle program as part of an automated system.

1414 Table 47 shows all attributes of AutomationFunction.

1415 **Table 47 – 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

1416
1417

Table 48 shows all association ends of AutomationFunction with other classes.

1418 **Table 48 – Association ends of EquipmentReliabilityProfile::AutomationFunction with**
1419 **other classes**

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

1420

1421 3.31 (NC) BaseOverloadLimitCurve

1422 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1423 A curve or functional relationship between

1424 - the relative loading - current loading over permanent loading (PATL) independent variable (X-axis), and

1425 - temporary overloading (TATL) limiting dependent (Y-axis) variables.

1427 Table 49 shows all attributes of BaseOverloadLimitCurve.

1428 **Table 49 – 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

1429

1430 3.32 (NC) BiddingZone

1431 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1432 A bidding zone is a market-based method for handling power transmission congestion. It consists of scheduling areas that include the relevant production (supply) and consumption (demand) to form an electrical area with the same market price without capacity allocation.

1435 Table 50 shows all attributes of BiddingZone.

1436 **Table 50 – 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

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

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Table 51 shows all association ends of BiddingZone with other classes.

Table 51 – Association ends of EquipmentReliabilityProfile::BiddingZone with other 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.

1441
1442
1443
1444
1445
1446

3.33 (NC) BiddingZoneBorder

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

Defines the aggregated connection capacity between two Bidding Zones.

Table 52 shows all attributes of BiddingZoneBorder.

Table 52 – 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

1447
1448
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1450

Table 53 shows all association ends of BiddingZoneBorder with other classes.

Table 53 – Association ends of EquipmentReliabilityProfile::BiddingZoneBorder with other classes

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

1451
1452
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1456

3.34 (NC) CapacityCalculationRegion

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

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

Table 54 shows all attributes of CapacityCalculationRegion.

1457 **Table 54 – 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

1458

1459 Table 55 shows all association ends of CapacityCalculationRegion with other classes.

1460 **Table 55 – Association ends of EquipmentReliabilityProfile::CapacityCalculationRegion**
1461 **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

1462

1463 **3.35 (NC) ChargingUnit**1464 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1465 [IdentifiedObject](#)1466 A unit that supplies electrical power for charging electrical non-stationary entities, e.g. electrical
1467 vehicle, trucks, buses, ferries, boats and airplanes. The characteristic is that the energy
1468 consumption is highly schedule dependent.

1469 Table 56 shows all attributes of ChargingUnit.

1470 **Table 56 – Attributes of EquipmentReliabilityProfile::ChargingUnit**

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
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

1471

1472 Table 57 shows all association ends of ChargingUnit with other classes.

1473 **Table 57 – Association ends of EquipmentReliabilityProfile::ChargingUnit with other**
1474 **classes**

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

mult from	name	mult to	type	description
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

1475

1476 **3.36 (abstract,NC) Circuit**1477 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1478 A circuit is a collection of equipment in a network graph that provide common stability limits.

1479 The relevant equipment is in general given by the identifying terminal. A software application

1480 that can do topology processing shall calculate the equipment belonging to the circuit, if there

1481 are no stability limits associated to it. In case of stability limits, the containment reflects the

1482 equipments that were used in the calculation/analysis.

1483 Table 58 shows all attributes of Circuit.

1484

Table 58 – 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

1485

1486 Table 59 shows all association ends of Circuit with other classes.

1487 **Table 59 – 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.

1488

1489 **3.37 (NC) CircuitShare**1490 Inheritance path = [IdentifiedObject](#)

1491 Defines the share of the circuit which is part of an associated power transfer corridor.

1492 Table 60 shows all attributes of CircuitShare.

1493

Table 60 – 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

1494

1495 Table 61 shows all association ends of CircuitShare with other classes.

1496

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

1497

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.

1498

3.38 (NC) ClosedDistributionSystemOperator

1500 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) :
1501 [IdentifiedObject](#)

1502 A system operator which distributes electricity (or gas) within a geographically confined
1503 industrial, commercial or shared services and does not supply household customers.

1504 Table 62 shows all attributes of ClosedDistributionSystemOperator.

Table 62 – 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

1506

1507 Table 63 shows all association ends of ClosedDistributionSystemOperator with other classes.

1508

Table 63 – Association ends of EquipmentReliabilityProfile::ClosedDistributionSystemOperator with other classes

1509

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

1510

3.39 (NC) CompensatorController

1512 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
1513 [IdentifiedObject](#)

1514 Compensator controller is controlling the equipment to optimize the use of the compensators.

1515 Table 64 shows all attributes of CompensatorController.

Table 64 – 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

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

1517

1518

Table 65 shows all association ends of CompensatorController with other classes.

1519

Table 65 – Association ends of EquipmentReliabilityProfile::CompensatorController with other classes

1520

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

1521

1522

3.40 (abstract) ConductingEquipment

1523

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

1524

The parts of the AC power system that are designed to carry current or that are conductively connected through terminals.

1525

1526

Table 66 shows all attributes of ConductingEquipment.

1527

Table 66 – 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

1528

1529

Table 67 shows all association ends of ConductingEquipment with other classes.

1530

Table 67 – Association ends of EquipmentReliabilityProfile::ConductingEquipment with other classes

1531

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

1532

1533

3.41 (abstract) ConnectivityNodeContainer

1534

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

1535

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

1536

Table 68 shows all attributes of ConnectivityNodeContainer.

1537

Table 68 – 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

1538

1539 **3.42 (Description) ControlArea**

1540 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1541 A control area is a grouping of generating units and/or loads and a cutset of tie lines (as
1542 terminals) which may be used for a variety of purposes including automatic generation control,
1543 power flow solution area interchange control specification, and input to load forecasting. All
1544 generation and load within the area defined by the terminals on the border are considered in
1545 the area interchange control. Note that any number of overlapping control area specifications
1546 can be superimposed on the physical model. The following general principles apply to
1547 ControlArea:

- 1548 1. The control area orientation for net interchange is positive for an import, negative for an
1549 export.
- 1550 2. The control area net interchange is determined by summing flows in Terminals. The
1551 Terminals are identified by creating a set of TieFlow objects associated with a ControlArea
1552 object. Each TieFlow object identifies one Terminal.
- 1553 3. In a single network model, a tie between two control areas must be modelled in both control
1554 area specifications, such that the two representations of the tie flow sum to zero.
- 1555 4. The normal orientation of Terminal flow is positive for flow into the conducting equipment
1556 that owns the Terminal. (i.e. flow from a bus into a device is positive.) However, the orientation
1557 of each flow in the control area specification must align with the control area convention, i.e.
1558 import is positive. If the orientation of the Terminal flow referenced by a TieFlow is positive into
1559 the control area, then this is confirmed by setting TieFlow.positiveFlowIn flag TRUE. If not, the
1560 orientation must be reversed by setting the TieFlow.positiveFlowIn flag FALSE.

1561 Table 69 shows all attributes of ControlArea.

1562 **Table 69 – Attributes of EquipmentReliabilityProfile::ControlArea**

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

1563
1564 Table 70 shows all association ends of ControlArea with other classes.

1565 **Table 70 – Association ends of EquipmentReliabilityProfile::ControlArea with other**
1566 **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.

1567
1568 **3.43 (abstract,NC) ControlFunctionBlock**

1569 Inheritance path = [FunctionBlock](#) : [IdentifiedObject](#)

1570 Control function block is a function block that contains an algorithm for controlling the
1571 equipment.

1572 Table 71 shows all attributes of ControlFunctionBlock.

1573

Table 71 – 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

1574

1575

Table 72 shows all association ends of ControlFunctionBlock with other classes.

1576

1577

Table 72 – Association ends of EquipmentReliabilityProfile::ControlFunctionBlock 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

1578

3.44 (abstract) CurveInheritance path = [IdentifiedObject](#)

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

Table 73 shows all attributes of Curve.

1584

Table 73 – 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.

name	mult	type	description
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

1585

1586 **3.45 CurveData root class**

1587 Multi-purpose data points for defining a curve. The use of this generic class is discouraged if
1588 a more specific class can be used to specify the X and Y axis values along with their specific
1589 data types.

1590 Table 74 shows all attributes of CurveData.

1591 **Table 74 – 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.

1592

1593 Table 75 shows all association ends of CurveData with other classes.

1594 **Table 75 – Association ends of EquipmentReliabilityProfile::CurveData with other**
1595 **classes**

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

1596

1597 **3.46 (Description) DCConverterUnit**

1598 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
1599 [PowerSystemResource](#) : [IdentifiedObject](#)

1600 Indivisible operative unit comprising all equipment between the point of common coupling on
1601 the AC side and the point of common coupling – DC side, essentially one or more converters,
1602 together with one or more converter transformers, converter control equipment, essential
1603 protective and switching devices and auxiliaries, if any, used for conversion.

1604 Table 76 shows all attributes of DCConverterUnit.

1605 **Table 76 – 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

1606

1607 Table 77 shows all association ends of DCConverterUnit with other classes.

1608 **Table 77 – Association ends of EquipmentReliabilityProfile::DCConverterUnit with other**
1609 **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.

1610

1611 3.47 (abstract) DCEquipmentContainer

1612 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) :
1613 [IdentifiedObject](#)

1614 A modelling construct to provide a root class for containment of DC as well as AC equipment.
1615 The class differ from the EquipmentContainer for AC in that it may also contain DCNode-s.
1616 Hence it can contain both AC and DC equipment.

1617 Table 78 shows all attributes of DCEquipmentContainer.

1618 **Table 78 – 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

1619

1620 3.48 (Description) DCLine root class

1621 Overhead lines and/or cables connecting two or more HVDC substations.

1622 Table 79 shows all association ends of DCLine with other classes.

1623 **Table 79 – 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.

1624

1625 3.49 (NC) DCPole

1626 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1627 The direct current (DC) system pole (IEC 60633) is part of a DC system consisting of all the
1628 equipment in the DC substations and the interconnecting transmission lines, if any, which during
1629 normal operation exhibit a common direct voltage polarity with respect to earth.

1630 Table 80 shows all attributes of DCPole.

1631

Table 80 – 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

1632

1633

Table 81 shows all association ends of DCPole with other classes.

1634

Table 81 – 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.

1635

1636

3.50 (NC) DCTieCorridor

1637

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

1638

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

1639

Table 82 shows all attributes of DCTieCorridor.

1640

Table 82 – 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

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

1641

1642

Table 83 shows all association ends of DCTieCorridor with other classes.

1643

Table 83 – Association ends of EquipmentReliabilityProfile::DCTieCorridor with other classes

1644

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

1645

1646

3.51 (NC) DirectCurrentMasterController

1647

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

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1659

Direct current system control is a control system which governs the operation of an entire DC system consisting of more than one DC substation and performs those functions of controlling, monitoring and protection which require information from more than one substation. This can also be a multiterminal control which is a DC system control for more than two DC substations or a DC master control, which is a general concept for control coordination of a DC system. The DC master control may be implemented at the bipole and/or pole level as defined in IEC 60633. The DC system control/multiterminal control/master control is part of the hierarchical structure of an HVDC control system that has an integrated AC/DC system control as the highest level of control which governs the integrated operation of AC and DC systems of a power system. This control system is under the responsibility of the system operator.

Table 84 shows all attributes of DirectCurrentMasterController.

1660

Table 84 – 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
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1661

1662

Table 85 shows all association ends of DirectCurrentMasterController with other classes.

1663

Table 85 – Association ends of EquipmentReliabilityProfile::DirectCurrentMasterController with other classes

1664

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

1665

1666 **3.52 (NC) DirectCurrentSystemOperator**

1667 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) :
1668 [IdentifiedObject](#)

1669 System operator of the direct current pole. There are typically one or two system operators that
1670 are operating either the control area at one side or the control areas at both sides of the direct
1671 current pole. In some cases it is operated by an operator from the connected control areas.
1672 Table 86 shows all attributes of DirectCurrentSystemOperator.

1673 **Table 86 – 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

1674

1675 Table 87 shows all association ends of DirectCurrentSystemOperator with other classes.

1676 **Table 87 – Association ends of**
1677 **EquipmentReliabilityProfile::DirectCurrentSystemOperator with other classes**

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

1678

1679 **3.53 (NC) DistributionSystemOperator**

1680 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) :
1681 [IdentifiedObject](#)

1682 A system operator that is responsible for operating of energy distribution network from
1683 transmission level down to low voltage levels including the connection to household.

1684 Table 88 shows all attributes of DistributionSystemOperator.

1685 **Table 88 – 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

1686

1687 Table 89 shows all association ends of DistributionSystemOperator with other classes.

1688 **Table 89 – Association ends of**
1689 **EquipmentReliabilityProfile::DistributionSystemOperator with other classes**

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

1690

1691 **3.54 (NC) DurationOverloadLimitCurve**1692 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1693 A curve or functional relationship between

1694 - the overload duration independent variable (X-axis), and

1695 - temporary overloading (TATL) limiting dependent (Y-axis) variables.

1696 Table 90 shows all attributes of DurationOverloadLimitCurve.

1697 **Table 90 – 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

1698

1699 **3.55 (NC) EnergyAlignmentCoordinator**1700 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
1701 [OrganisationRole](#) : [IdentifiedObject](#)1702 A role that is responsible for alignment of forecast and schedule energy to a given energy
1703 coordination region.

1704 Table 91 shows all attributes of EnergyAlignmentCoordinator.

1705 **Table 91 – 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

1706

1707 Table 92 shows all association ends of EnergyAlignmentCoordinator with other classes.

1708 **Table 92 – Association ends of**
1709 **EquipmentReliabilityProfile::EnergyAlignmentCoordinator with other classes**

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

1710

1711 **3.56 (NC) EnergyBlockComponent**1712 Inheritance path = [EnergyComponent](#) : [IdentifiedObject](#)

1713 Energy block component where the energy group is distributed according to the energy block order of each energy component in an energy group.

1715 Table 93 shows all attributes of EnergyBlockComponent.

1716 **Table 93 – 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

1717

1718 Table 94 shows all association ends of EnergyBlockComponent with other classes.

1719 **Table 94 – Association ends of EquipmentReliabilityProfile::EnergyBlockComponent with other classes**
1720

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..*	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

1721

1722 **3.57 (NC) EnergyBlockOrder**1723 Inheritance path = [IdentifiedObject](#)

1724 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.

1725 Table 95 shows all attributes of EnergyBlockOrder.

1727 **Table 95 – 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

1728

1729 Table 96 shows all association ends of EnergyBlockOrder with other classes.

1730 **Table 96 – Association ends of EquipmentReliabilityProfile::EnergyBlockOrder with**
1731 **other classes**

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

1732

1733 3.58 (abstract,NC) EnergyComponent

1734 Inheritance path = [IdentifiedObject](#)

1735 The energy component for a producer or a consumer that has the same energy characteristic,
1736 e.g. fuel type and technology.

1737 Table 97 shows all attributes of EnergyComponent.

1738 **Table 97 – 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

1739

1740 Table 98 shows all association ends of EnergyComponent with other classes.

1741 **Table 98 – Association ends of EquipmentReliabilityProfile::EnergyComponent with**
1742 **other classes**

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.
0..*	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.

1743

1744 3.59 (abstract) EnergyConnection

1745 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
1746 [IdentifiedObject](#)

1747 A connection of energy generation or consumption on the power system model.

1748 Table 99 shows all attributes of EnergyConnection.

1749 **Table 99 – Attributes of EquipmentReliabilityProfile::EnergyConnection**

name	mult	type	description
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

1750

1751

Table 100 shows all association ends of EnergyConnection with other classes.

1752

Table 100 – Association ends of EquipmentReliabilityProfile::EnergyConnection with other classes

1753

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

1754

1755

3.60 (Description) EnergyConsumer

1756

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

1757

1758

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

1759

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

1760

LoadResponseCharacteristic associated with EnergyConsumer or if

1761

LoadResponseCharacteristic.exponentModel is set to False.

1762

Table 101 shows all attributes of EnergyConsumer.

1763

Table 101 – 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 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

1764

1765

Table 102 shows all association ends of EnergyConsumer with other classes.

1766 **Table 102 – Association ends of EquipmentReliabilityProfile::EnergyConsumer with**
1767 **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

1768

1769 3.61 (NC) EnergyCoordinationRegion

1770 Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1771 A region that has a common organisation or a service that is responsible for alignment of
1772 forecast and scheduling of energy.

1773 Table 103 shows all attributes of EnergyCoordinationRegion.

1774 **Table 103 – 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

1775

1776 Table 104 shows all association ends of EnergyCoordinationRegion with other classes.

1777 **Table 104 – Association ends of**
1778 **EquipmentReliabilityProfile::EnergyCoordinationRegion with other classes**

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

1779

1780 3.62 (NC) EnergyType

1781 Inheritance path = [IdentifiedObject](#)

1782 A source of the energy.

1783 An energy type reference refers to an energy characteristic that is needed for reporting, e.g.
1784 European Energy Certificate System (EECS). The kind of energy should be possible to be linked
1785 with different type of energy forecast, e.g. wind production for a given area based on wind
1786 forecast.

1787 Table 105 shows all attributes of EnergyType.

1788 **Table 105 – 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

1789

1790

Table 106 shows all association ends of EnergyType with other classes.

1791

Table 106 – Association ends of EquipmentReliabilityProfile::EnergyType with other classes

1792

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

1793

1794

3.63 (abstract,Description) Equipment

1795

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

1796

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

1797

Table 107 shows all attributes of Equipment.

1798

Table 107 – 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

1799

1800

Table 108 shows all association ends of Equipment with other classes.

1801

Table 108 – Association ends of EquipmentReliabilityProfile::Equipment with other classes

1802

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.

1803

1804

3.64 (abstract) EquipmentContainer

1805

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

1806

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

1807

Table 109 shows all attributes of EquipmentContainer.

1808

Table 109 – 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

1809

1810

3.65 (abstract,NC) EquipmentController

1811

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

1812 Equipment controller is an automation function that can control one or multiple equipment
1813 function to achieve all the targets inside the given tolerance.
1814 Table 110 shows all attributes of EquipmentController.

1815 **Table 110 – 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

1816
1817 Table 111 shows all association ends of EquipmentController with other classes.

1818 **Table 111 – Association ends of EquipmentReliabilityProfile::EquipmentController with**
1819 **other classes**

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

1820

1821 3.66 (NC) ExceptionalPowerTransferCorridor

1822 Inheritance path = [PowerTransferCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
1823 Potential power transfer corridor that can be triggered by equipment which changes its in
1824 service status or it is operating in an island.
1825 Table 112 shows all attributes of ExceptionalPowerTransferCorridor.

1826 **Table 112 – Attributes of**
1827 **EquipmentReliabilityProfile::ExceptionalPowerTransferCorridor**

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

1828

1829 3.67 (abstract,NC) FACTSEquipment

1830 Inheritance path = [RegulatingCondEq](#) : [EnergyConnection](#) : [ConductingEquipment](#) :
1831 [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
1832 Flexible Alternating Current Transmission System regulating equipment.
1833 Table 113 shows all attributes of FACTSEquipment.

1834 **Table 113 – 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

name	mult	type	description
			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

1835
1836
1837
1838

Table 114 shows all association ends of FACTSEquipment with other classes.

Table 114 – Association ends of EquipmentReliabilityProfile::FACTSEquipment 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

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1845
1846

3.68 Feeder

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

A collection of equipment for organizational purposes, used for grouping distribution resources. The organization a feeder does not necessarily reflect connectivity or current operation state.

Table 115 shows all attributes of Feeder.

Table 115 – Attributes of EquipmentReliabilityProfile::Feeder

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 116 shows all association ends of Feeder with other classes.

1849 **Table 116 – Association ends of EquipmentReliabilityProfile::Feeder with other classes**

mult from	name	mult to	type	description
0..*	NormalEnergizingSubstation	0..1	Substation	The substation that nominally energizes the feeder. Also used for naming purposes.
0..1	NamingSecondarySubstation	0..*	Substation	The secondary substations that are normally energized from the feeder. Used for naming purposes. Should be consistent with the other associations for energizing terminal specification and the feeder energization specification.
0..*	SubSchedulingArea	0..1	SubSchedulingArea	(NC) The subscheduling area that has this feeder.
0..*	NormalEnergizedSubstation	0..*	Substation	The substations that are normally energized by the feeder.

1850

1851 **3.69 (NC) FlexibleEnergyUnit**

1852 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1853 [IdentifiedObject](#)

1854 Flexible consumer or embedded producer of energy. The unit cannot be a net producer.

1855 Table 117 shows all attributes of FlexibleEnergyUnit.

1856 **Table 117 – 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

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

1857

1858

Table 118 shows all association ends of FlexibleEnergyUnit with other classes.

1859

1860

Table 118 – Association ends of EquipmentReliabilityProfile::FlexibleEnergyUnit 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

1861

1862

3.70 (abstract,NC) FunctionBlock

1863

Inheritance path = [IdentifiedObject](#)

1864

Function block is a function described as a set of elementary blocks. The blocks describe the function between input variables and output variables.

1865

1866

Table 119 shows all attributes of FunctionBlock.

1867

Table 119 – 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

1868

1869

Table 120 shows all association ends of FunctionBlock with other classes.

1870

1871

Table 120 – Association ends of EquipmentReliabilityProfile::FunctionBlock with other 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.

1872

1873

3.71 (abstract,NC) FunctionInputVariable

1874

Inheritance path = [IdentifiedObject](#)

1875

Functional input variable defines the domain of the function.

1876

Table 121 shows all attributes of FunctionInputVariable.

1877 **Table 121 – 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

1878

1879 Table 122 shows all association ends of FunctionInputVariable with other classes.

1880 **Table 122 – Association ends of EquipmentReliabilityProfile::FunctionInputVariable**
1881 **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.

1882

1883 **3.72 (NC) FunctionOutputVariable**1884 Inheritance path = [IdentifiedObject](#)

1885 Functional output variable defines the codomain of the function.

1886 Table 123 shows all attributes of FunctionOutputVariable.

1887 **Table 123 – 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

1888

1889 Table 124 shows all association ends of FunctionOutputVariable with other classes.

1890 **Table 124 – Association ends of EquipmentReliabilityProfile::FunctionOutputVariable**
1891 **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.

1892

1893 **3.73 (NC) GateInputPin**1894 Inheritance path = [FunctionInputVariable](#) : [IdentifiedObject](#)

1895 Input pin for a logical gate. The condition described in the input pin gives a logical true or false.

1896 The result from measurement and calculation are converted to a true or false.

1897 Table 125 shows all attributes of GateInputPin.

1898

Table 125 – 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.
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

1899

1900

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

1901

1902

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

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

1903

1904

3.74 (Description) GeneratingUnit

1905

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

1906

1907

1908

1909

1910

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 GeneratingUnit for each member of the set and an additional GeneratingUnit corresponding to the set.

1911

Table 127 shows all attributes of GeneratingUnit.

1912

Table 127 – 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.

name	mult	type	description
shutdownCost	0..1	Money	(NC) The shutdown cost incurred for each shutdown of the GeneratingUnit.
shutdownTime	0..1	Duration	(NC) Time it takes to shutdown the unit.
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.
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.
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.
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	Money	(NC) The normal initial startup cost incurred for each start of the GeneratingUnit.
normalWarmStartupCost	0..1	Money	(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.
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

1913
1914

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

1915 **Table 128 – Association ends of EquipmentReliabilityProfile::GeneratingUnit with other**
1916 **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

1917

1918 3.75 (NC) GeothermalGeneratingUnit

1919 Inheritance path = [GeneratingUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1920 Generating unit that is generating electrical power from geothermal energy.

1921 Table 129 shows all attributes of GeothermalGeneratingUnit.

1922 **Table 129 – 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
shutdownCost	0..1	Money	(NC) inherited from: GeneratingUnit
shutdownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalMustRunP	0..1	ActivePower	(NC) inherited from: GeneratingUnit
runningLeadTime	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
minimumUpTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalStartupCost	0..1	Money	(NC) inherited from: GeneratingUnit
normalWarmStartupCost	0..1	Money	(NC) inherited from: GeneratingUnit
normalMustRunQ	0..1	ReactivePower	(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

1923

1924 Table 130 shows all association ends of GeothermalGeneratingUnit with other classes.

1925 **Table 130 – Association ends of EquipmentReliabilityProfile::GeothermalGeneratingUnit**
1926 **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

1927

1928 3.76 (Description) HydroPump

1929 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1930 A synchronous motor-driven pump, typically associated with a pumped storage plant.

1931 Table 131 shows all attributes of HydroPump.

1932 **Table 131 – 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

1933

1934 Table 132 shows all association ends of HydroPump with other classes.

1935 **Table 132 – Association ends of EquipmentReliabilityProfile::HydroPump with other**
1936 **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

1937

1938 **3.77 (abstract) IdentifiedObject root class**1939 This is a root class to provide common identification for all classes needing identification and
1940 naming attributes.

1941 Table 133 shows all attributes of IdentifiedObject.

1942

Table 133 – 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.

1943

1944 **3.78 (NC) ImpedanceControlFunction**1945 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)1946 Impedance control function is a function block that calculates the operating point of the
1947 controlled equipment to achieve the target impedance.

1948 Table 134 shows all attributes of ImpedanceControlFunction.

1949

Table 134 – 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

1950
1951 Table 135 shows all association ends of ImpedanceControlFunction with other classes.

1952 **Table 135 – Association ends of**
1953 **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

1954
1955 **3.79 (abstract,NC) LimitDependencyCurve**
1956 Inheritance path = [Curve](#) : [IdentifiedObject](#)
1957 A curve or functional relationship between an independent variable (X-axis) and limiting
1958 dependent (Y-axis) variables.
1959 Table 136 shows all attributes of LimitDependencyCurve.

1960 **Table 136 – 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

1961
1962 **3.80 (Description) Line**
1963 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) :
1964 [IdentifiedObject](#)
1965 Contains equipment beyond a substation belonging to a power transmission line.
1966 Table 137 shows all attributes of Line.

1967 **Table 137 – 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

1968
1969 Table 138 shows all association ends of Line with other classes.

1970 **Table 138 – 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.

1971

1972 **3.81 (NC) LineCircuit**1973 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1974 A line circuit is a circuit that has at least one ACLineSegment and may or may not include related switching and/or auxiliary equipment.

1975 Table 139 shows all attributes of LineCircuit.

1976 **Table 139 – 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

1978

1979 Table 140 shows all association ends of LineCircuit with other classes.

1980 **Table 140 – Association ends of EquipmentReliabilityProfile::LineCircuit with other classes**

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

1982

1983 **3.82 (NC) LoadFrequencyControlArea**1984 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1985 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) areas, operated by one or more TSOs fulfilling the obligations of load-frequency control.

1988 Table 141 shows all attributes of LoadFrequencyControlArea.

1989 **Table 141 – 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

1990

1991

Table 142 shows all association ends of LoadFrequencyControlArea with other classes.

1992

Table 142 – Association ends of

1993

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.

1994

1995

3.83 (NC) LoadFrequencyControlBlock

1996

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

1997

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.

2000

Table 143 shows all attributes of LoadFrequencyControlBlock.

2002

Table 143 – 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

2003

2004

Table 144 shows all association ends of LoadFrequencyControlBlock with other classes.

2005

Table 144 – Association ends of

2006

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.

2007

2008

3.84 (NC) LoadFrequencyControlOperator

2009

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

2010 A role that is responsible for operational security by operating the load frequency control (LFC)
2011 mechanism.

2012 Table 145 shows all attributes of LoadFrequencyControlOperator.

2013 **Table 145 – 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

2014

2015 Table 146 shows all association ends of LoadFrequencyControlOperator with other classes.

2016 **Table 146 – Association ends of**

2017 **EquipmentReliabilityProfile::LoadFrequencyControlOperator with other classes**

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

2018

2019 **3.85 (NC) ModularStaticSynchronousSeriesCompensator**

2020 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2021 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2022 Modular static synchronous series compensator (MSSSC) is a type of flexible AC transmission
2023 system regulating equipment which consists of solid-state voltage source inverter connected in
2024 series with a transmission line. This is similar to static synchronous series compensator
2025 (SSSC), but without injection transformer. This enables the MSSSC to be truly modular with the
2026 ability to simply install a number of equipment in series to provide a desired maximum level of
2027 impedance. MSSSC can be dispersed into multiple location in a circuit working collectively
2028 under the same controller scheme.

2029 Table 147 shows all attributes of ModularStaticSynchronousSeriesCompensator.

2030 **Table 147 – Attributes of**

2031 **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

2032
2033
2034

Table 148 shows all association ends of ModularStaticSynchronousSeriesCompensator with other classes.

**Table 148 – 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

2038

2039 3.86 (Description) NuclearGeneratingUnit

2040 Inheritance path = [GeneratingUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2041 A nuclear generating unit.

2042 Table 149 shows all attributes of NuclearGeneratingUnit.

2043 **Table 149 – 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
shutdownCost	0..1	Money	(NC) inherited from: GeneratingUnit
shutdownTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalMustRunP	0..1	ActivePower	(NC) inherited from: GeneratingUnit
runningLeadTime	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
minimumUpTime	0..1	Duration	(NC) inherited from: GeneratingUnit
normalStartupCost	0..1	Money	(NC) inherited from: GeneratingUnit
normalWarmStartupCost	0..1	Money	(NC) inherited from: GeneratingUnit
normalMustRunQ	0..1	ReactivePower	(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	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

2044

2045

Table 150 shows all association ends of NuclearGeneratingUnit with other classes.

2046

Table 150 – Association ends of EquipmentReliabilityProfile::NuclearGeneratingUnit with other classes

2047

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

2048

2049

3.87 (abstract) OperationalLimit

2050

Inheritance path = [IdentifiedObject](#)

2051

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

2052

The sub class value and normalValue attributes vary inversely to the associated OperationalLimitType.acceptableDuration (acceptableDuration for short).

2053

2054

If a particular piece of equipment has multiple operational limits of the same kind (apparent power, current, etc.), the limit with the greatest acceptableDuration shall have the smallest limit value and the limit with the smallest acceptableDuration shall have the largest limit value. Note:

2055

2056

A large current can only be allowed to flow through a piece of equipment for a short duration without causing damage, but a lesser current can be allowed to flow for a longer duration.

2057

2058

Table 151 shows all attributes of OperationalLimit.

2059

2060

Table 151 – 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

2061

2062

Table 152 shows all association ends of OperationalLimit with other classes.

2063

Table 152 – Association ends of EquipmentReliabilityProfile::OperationalLimit with other classes

2064

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.

2065

2066

3.88 (Description) OperationalLimitSet

2067

Inheritance path = [IdentifiedObject](#)

2068

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

2069

2070

2071

2072

2073 Table 153 shows all attributes of OperationalLimitSet.

2074 **Table 153 – 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

2075

2076 Table 154 shows all association ends of OperationalLimitSet with other classes.

2077 **Table 154 – Association ends of EquipmentReliabilityProfile::OperationalLimitSet with other classes**

2078

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.

2079

2080 3.89 OperationalLimitType

2081 Inheritance path = [IdentifiedObject](#)

2082 The operational meaning of a category of limits.

2083 Table 155 shows all attributes of OperationalLimitType.

2084 **Table 155 – 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

2085

2086 Table 156 shows all association ends of OperationalLimitType with other classes.

2087 **Table 156 – Association ends of EquipmentReliabilityProfile::OperationalLimitType with other classes**

2088

mult from	name	mult to	type	description
0..*	PermanentAmbientTemperatureDependencyCurve	0..1	AmbientTemperatureDependencyCurve	(NC) The permanent ambient temperature dependency curve for this operational limit type.

mult from	name	mult to	type	description
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.

2089

2090 **3.90 (NC) SecurityCoordinator**

2091 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
2092 [OrganisationRole](#) : [IdentifiedObject](#)

2093 A role that coordinates the relevant remedial actions and their optimisation to ensure efficient
2094 use to achieve required operational security of the power system.

2095 Table 157 shows all attributes of SecurityCoordinator.

2096

Table 157 – 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

2097

2098 Table 158 shows all association ends of SecurityCoordinator with other classes.

2099 **Table 158 – Association ends of EquipmentReliabilityProfile::SecurityCoordinator with
2100 other classes**

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

2101

2102 **3.91 (NC) SolarRadiationDependencyCurve**

2103 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

2104 A curve or functional relationship between

2105 - the solar radiation independent variable (X-axis), and

2106 - relative dependent (Y-axis) variables.

2107 Table 159 shows all attributes of SolarRadiationDependencyCurve.

2108

Table 159 – 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

name	mult	type	description
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

2109

2110 3.92 (NC) StaticSynchronousCompensator

2111 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2112 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2113 Static synchronous compensator (STATCOM), also known as a static synchronous condenser
2114 (STATCON), is a type of flexible AC transmission system regulating equipment used on
2115 alternating current electricity transmission networks. It is based on a power electronics voltage-
2116 source converter and can act as either a source or sink of reactive AC power to an electricity
2117 network. If connected to a source of power it can also provide active AC power.

2118 Table 160 shows all attributes of StaticSynchronousCompensator.

2119 Table 160 – 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

2120

2121 Table 161 shows all association ends of StaticSynchronousCompensator with other classes.

2122

2123

Table 161 – 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

2124

2125 **3.93 (NC) StaticSynchronousSeriesCompensator**

2126 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2127 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2128 Static synchronous series compensator (SSSC) is a type of flexible AC transmission system
2129 which consists of a solid-state voltage source inverter coupled with a transformer that is
2130 connected in series with a transmission line. This device can inject an almost sinusoidal voltage
2131 in series with the line. This injected voltage could be considered as an inductive or capacitive
2132 reactance, which is connected in series with the transmission line. This feature can provide
2133 controllable voltage compensation. In addition, SSSC is able to reverse the power flow by
2134 injecting a sufficiently large series reactive compensating voltage. Moreover it can inject a
2135 voltage proportional to the difference between the line current and the pre-configured current
2136 threshold. It shall have two Terminal-s associated with it.

2137 Table 162 shows all attributes of StaticSynchronousSeriesCompensator.

2138

2139

**Table 162 – 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

2140

2141 Table 163 shows all association ends of StaticSynchronousSeriesCompensator with other
2142 classes.

2143

2144

**Table 163 – 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

2145

2146 **3.94 (NC) SubSchedulingArea**

2147 Inheritance path = [SchedulingArea](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2148 An area that is a part of another scheduling area. Typically part of a Transmission System
2149 Operator (TSO) scheduling area operated by a Distributed System Operator (DSO) or a Close

2150 Distributed System Operator (CDSO). This includes microgrid concept. A sub scheduling area
2151 can contain other sub areas. A sub scheduling area leaf will form the smallest entity of any
2152 given energy area.
2153 Table 164 shows all attributes of SubSchedulingArea.

2154 **Table 164 – Attributes of EquipmentReliabilityProfile::SubSchedulingArea**

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
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

2155
2156 Table 165 shows all association ends of SubSchedulingArea with other classes.

2157 **Table 165 – Association ends of EquipmentReliabilityProfile::SubSchedulingArea with**
2158 **other classes**

mult from	name	mult to	type	description
0..*	SchedulingArea	1..1	SchedulingArea	(NC) The scheduling area that has this subscheduling area.
0..*	SystemOperator	0..1	SystemOperator	(NC) inherited from: SchedulingArea
0..*	SynchronousArea	0..1	SynchronousArea	(NC) inherited from: SchedulingArea
0..*	LoadFrequencyControlArea	0..1	LoadFrequencyControlArea	(NC) inherited from: SchedulingArea
0..*	EnergyCoordinationRegion	0..1	EnergyCoordinationRegion	(NC) inherited from: SchedulingArea
1..*	ControlArea	0..1	ControlArea	(NC) inherited from: SchedulingArea
1..*	BiddingZone	1..1	BiddingZone	(NC) inherited from: SchedulingArea

2159
2160 **3.95 (Description) Substation**

2161 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) :
2162 [IdentifiedObject](#)

2163 A collection of equipment for purposes other than generation or utilization, through which
2164 electric energy in bulk is passed for the purposes of switching or modifying its characteristics.

2165 Table 166 shows all attributes of Substation.

2166 **Table 166 – 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

2167

2168 Table 167 shows all association ends of Substation with other classes.

2169 **Table 167 – Association ends of EquipmentReliabilityProfile::Substation with other**
2170 **classes**

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

2171

2172 3.96 (NC) SubstationController

2173 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2174 [IdentifiedObject](#)

2175 Substation controller is controlling the equipment to optimize the use of the controlling
2176 equipment within a substation.

2177 Table 168 shows all attributes of SubstationController.

2178 **Table 168 – 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

2179

2180 Table 169 shows all association ends of SubstationController with other classes.

2181 **Table 169 – Association ends of EquipmentReliabilityProfile::SubstationController with**
2182 **other classes**

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

2183

2184 3.97 (NC) SynchronousArea

2185 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2186 A synchronous area is an electrical area covered by interconnect with a common system
2187 frequency in a steady-state.

2188 Table 170 shows all attributes of SynchronousArea.

2189 **Table 170 – 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

2190

2191 **3.98 (abstract,NC) SystemOperationCoordinator**2192 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

2193 A role that coordinates relevant information and impact in regards to operating the power system.

2194 Table 171 shows all attributes of SystemOperationCoordinator.

2196 **Table 171 – 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

2197

2198 Table 172 shows all association ends of SystemOperationCoordinator with other classes.

2199 **Table 172 – Association ends of**2200 **EquipmentReliabilityProfile::SystemOperationCoordinator with other classes**

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

2201

2202 **3.99 (abstract,NC) SystemOperator**2203 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

2204 System operator.

2205 Table 173 shows all attributes of SystemOperator.

2206 **Table 173 – 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

2207

2208 Table 174 shows all association ends of SystemOperator with other classes.

2209 **Table 174 – Association ends of EquipmentReliabilityProfile::SystemOperator with other classes**

2210

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

2211

2212 **3.100 (abstract,Description) TapChanger root class**

2213 Mechanism for changing transformer winding tap positions.

2214 Table 175 shows all association ends of TapChanger with other classes.

2215 **Table 175 – Association ends of EquipmentReliabilityProfile::TapChanger with other**
2216 **classes**

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

2217

2218 3.101 (abstract) Terminal

2219 Inheritance path = [ACDCTerminal](#)

2220 An AC electrical connection point to a piece of conducting equipment. Terminals are connected
2221 at physical connection points called connectivity nodes.

2222 3.102 (NC) TieCorridor

2223 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2224 A collection of one or more tie-lines or direct current poles that connect two different control
2225 areas.

2226 Table 176 shows all attributes of TieCorridor.

2227 **Table 176 – 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

2228

2229 Table 177 shows all association ends of TieCorridor with other classes.

2230 **Table 177 – Association ends of EquipmentReliabilityProfile::TieCorridor with other**
2231 **classes**

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

2232

2233 3.103 (NC) ThyristorControlledSeriesCompensator

2234 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2235 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2236 Thyristor-controlled series capacitors (TCSC) is a type of flexible AC transmission system
2237 regulating equipment that is configured with controlled reactors in parallel with sections of a

2238 capacitor bank. This combination allows smooth control of the fundamental frequency
2239 capacitive reactance over a wide range. The thyristor valve contains a string of series connected
2240 high power thyristors. TCSC can control power flows in order to achieve eliminating of line
2241 overloads, reducing loop flows and minimising system losses.

2242 Table 178 shows all attributes of ThyristorControlledSeriesCompensator.

2243

2244

**Table 178 – 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

2245

2246

2247

Table 179 shows all association ends of ThyristorControlledSeriesCompensator with other classes.

2248

2249

**Table 179 – 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

2250

2251 3.104 (NC) TransmissionSystemOperator

2252 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) :
2253 [IdentifiedObject](#)

2254 A system operator role that is responsible for operating of an energy transmission network.

2255 Table 180 shows all attributes of TransmissionSystemOperator.

2256 **Table 180 – 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

2257

2258 Table 181 shows all association ends of TransmissionSystemOperator with other classes.

2259 **Table 181 – Association ends of**
2260 **EquipmentReliabilityProfile::TransmissionSystemOperator with other classes**

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

2261

2262 3.105 (NC) UnifiedPowerFlowController

2263 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2264 [IdentifiedObject](#)

2265 Unified power flow controller (UPFC) is providing fast-acting reactive power compensation on
2266 high-voltage electricity transmission networks.

2267 Table 182 shows all attributes of UnifiedPowerFlowController.

2268 **Table 182 – 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

2269

2270 Table 183 shows all association ends of UnifiedPowerFlowController with other classes.

2271 **Table 183 – Association ends of**
2272 **EquipmentReliabilityProfile::UnifiedPowerFlowController with other classes**

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

2273

2274 3.106 (NC) VoltageAngleLimit

2275 Inheritance path = [OperationalLimit](#) : [IdentifiedObject](#)

2276 Voltage angle limit between two terminals. The association end OperationalLimitSet.Terminal
2277 defines one end and the host of the limit. The association end
2278 VoltageAngleLimit.AngleReferenceTerminal defines the reference terminal.

2279 Table 184 shows all attributes of VoltageAngleLimit.

2280 **Table 184 – 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

2281

2282 Table 185 shows all association ends of VoltageAngleLimit with other classes.

2283 **Table 185 – Association ends of EquipmentReliabilityProfile::VoltageAngleLimit with**
2284 **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

2285

2286 **3.107 (NC) VoltageControlFunction**

2287 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2288 Voltage control function is a function block that calculate the operating point of the controlled
2289 equipment to achieve the target voltage.

2290 Table 186 shows all attributes of VoltageControlFunction.

2291 **Table 186 – 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

2292

2293 Table 187 shows all association ends of VoltageControlFunction with other classes.

2294 **Table 187 – Association ends of EquipmentReliabilityProfile::VoltageControlFunction**
2295 **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

2296

2297 **3.108 Currency enumeration**

2298 Monetary currencies. ISO 4217 standard including 3-character currency code.

2299 Table 188 shows all literals of Currency.

2300 **Table 188 – 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.

literal	value	description
CHF	756	Swiss franc.
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.

literal	value	description
JMD	388	Jamaican dollar.
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.

literal	value	description
PAB	590	Panamanian balboa.
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.
SLL	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.

literal	value	description
VUV	548	Vanuatu vatu.
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.

2301

2302 **3.109 CurveStyle enumeration**

2303 Style or shape of curve.

2304 Table 189 shows all literals of CurveStyle.

2305 **Table 189 – 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.

2306

2307 **3.110 (NC) MarineUnitKind enumeration**

2308 Kind of marine energy capture.

2309 Table 190 shows all literals of MarineUnitKind.

2310 **Table 190 – 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.

2311

2312 **3.111 OperationalLimitDirectionKind enumeration**

2313 The direction attribute describes the side of a limit that is a violation.

2314 Table 191 shows all literals of OperationalLimitDirectionKind.

2315 **Table 191 – 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.

2316

2317 **3.112 (NC) PinTerminalKind enumeration**

2318 The kind of quantities that can serve as an input value for the pin.

2319 Table 192 shows all literals of PinTerminalKind.

2320 **Table 192 – 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.

2321

2322 **3.113 (NC) NuclearReactorKind enumeration**

2323 Kind of nuclear reactor.

2324 Table 193 shows all literals of NuclearReactorKind.

2325 **Table 193 – 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.

2326

2327 **3.114 (NC) GeothermalUnitKind enumeration**

2328 Kind of geothermal.

2329 Table 194 shows all literals of GeothermalUnitKind.

2330 **Table 194 – 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.

2331

2332 **3.115 (NC) LogicalOperatorsKind enumeration**

2333 Kinds of logical operators for comparison.

2334 Table 195 shows all literals of LogicalOperatorsKind.

2335 **Table 195 – 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.

2336

2337 **3.116 (NC) PowerElectricalChemicalUnitKind enumeration**

2338 Kind of power electrical chemical unit.

2339 Table 196 shows all literals of PowerElectricalChemicalUnitKind.

2340 **Table 196 – 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.

2341

2342 **3.117 UnitMultiplier enumeration**

2343 The unit multipliers defined for the CIM. When applied to unit symbols, the unit symbol is
2344 treated as a derived unit. Regardless of the contents of the unit symbol text, the unit symbol
2345 shall be treated as if it were a single-character unit symbol. Unit symbols should not contain
2346 multipliers, and it should be left to the multiplier to define the multiple for an entire data type.

2347 For example, if a unit symbol is "m2Pers" and the multiplier is "k", then the value is $k(m^{**2}/s)$,
2348 and the multiplier applies to the entire final value, not to any individual part of the value. This
2349 can be conceptualized by substituting a derived unit symbol for the unit type. If one imagines
2350 that the symbol "P" represents the derived unit "m2Pers", then applying the multiplier "k" can
2351 be conceptualized simply as "kP".

2352 For example, the SI unit for mass is "kg" and not "g". If the unit symbol is defined as "kg", then
2353 the multiplier is applied to "kg" as a whole and does not replace the "k" in front of the "g". In
2354 this case, the multiplier of "m" would be used with the unit symbol of "kg" to represent one gram.

2355 As a text string, this violates the instructions in IEC 80000-1. However, because the unit symbol
2356 in CIM is treated as a derived unit instead of as an SI unit, it makes more sense to conceptualize
2357 the "kg" as if it were replaced by one of the proposed replacements for the SI mass symbol. If
2358 one imagines that the "kg" were replaced by a symbol "P", then it is easier to conceptualize the
2359 multiplier "m" as creating the proper unit "mP", and not the forbidden unit "mkg".

2360 Table 197 shows all literals of UnitMultiplier.

2361 **Table 197 – 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} .

2362

2363 **3.118 UnitSymbol enumeration**

2364 The derived units defined for usage in the CIM. In some cases, the derived unit is equal to an
2365 SI unit. Whenever possible, the standard derived symbol is used instead of the formula for the
2366 derived unit. For example, the unit symbol Farad is defined as "F" instead of "CPerV". In cases
2367 where a standard symbol does not exist for a derived unit, the formula for the unit is used as
2368 the unit symbol. For example, density does not have a standard symbol and so it is represented
2369 as "kgPerm3". With the exception of the "kg", which is an SI unit, the unit symbols do not contain
2370 multipliers and therefore represent the base derived unit to which a multiplier can be applied as
2371 a whole.

2372 Every unit symbol is treated as an unparseable text as if it were a single-letter symbol. The
2373 meaning of each unit symbol is defined by the accompanying descriptive text and not by the
2374 text contents of the unit symbol.

2375 To allow the widest possible range of serializations without requiring special character handling,
2376 several substitutions are made which deviate from the format described in IEC 80000-1. The
2377 division symbol "/" is replaced by the letters "Per". Exponents are written in plain text after the
2378 unit as "m3" instead of being formatted as "m" with a superscript of 3 or introducing a symbol
2379 as in "m^3". The degree symbol "°" is replaced with the letters "deg". Any clarification of the
2380 meaning for a substitution is included in the description for the unit symbol.

2381 Non-SI units are included in list of unit symbols to allow sources of data to be correctly labelled
2382 with their non-SI units (for example, a GPS sensor that is reporting numbers that represent feet
2383 instead of meters). This allows software to use the unit symbol information correctly convert
2384 and scale the raw data of those sources into SI-based units.

2385 The integer values are used for harmonization with IEC 61850.

2386 Table 198 shows all literals of UnitSymbol.

2387

Table 198 – 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 (W/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.

2388

2389 3.119 ActivePower datatype

2390 Product of RMS value of the voltage and the RMS value of the in-phase component of the
2391 current.

2392 Table 199 shows all attributes of ActivePower.

2393

Table 199 – 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	

2394

2395 **3.120 ActivePowerChangeRate datatype**

2396 Rate of change of active power per time.

2397 Table 200 shows all attributes of ActivePowerChangeRate.

2398 **Table 200 – Attributes of EquipmentReliabilityProfile::ActivePowerChangeRate**

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

2399

2400 **3.121 AngleDegrees datatype**

2401 Measurement of angle in degrees.

2402 Table 201 shows all attributes of AngleDegrees.

2403 **Table 201 – Attributes of EquipmentReliabilityProfile::AngleDegrees**

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

2404

2405 **3.122 Frequency datatype**

2406 Cycles per second.

2407 Table 202 shows all attributes of Frequency.

2408 **Table 202 – Attributes of EquipmentReliabilityProfile::Frequency**

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

2409

2410 **3.123 Impedance datatype**

2411 Ratio of voltage to current.

2412 Table 203 shows all attributes of Impedance.

2413 **Table 203 – Attributes of EquipmentReliabilityProfile::Impedance**

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

2414

2415 **3.124 Money datatype**

2416 Amount of money.

2417 Table 204 shows all attributes of Money.

2418 **Table 204 – Attributes of EquipmentReliabilityProfile::Money**

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=none)
unit	0..1	Currency	
value	0..1	Decimal	

2419

2420 **3.125 PerCent datatype**

2421 Percentage on a defined base. For example, specify as 100 to indicate at the defined base.

2422 Table 205 shows all attributes of PerCent.

2423 **Table 205 – 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)

2424

2425 **3.126 Reactance datatype**

2426 Reactance (imaginary part of impedance), at rated frequency.

2427 Table 206 shows all attributes of Reactance.

2428 **Table 206 – Attributes of EquipmentReliabilityProfile::Reactance**

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

2429

2430 **3.127 Seconds datatype**

2431 Time, in seconds.

2432 Table 207 shows all attributes of Seconds.

2433 **Table 207 – 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)

2434

2435 **3.128 VoltagePerReactivePower datatype**

2436 Voltage variation with reactive power.

2437 Table 208 shows all attributes of VoltagePerReactivePower.

2438 **Table 208 – Attributes of EquipmentReliabilityProfile::VoltagePerReactivePower**

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

2439

2440 **3.129 Boolean primitive**

2441 A type with the value space "true" and "false".

2442 **3.130 Decimal primitive**

2443 Decimal is the base-10 notational system for representing real numbers.

2444 **3.131 Duration primitive**

2445 Duration as "PnYnMnDTnHnMnS" which conforms to ISO 8601, where nY expresses a number
 2446 of years, nM a number of months, nD a number of days. The letter T separates the date
 2447 expression from the time expression and, after it, nH identifies a number of hours, nM a number
 2448 of minutes and nS a number of seconds. The number of seconds could be expressed as a
 2449 decimal number, but all other numbers are integers.

2450 **3.132 Float primitive**

2451 A floating point number. The range is unspecified and not limited.

2452 **3.133 Integer primitive**

2453 An integer number. The range is unspecified and not limited.

2454 **3.134 String primitive**

2455 A string consisting of a sequence of characters. The character encoding is UTF-8. The string
 2456 length is unspecified and unlimited.

2457 **3.135 (NC) SSSCSimulationSettings root class**

2458 SSSC control simulation settings used by the algorithm for power flow calculations.

2459 Table 209 shows all attributes of SSSCSimulationSettings.

2460 **Table 209 – 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 calculation algorithm for the purpose of achieving control target value.

name	mult	type	description
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.

2461

2462 **3.136 (NC) RotatingMachineController**2463 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2464 [IdentifiedObject](#)2465 Rotating machine controller is controlling the equipment which may be used as a generator or
2466 motor.

2467 Table 210 shows all attributes of RotatingMachineController.

2468 **Table 210 – 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

2469

2470 Table 211 shows all association ends of RotatingMachineController with other classes.

2471 **Table 211 – Association ends of**
2472 **EquipmentReliabilityProfile::RotatingMachineController with other classes**

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

2473

2474 **3.137 (NC) InjectionController**2475 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2476 [IdentifiedObject](#)2477 Injection controller is controlling the equipment which represents an injection or an external
2478 network.

2479 Table 212 shows all attributes of InjectionController.

2480 **Table 212 – Attributes of EquipmentReliabilityProfile::InjectionController**

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

2481

2482

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

2483

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

2484

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

2485

2486

3.138 (NC) CurrentControlFunction

2487

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

2488

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

2489

2490

Table 214 shows all attributes of CurrentControlFunction.

2491

Table 214 – 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

2492

2493

Table 215 shows all association ends of CurrentControlFunction with other classes.

2494

Table 215 – Association ends of EquipmentReliabilityProfile::CurrentControlFunction with other classes

2495

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

2496

2497

3.139 (NC) TCSCCompensationPoint root class

2498

Compensation point of a TCSC compensator.

2499

Table 216 shows all attributes of TCSCCompensationPoint.

2500 **Table 216 – 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.

2501

2502 Table 217 shows all association ends of TCSCCompensationPoint with other classes.

2503 **Table 217 – Association ends of EquipmentReliabilityProfile::TCSCCompensationPoint**
2504 **with other classes**

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

2505

2506 **3.140 (NC) StaticVarCompensator**2507 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2508 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)2509 A facility for providing variable and controllable shunt reactive power. The SVC typically
2510 consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched
2511 capacitor arms.2512 The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage
2513 control mode, the output of the SVC will be proportional to the deviation of voltage at the
2514 controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion.
2515 If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.
2516 Table 218 shows all attributes of StaticVarCompensator.2517 **Table 218 – 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

2518

2519 Table 219 shows all association ends of StaticVarCompensator with other classes.

2520 **Table 219 – Association ends of EquipmentReliabilityProfile::StaticVarCompensator**
2521 **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

2522

2523 **3.141 (NC) LossCurve**2524 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2525 Represents the losses in the equipment due to operation position.

2526 Table 220 shows all attributes of LossCurve.

2527 **Table 220 – 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

2528

2529 Table 221 shows all association ends of LossCurve with other classes.

2530 **Table 221 – Association ends of EquipmentReliabilityProfile::LossCurve with other**
2531 **classes**

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

2532

2533 **3.142 (Description) DCSwitch**2534 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2535 [IdentifiedObject](#)

2536 A switch within the DC system.
2537 Table 222 shows all attributes of DCSwitch.

2538 **Table 222 – 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

2539
2540 Table 223 shows all association ends of DCSwitch with other classes.

2541 **Table 223 – Association ends of EquipmentReliabilityProfile::DCSwitch with other**
2542 **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

2543
2544 **3.143 (abstract) DCConductingEquipment**

2545 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
2546 The parts of the DC power system that are designed to carry current or that are conductively
2547 connected through DC terminals.
2548 Table 224 shows all attributes of DCConductingEquipment.

2549 **Table 224 – 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

2550
2551 Table 225 shows all association ends of DCConductingEquipment with other classes.

2552 **Table 225 – Association ends of EquipmentReliabilityProfile::DCConductingEquipment**
2553 **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

2554

2555 **3.144 (Description) DCDisconnector**2556 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2557 A disconnector within a DC system.

2558 Table 226 shows all attributes of DCDisconnector.

2560 **Table 226 – 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

2561

2562 Table 227 shows all association ends of DCDisconnector with other classes.

2563 **Table 227 – Association ends of EquipmentReliabilityProfile::DCDisconnector with other classes**

2564

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

2565

2566 **3.145 (Description) DCBreaker**2567 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2568 A breaker within a DC system.

2569 Table 228 shows all attributes of DCBreaker.

2570 **Table 228 – 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

2572

2573 Table 229 shows all association ends of DCBreaker with other classes.

2574 **Table 229 – Association ends of EquipmentReliabilityProfile::DCBreaker with other classes**

2575

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

2576

2577 **3.146 (Description) DCGround**2578 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2579 [IdentifiedObject](#)

2580 A ground within a DC system.

2581 Table 230 shows all attributes of DCGround.

2582 **Table 230 – 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

2583

2584 Table 231 shows all association ends of DCGround with other classes.

2585 **Table 231 – Association ends of EquipmentReliabilityProfile::DCGround with other**
2586 **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

2587

2588 **3.147 (Description) DCBusbar**2589 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2590 [IdentifiedObject](#)

2591 A busbar within a DC system.

2592 Table 232 shows all attributes of DCBusbar.

2593 **Table 232 – 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

2594

2595 Table 233 shows all association ends of DCBusbar with other classes.

2596 **Table 233 – Association ends of EquipmentReliabilityProfile::DCBusbar with other**
2597 **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

2598

2599 **3.148 (Description) DCShunt**

2600 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2601 [IdentifiedObject](#)

2602 A shunt device within the DC system, typically used for filtering. Needed for transient and short
2603 circuit studies.

2604 Table 234 shows all attributes of DCShunt.

2605 **Table 234 – 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

2606

2607 Table 235 shows all association ends of DCShunt with other classes.

2608 **Table 235 – Association ends of EquipmentReliabilityProfile::DCShunt with other**
2609 **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

2610

2611 **3.149 (Description) DCSeriesDevice**

2612 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2613 [IdentifiedObject](#)

2614 A series device within the DC system, typically a reactor used for filtering or smoothing. Needed
2615 for transient and short circuit studies.

2616 Table 236 shows all attributes of DCSeriesDevice.

2617 **Table 236 – 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

2618

2619 Table 237 shows all association ends of DCSeriesDevice with other classes.

2620 **Table 237 – Association ends of EquipmentReliabilityProfile::DCSeriesDevice with other**
2621 **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

2622

2623 **3.150 (Description) DCLineSegment**

2624 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2625 [IdentifiedObject](#)

2626 A wire or combination of wires not insulated from one another, with consistent electrical
2627 characteristics, used to carry direct current between points in the DC region of the power
2628 system.

2629 Table 238 shows all attributes of DCLineSegment.

2630

Table 238 – 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

2631

2632 Table 239 shows all association ends of DCLineSegment with other classes.

Table 239 – Association ends of EquipmentReliabilityProfile::DCLineSegment with other classes

2634

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

2635

2636 **3.151 (Description) DCChopper**

2637 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2638 [IdentifiedObject](#)

2639 Low resistance equipment used in the internal DC circuit to balance voltages. It has typically
2640 positive and negative pole terminals and a ground.

2641 Table 240 shows all attributes of DCChopper.

2642

Table 240 – 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

2643

2644 Table 241 shows all association ends of DCChopper with other classes.

2645 **Table 241 – Association ends of EquipmentReliabilityProfile::DCChopper with other**
2646 **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

2647

2648 3.152 (Description) TieFlow

2649 Inheritance path = [IdentifiedObject](#)

2650 Defines the structure (in terms of location and direction) of the net interchange constraint for a
2651 control area. This constraint may be used by either AGC or power flow.

2652 Table 242 shows all attributes of TieFlow.

2653 **Table 242 – 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

2654

2655 Table 243 shows all association ends of TieFlow with other classes.

2656 **Table 243 – 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.

2657

2658 3.153 (NC) PowerPlantController

2659 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2660 [IdentifiedObject](#)

2661 Power plant controller is controlling the equipment of a power plant.

2662 Table 244 shows all attributes of PowerPlantController.

2663 **Table 244 – 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

2664

2665 Table 245 shows all association ends of PowerPlantController with other classes.

2666 **Table 245 – Association ends of EquipmentReliabilityProfile::PowerPlantController with**
2667 **other classes**

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

2668

2669 3.154 (NC) TCSCController

2670 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2671 [IdentifiedObject](#)

2672 TCSC controller is controlling the equipment to optimize the performance of the TCSC.

2673 Table 246 shows all attributes of TCSCController.

2674 **Table 246 – 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

2675

2676 Table 247 shows all association ends of TCSCController with other classes.

2677 **Table 247 – Association ends of EquipmentReliabilityProfile::TCSCController with other**
2678 **classes**

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

2679

2680 3.155 (NC) DCCurrentControlFunction

2681 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2682 DC current control function is a function block that calculates the operating point of the
2683 controlled equipment to achieve the target current.

2684 Table 248 shows all attributes of DCCurrentControlFunction.

2685 **Table 248 – 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

2686

2687

Table 249 shows all association ends of DCCurrentControlFunction with other classes.

2688

Table 249 – Association ends of EquipmentReliabilityProfile::DCCurrentControlFunction with other classes

2689

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

2690

2691 3.156 (NC) DCVoltageControlFunction

2692 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2693 DC voltage control function is a function block that calculate the operating point of the controlled
2694 equipment to achieve the target voltage.

2695 Table 250 shows all attributes of DCVoltageControlFunction.

2696

Table 250 – 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

2697

2698

Table 251 shows all association ends of DCVoltageControlFunction with other classes.

2699

Table 251 – Association ends of EquipmentReliabilityProfile::DCVoltageControlFunction with other classes

2700

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

2701

2702 3.157 (NC) PhaseControlFunction

2703 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2704 Phase control function is a function block that calculate the operating point of the controlled
2705 equipment to achieve the target voltage.

2706 Table 252 shows all attributes of PhaseControlFunction.

2707 **Table 252 – 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

2708

2709 Table 253 shows all association ends of PhaseControlFunction with other classes.

2710 **Table 253 – Association ends of EquipmentReliabilityProfile::PhaseControlFunction**
2711 **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

2712

2713 3.158 (NC) RampingPrincipleKind enumeration

2714 Kind of ramping principle.

2715 Table 254 shows all literals of RampingPrincipleKind.

2716 **Table 254 – 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).

2717

2718 **3.159 (NC) DirectCurrentCircuit**2719 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2720 A direct current circuit is a circuit consists of direct current equipment.

2721 Table 255 shows all attributes of DirectCurrentCircuit.

2722 **Table 255 – 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

2723

2724 Table 256 shows all association ends of DirectCurrentCircuit with other classes.

2725 **Table 256 – Association ends of EquipmentReliabilityProfile::DirectCurrentCircuit with other classes**

2726

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

2727

2728 **3.160 (NC) OverlappingZone**2729 Inheritance path = [IdentifiedObject](#)

2730 A collection of all the overlapping cross border assessed elements which have the same sets of impacted and impacting regions.

2731 Table 257 shows all attributes of OverlappingZone.

2732 **Table 257 – Attributes of EquipmentReliabilityProfile::OverlappingZone**

2733

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

2734

2735 **3.161 (NC) TapChangerController**2736 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2737

2738 Tap changer controller is an equipment controller that controls a tap changer, e.g. how the
2739 voltage at the end of a line varies with the load level and compensation of the voltage drop by
2740 tap adjustment.

2741 Table 258 shows all attributes of TapChangerController.

2742 **Table 258 – 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

2743

2744 Table 259 shows all association ends of TapChangerController with other classes.

2745 **Table 259 – Association ends of EquipmentReliabilityProfile::TapChangerController**
2746 **with other classes**

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

2747

2748 3.162 (NC) CurrentDroopControlFunction

2749 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2750 Current droop control function is a function block that calculates the operating point of the
2751 controlled equipment to achieve the target current.

2752 Table 260 shows all attributes of CurrentDroopControlFunction.

2753 **Table 260 – 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

2754

2755 Table 261 shows all association ends of CurrentDroopControlFunction with other classes.

2756
2757**Table 261 – 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

2758

3.163 (NC) VoltageInjectionControlFunction2760 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)2761 Voltage injection control function is a function block that calculates the operating point of the
2762 controlled equipment to achieve the target voltage injection. The controlled point is the Terminal
2763 with sequenceNumber =1.

2764 Table 262 shows all attributes of VoltageInjectionControlFunction.

Table 262 – 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

2766

2767 Table 263 shows all association ends of VoltageInjectionControlFunction with other classes.

**Table 263 – 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

2770

3.164 (NC) SSSCController2772 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2773 [IdentifiedObject](#)

2774 The controller of a Static synchronous series compensator (SSSC).

2775 Table 264 shows all attributes of SSSCController.

Table 264 – 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

2777

2778

Table 265 shows all association ends of SSSCController with other classes.

2779

2780

Table 265 – Association ends of EquipmentReliabilityProfile::SSSCController with other classes

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

2781

3.165 (NC) CurrentDropOverride root class

Current droop override uses the following logic:

2784 - When the current exceeds a threshold the device executes the following transitions: 1) When
2785 injecting an inductive voltage or in monitoring mode the device tends to inject a voltage
2786 proportional to the difference between the line current and the aforementioned threshold. 2)
2787 When injecting a capacitive voltage the device transitions to monitoring mode.

2788 - If the aforementioned proportional voltage is lower than the initial one, the voltage injection
2789 remains unchanged.

2790 Current droop override is not applied when the device operates in currentDrop mode.

2791 Table 266 shows all attributes of CurrentDropOverride.

2792

Table 266 – Attributes of EquipmentReliabilityProfile::CurrentDropOverride

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.

2793

2794 Table 267 shows all association ends of CurrentDroopOverride with other classes.

2795 **Table 267 – Association ends of EquipmentReliabilityProfile::CurrentDroopOverride**
2796 **with other classes**

mult from	name	mult to	type	description
0..1	SSSCController	1..1	SSSCController	(NC) The SSSC controller to which this CurrentDroopOverride applies to.

2797

2798 **3.166 CurrentFlow datatype**2799 Electrical current with sign convention: positive flow is out of the conducting equipment into the
2800 connectivity node. Can be both AC and DC.

2801 Table 268 shows all attributes of CurrentFlow.

2802 **Table 268 – Attributes of EquipmentReliabilityProfile::CurrentFlow**

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

2803

2804 **3.167 Voltage datatype**

2805 Electrical voltage, can be both AC and DC.

2806 Table 269 shows all attributes of Voltage.

2807 **Table 269 – Attributes of EquipmentReliabilityProfile::Voltage**

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

2808

2809 **3.168 PU datatype**2810 Per Unit - a positive or negative value referred to a defined base. Values typically range from -
2811 10 to +10.

2812 Table 270 shows all attributes of PU.

2813 **Table 270 – Attributes of EquipmentReliabilityProfile::PU**

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

2814

2815 **3.169 Resistance datatype**

2816 Resistance (real part of impedance).

2817 Table 271 shows all attributes of Resistance.

2818

Table 271 – Attributes of EquipmentReliabilityProfile::Resistance

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

2819

2820 3.170 (abstract) SynchronousMachine root class

2821 An electromechanical device that operates with shaft rotating synchronously with the network.
2822 It is a single machine operating either as a generator or synchronous condenser or pump.

2823 3.171 ReactiveCapabilityCurve

2824 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2825 Reactive power rating envelope versus the synchronous machine's active power, in both the
2826 generating and motoring modes. For each active power value there is a corresponding high and
2827 low reactive power limit value. Typically there will be a separate curve for each coolant
2828 condition, such as hydrogen pressure. The Y1 axis values represent reactive minimum and the
2829 Y2 axis values represent reactive maximum.

2830 Table 272 shows all attributes of ReactiveCapabilityCurve.

2831

Table 272 – 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.
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

2832

2833 Table 273 shows all association ends of ReactiveCapabilityCurve with other classes.

**2834 Table 273 – Association ends of EquipmentReliabilityProfile::ReactiveCapabilityCurve
2835 with other classes**

mult from	name	mult to	type	description
0..*	SynchronousMachine2	0..1	SynchronousMachine	(NC) Synchronous machine using this curve.

mult from	name	mult to	type	description
0..*	EquivalentInjection2	0..1	EquivalentInjection	(NC) The equivalent injection using this reactive capability curve.

2836

3.172 Temperature datatype

2838 Value of temperature in degrees Celsius.

2839 Table 274 shows all attributes of Temperature.

2840

Table 274 – Attributes of EquipmentReliabilityProfile::Temperature

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

2841

3.173 Pressure datatype

2843 Pressure in pascals.

2844 Table 275 shows all attributes of Pressure.

2845

Table 275 – Attributes of EquipmentReliabilityProfile::Pressure

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

2846

3.174 (abstract) VsConverter root class

2848 DC side of the voltage source converter (VSC).

3.175 VsCapabilityCurve2850 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2851 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.

2853 Table 276 shows all attributes of VsCapabilityCurve.

2854

Table 276 – 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
y2Multiplier	0..1	UnitMultiplier	inherited from: Curve
y2Unit	0..1	UnitSymbol	inherited from: Curve
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

2855

2856 Table 277 shows all association ends of VsCapabilityCurve with other classes.

2857 **Table 277 – Association ends of EquipmentReliabilityProfile::VsCapabilityCurve with other classes**
2858

mult from	name	mult to	type	description
0..*	VsConverter	1..1	VsConverter	(NC) Converter with this capability curve.

2859

2860 **3.176 (Description) EquivalentInjection root class**2861 This class represents equivalent injections (generation or load). Voltage regulation is allowed
2862 only at the point of connection.

2863 Table 278 shows all association ends of EquivalentInjection with other classes.

2864 **Table 278 – Association ends of EquipmentReliabilityProfile::EquivalentInjection with other classes**
2865

mult from	name	mult to	type	description
0..*	InjectionController	0..1	InjectionController	(NC) Injection controller which controls the equivalent injection.

2866

2867 **3.177 (abstract) ACDCConverter**2868 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2869 [IdentifiedObject](#)2870 A unit with valves for three phases, together with unit control equipment, essential protective
2871 and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for
2872 conversion.

2873 Table 279 shows all attributes of ACDCConverter.

2874 **Table 279 – 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

2875

2876 Table 280 shows all association ends of ACDCConverter with other classes.

2877 **Table 280 – Association ends of EquipmentReliabilityProfile::ACDCConverter with other classes**
2878

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

2879

2880 **3.178 Reservoir**2881 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)2882 A water storage facility within a hydro system, including: ponds, lakes, lagoons, and rivers. The
2883 storage is usually behind some type of dam.

2884 Table 281 shows all attributes of Reservoir.

2885

Table 281 – Attributes of EquipmentReliabilityProfile::Reservoir

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

2886

2887 **3.179 (Description) HydroPowerPlant root class**2888 A hydro power station which can generate or pump. When generating, the generator turbines
2889 receive water from an upper reservoir. When pumping, the pumps receive their water from a
2890 lower reservoir.

2891 Table 282 shows all association ends of HydroPowerPlant with other classes.

2892

Table 282 – Association ends of EquipmentReliabilityProfile::HydroPowerPlant with other classes

2893

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.

2894

2895 **3.180 (NC) InfeedLimit**2896 Inheritance path = [OperationalLimit](#) : [IdentifiedObject](#)

2897 Infeed limit set constraints fed in to the network by two or more terminals.

2898 Table 283 shows all attributes of InfeedLimit.

2899

Table 283 – 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

2900

2901 Table 284 shows all association ends of InfeedLimit with other classes.

2902 **Table 284 – Association ends of EquipmentReliabilityProfile::InfeedLimit with other**
2903 **classes**

mult from	name	mult to	type	description
1..*	OperationalLimitType	1..1	OperationalLimitType	inherited from: OperationalLimit
1..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

2904

2905 3.181 (NC) InfeedTerminal root class

2906 Infeed terminal defines the terminals that are linked to an infeed limit.

2907 Table 285 shows all attributes of InfeedTerminal.

2908 **Table 285 – 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.

2909

2910 Table 286 shows all association ends of InfeedTerminal with other classes.

2911 **Table 286 – Association ends of EquipmentReliabilityProfile::InfeedTerminal with other**
2912 **classes**

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.

2913

2914 3.182 (NC) FuelStorage

2915 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2916 Fuel storage. e.g. pile of coal that can be shared between multiple thermal generating units.

2917 Table 287 shows all attributes of FuelStorage.

2918 **Table 287 – Attributes of EquipmentReliabilityProfile::FuelStorage**

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

2919

2920 3.183 (Description) FossilFuel root class

2921 The fossil fuel consumed by the non-nuclear thermal generating unit. For example, coal, oil,
2922 gas, etc. These are the specific fuels that the generating unit can consume.

2923 Table 288 shows all association ends of FossilFuel with other classes.

2924 **Table 288 – Association ends of EquipmentReliabilityProfile::FossilFuel with other**
2925 **classes**

mult from	name	mult to	type	description
0..*	FuelStorage	0..1	FuelStorage	(NC) Fuel storage that store fossil fuels.

2926

2927 **3.184 (NC) ACTieCorridor**

2928 Inheritance path = [TieCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2929 A collection of one or more AC tie lines that connect two different control areas.

2930 Table 289 shows all attributes of ACTieCorridor.

2931 **Table 289 – 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

2932

2933 Table 290 shows all association ends of ACTieCorridor with other classes.

2934 **Table 290 – Association ends of EquipmentReliabilityProfile::ACTieCorridor with other**
2935 **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

2936

2937 **3.185 (NC) PowerCapacity root class**

2938 Power capacity defines the capacity in regard to generation, consumption and transmission
2939 (import and export) for a relevant power system resource, e.g. bidding zone, including maximum
2940 and minimum electrical power capacity and any capacity allocation.

2941 **3.186 (NC) PowerShiftKeyStrategy**

2942 Inheritance path = [IdentifiedObject](#)

2943 Strategy of the power shift key.

2944 Table 291 shows all attributes of PowerShiftKeyStrategy.

2945 **Table 291 – 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.
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

2946
2947 Table 292 shows all association ends of PowerShiftKeyStrategy with other classes.

2948 **Table 292 – Association ends of EquipmentReliabilityProfile::PowerShiftKeyStrategy**
2949 **with other classes**

mult from	name	mult to	type	description
0..*	SchedulingArea	0..1	SchedulingArea	(NC) Scheduling area associated with power shift key strategy.

2950
2951 **3.187 (NC) ShiftMethodKind enumeration**
2952 Kind of shift method. Describes the way a power schedule should be distributed amongst
2953 production and consumption. e.g. Type of generating and load shift key.
2954 Table 293 shows all literals of ShiftMethodKind.

2955 **Table 293 – 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

literal	value	description
		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 participation factor unit will be reduced to its min economy factor or minimum power.

2956

2957 **3.188 (NC) PowerShiftKeyKind enumeration**

2958 Kind of generating and load shift keys strategy.

2959 Table 294 shows all literals of PowerShiftKeyKind.

2960

Table 294 – 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.

literal	value	description
generatorsUsedCapacity		The distribution is based on the used capacity, the difference between the minimum operation and operating p (GeneratingUnit.minOperatingP)

2961

2962 **3.189 (NC) FrequencyControlFunction**2963 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2964 Frequency control function is a function block that calculate the operating point of the controlled equipment to achieve the target frequency.

2965 Table 295 shows all attributes of FrequencyControlFunction.

2967 **Table 295 – 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

2968

2969 Table 296 shows all association ends of FrequencyControlFunction with other classes.

2970 **Table 296 – Association ends of EquipmentReliabilityProfile::FrequencyControlFunction with other classes**

2971

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

2972

2973 **3.190 (abstract,NC) SystemControl**2974 Inheritance path = [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2975 System control is the management and regulation of various parameters within the electrical grid to ensure its stable and reliable operation. The primary goal of system control is to maintain the balance between electricity generation and consumption, while also managing factors such as voltage, frequency, and power quality. This involves the use of control devices, automation, and monitoring systems to respond to changes in the grid and maintain its overall stability.

2978 This serves as Integrated AC and DC control system (IEC 60633) which governs the integrated operation of AC and DC systems of a power system.

2980 Table 297 shows all attributes of SystemControl.

2983 **Table 297 – Attributes of EquipmentReliabilityProfile::SystemControl**

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

2984

2985

Table 298 shows all association ends of SystemControl with other classes.

2986

2987

Table 298 – Association ends of EquipmentReliabilityProfile::SystemControl with other 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

2988

2989

3.191 (NC) AreaInterchangeController

2990

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

2991

2992

Area interchange control is set to control active power of an area.

2993

Table 299 shows all attributes of AreaInterchangeController.

2994

Table 299 – 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

2995

2996

Table 300 shows all association ends of AreaInterchangeController with other classes.

2997

2998

Table 300 – Association ends of EquipmentReliabilityProfile::AreaInterchangeController 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

2999

3000 **3.192 (NC) PowerFrequencyController**

3001 Inheritance path = [SystemControl](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3002 [IdentifiedObject](#)

3003 Power frequency controller is controlling the active power balance as typically done by the
3004 secondary control. If an unbalance between the scheduled active power values of each
3005 generation unit and the loads plus losses occurs, primary control will adapt (increase/decrease)
3006 the active power production of each unit (depending on the power shift key strategy), leading
3007 to an over- or under-frequency situation. The secondary frequency controller will then control
3008 the frequency back to its nominal value, re- establishing a cost-efficient generation delivered
3009 by each unit.

3010 Table 301 shows all attributes of PowerFrequencyController.

3011 **Table 301 – Attributes of EquipmentReliabilityProfile::PowerFrequencyController**

name	mult	type	description
mode	1..1	PowerFrequencyControlKind	(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

3012

3013 Table 302 shows all association ends of PowerFrequencyController with other classes.

3014

3015 **Table 302 – Association ends of 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.
0..1	EquipmentController	1..*	EquipmentController	(NC) inherited from: SystemControl
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3016

3017 **3.193 (NC) PowerFrequencyControlKind enumeration**

3018 Kinds of power frequency control modes.

3019 Table 303 shows all literals of PowerFrequencyControlKind.

3020 **Table 303 – Literals of EquipmentReliabilityProfile::PowerFrequencyControlKind**

literal	value	description
frequency		Frequency control mode.
activePower		Active power control mode.
activePowerAndFrequency		Active power and frequency control mode.

3021

3022 **3.194 (abstract,NC) MonitoringArea**3023 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)3024 A coherent part of the interconnected electrical power system, that includes the system
3025 operators' responsibility area and the surrounding parts of other system operators' responsibility
3026 area, that need to be monitored for security assessment.

3027 Table 304 shows all attributes of MonitoringArea.

3028

Table 304 – 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

3029

3030 **3.195 (NC) PowerBlockKind enumeration**

3031 Power block kind describes the increase and/or decrease of power.

3032 Table 305 shows all literals of PowerBlockKind.

3033

Table 305 – 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.

3034

3035 **3.196 (NC) EnergyGroup**3036 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)3037 An energy group is an aggregation of energy components which have the same energy
3038 characteristic, e.g. fuel type and technology. It can be used to allocate energy.

3039 Table 306 shows all attributes of EnergyGroup.

3040

Table 306 – 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

3041

3042 Table 307 shows all association ends of EnergyGroup with other classes.

3043 **Table 307 – Association ends of EquipmentReliabilityProfile::EnergyGroup with other**
3044 **classes**

mult from	name	mult to	type	description
0..*	SchedulingArea	1..1	SchedulingArea	(NC) The scheduling area that has this energy group.
0..*	EnergyType	0..1	EnergyType	(NC) The energy type that the energy group are defined by.

3045

3046 **3.197 (NC) EnergyKind enumeration**

3047 Categories of energy used for energy groups.

3048 Table 308 shows all literals of EnergyKind.

3049 **Table 308 – Literals of EquipmentReliabilityProfile::EnergyKind**

literal	value	description
hydroRunOfRiver		Hydro run of river.
hydroWaterReservoir		Hydro water reservoir.
hydroPump		Hydro pump.
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.

3050

3051 **3.198 (abstract,NC) EnergySourceReference root class**

3052 An energy source reference refers to a set of fuel types characteristic for reporting, e.g.
3053 European Energy Certificate System (EECS). The kind of energy should be possible to be linked
3054 with different type of energy forecast, e.g. wind production for a given area based on wind
3055 forecast.

3056 **3.199 (NC) DCHarmonicFilter**

3057 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3058 [PowerSystemResource](#) : [IdentifiedObject](#)

3059 DC harmonic filter (IEC 60633) is a filter which, in conjunction with the DC reactor(s) and with
3060 the DC surge capacitor(s), if any, serves the primary function of reducing (current or voltage)
3061 ripple on the DC transmission line and/or earth electrode line.

3062 Table 309 shows all attributes of DCHarmonicFilter.

3063 **Table 309 – 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

3064

3065 Table 310 shows all association ends of DCHarmonicFilter with other classes.

3066 **Table 310 – Association ends of EquipmentReliabilityProfile::DCHarmonicFilter with
3067 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

3068

3069 **3.200 (NC) DCSmoothingReactor**

3070 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3071 [PowerSystemResource](#) : [IdentifiedObject](#)

3072 Reactor (IEC 60633) connected in series with a converter unit or converter units on the DC side
3073 for the primary purpose of smoothing the direct current and reducing current transients.

3074 Table 311 shows all attributes of DCSmoothingReactor.

3075 **Table 311 – Attributes of EquipmentReliabilityProfile::DCSmoothingReactor**

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

3076

3077 Table 312 shows all association ends of DCSmoothingReactor with other classes.

3078 **Table 312 – Association ends of EquipmentReliabilityProfile::DCSmoothingReactor with
3079 other classes**

mult from	name	mult to	type	description
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

3080

3081 **3.201 (NC) DC Smoothing Reactor Arrester**

3082 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3083 [PowerSystemResource](#) : [IdentifiedObject](#)

3084 Arrester (IEC 60633) connected between the terminals of a smoothing reactor.

3085 Table 313 shows all attributes of DC Smoothing Reactor Arrester.

3086 **Table 313 – 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

3087

3088 Table 314 shows all association ends of DC Smoothing Reactor Arrester with other classes.

3089 **Table 314 – Association ends of**
3090 **EquipmentReliabilityProfile::DC Smoothing Reactor Arrester 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

3091

3092 **3.202 (abstract,NC) DC High Speed Switch**

3093 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
3094 [IdentifiedObject](#)

3095 High-speed DC switch (IEC 60633) is a type of switchgear used on a DC scheme, required to
3096 open or close rapidly (< 1 s), including in some cases the need to commutate load current into
3097 a parallel conducting path, but with no requirement to interrupt fault or load current. DC
3098 switchgear is usually based on a single-phase unit of an AC circuit-breaker, appropriately
3099 modified for their DC applications. Their capabilities to perform faster opening and closing than
3100 disconnect switches are used but the function of breaking short-circuit currents is not required.
3101 Table 315 shows all attributes of DC High Speed Switch.

3102 **Table 315 – Attributes of EquipmentReliabilityProfile::DC High Speed Switch**

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

3103

3104 Table 316 shows all association ends of DC High Speed Switch with other classes.

3105 **Table 316 – Association ends of EquipmentReliabilityProfile::DCHighSpeedSwitch with**
3106 **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

3107

3108 **3.203 (abstract,NC) DCCommutationSwitch**

3109 Inheritance path = [DCHighSpeedSwitch](#) : [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) :
3110 [PowerSystemResource](#) : [IdentifiedObject](#)

3111 DC commutation switch (IEC 60633) is a type of high-speed DC switch specifically designed to
3112 commutate load current into an alternative parallel current path.

3113 Table 317 shows all attributes of DCCommutationSwitch.

3114 **Table 317 – 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
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3115

3116 Table 318 shows all association ends of DCCommutationSwitch with other classes.

3117 **Table 318 – Association ends of EquipmentReliabilityProfile::DCCommutationSwitch**
3118 **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

3119

3120 **3.204 (NC) DCConverterParallelingSwitch**

3121 Inheritance path = [DCHighSpeedSwitch](#) : [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) :
3122 [PowerSystemResource](#) : [IdentifiedObject](#)

3123 Converter paralleling switch (IEC 60633) is a high-speed DC switch connected in series with
3124 each converter at the DC terminal in DC schemes where two or more converters are connected
3125 in parallel onto a common pole conductor, designed to allow additional converter(s) to be
3126 connected in parallel or disconnected without affecting the load current in the other converter.

3127 Table 319 shows all attributes of DCConverterParallelingSwitch.

3128 **Table 319 – 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	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

3129

3130

Table 320 shows all association ends of DCConverterParallelingSwitch with other classes.

3131

Table 320 – Association ends of

3132

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

3133

3134

3.205 (NC) DCBypassSwitch

3135

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

3136

3137

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 commutate 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).

3138

3139

3140

3141

3142

Table 321 shows all attributes of DCBypassSwitch.

3143

Table 321 – 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

3144

3145

Table 322 shows all association ends of DCBypassSwitch with other classes.

3146

Table 322 – Association ends of EquipmentReliabilityProfile::DCBypassSwitch with other classes

3147

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

3148

3149

3.206 (NC) DCNeutralBusGroundingSwitch

3150

Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3151

3152

Neutral bus grounding switch (IEC 60633) or a neutral bus earthing switch is a DC commutation switch connected from the neutral bus to the station earth mat on a bipolar DC scheme, designed to provide a temporary earth connection in the event of an open circuit fault on the electrode line until the imbalance of current between the two poles can be reduced to a safe minimum level or the electrode line connection can be restored.

3153

3154

3155

3156

3157

Table 323 shows all attributes of DCNeutralBusGroundingSwitch.

3158 **Table 323 – 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

3159
3160 Table 324 shows all association ends of DCNeutralBusGroundingSwitch with other classes.

3161 **Table 324 – Association ends of**
3162 **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

3163
3164 **3.207 (NC) DCNeutralBusSwitch**

3165 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3166 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3167 Neutral bus switch (IEC 60633) is a DC commutation switch connected in series with the neutral
3168 bus on a bipolar DC scheme, designed to commutate current out of the pole conductor or neutral
3169 bus and into the electrode line or dedicated metallic return conductor or earth in response to a
3170 fault in a converter or neutral bus.

3171 Table 325 shows all attributes of DCNeutralBusSwitch.

3172 **Table 325 – 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

3173
3174 Table 326 shows all association ends of DCNeutralBusSwitch with other classes.

3175 **Table 326 – Association ends of EquipmentReliabilityProfile::DCNeutralBusSwitch with**
3176 **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

3177
3178 **3.208 (NC) DCMetallicReturnSwitch**

3179 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3180 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3181 Metallic return transfer switch (IEC 60633) is a DC commutation switch used to transfer DC
3182 current from an earth return path to a metallic return path. Although the term "metallic return
3183 transfer breaker" has been widely used in the industry for many years, it is misleading since
3184 such switches have no ability to interrupt fault current.
3185 Table 327 shows all attributes of DCMetalicReturnSwitch.

3186 **Table 327 – Attributes of EquipmentReliabilityProfile::DCMetalicReturnSwitch**

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

3187
3188 Table 328 shows all association ends of DCMetalicReturnSwitch with other classes.

3189 **Table 328 – Association ends of EquipmentReliabilityProfile::DCMetalicReturnSwitch**
3190 **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

3191
3192 **3.209 (NC) DCEarthReturnTransferSwitch**
3193 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3194 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
3195 Earth return transfer switch (IEC 60633) DC commutation switch used to transfer DC current
3196 from a metallic return path to an earth return path. In some applications, this function is
3197 performed by a by-pass switch. Although the term "earth return transfer breaker" has been
3198 widely used in the industry for many years, it is misleading since such switches have no ability
3199 to interrupt fault current.

3200 Table 329 shows all attributes of DCEarthReturnTransferSwitch.

3201 **Table 329 – 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

3202
3203 Table 330 shows all association ends of DCEarthReturnTransferSwitch with other classes.

3204 **Table 330 – Association ends of**
3205 **EquipmentReliabilityProfile::DCEarthReturnTransferSwitch with other classes**

mult from	name	mult to	type	description
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

3206

3207 **3.210 (NC) DCLineParallelingSwitch**

3208 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3209 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3210 Line paralleling switch (IEC 60633) DC commutation switch placed in series with one or more
3211 high-voltage pole conductors, allowing two or more lines to be connected in parallel or to revert
3212 to single-line operation while conducting load current.

3213 Table 331 shows all attributes of DCLineParallelingSwitch.

3214 **Table 331 – 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
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3215

3216 Table 332 shows all association ends of DCLineParallelingSwitch with other classes.

3217 **Table 332 – Association ends of EquipmentReliabilityProfile::DCLineParallelingSwitch**
3218 **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

3219

3220 **3.211 (abstract,NC) DirectCurrentEquipmentController**

3221 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3222 [IdentifiedObject](#)

3223 Direct current equipment controller used to control different parts of the hierarchical structure
3224 of the DC control system defined by IEC 60633.

3225 Table 333 shows all attributes of DirectCurrentEquipmentController.

3226 **Table 333 – Attributes of**
3227 **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

3228

3229 Table 334 shows all association ends of DirectCurrentEquipmentController with other classes.

3230
3231**Table 334 – Association ends of
EquipmentReliabilityProfile::DirectCurrentEquipmentController with other classes**

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

3232

3.212 (NC) ACDCConverterController

3234 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3235 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3236 ACDC converter unit control. According to IEC 60633, it is the control system used for the
3237 controlling, monitoring and protection of a single converter unit.

3238 Table 335 shows all attributes of ACDCConverterController.

Table 335 – Attributes of EquipmentReliabilityProfile::ACDCConverterController

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

3240

3241 Table 336 shows all association ends of ACDCConverterController with other classes.

**Table 336 – 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

3244

3.213 (NC) DirectCurrentPoleController

3246 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3247 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3248 DC system pole control, which is the control system of a pole in accordance with IEC 60633.

3249 Table 337 shows all attributes of DirectCurrentPoleController.

Table 337 – 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

3250

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

3251
3252 Table 338 shows all association ends of `DirectCurrentPoleController` with other classes.

3253
3254 **Table 338 – 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

3255
3256 **3.214 (NC) DirectCurrentBipoleController**
3257 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3258 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
3259 DC system bipole control that is the control system of a bipole in accordance with IEC 60633.
3260 Table 339 shows all attributes of `DirectCurrentBipoleController`.

3261 **Table 339 – 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

3262
3263 Table 340 shows all association ends of `DirectCurrentBipoleController` with other classes.

3264
3265 **Table 340 – Association ends of
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

3266
3267 **3.215 (abstract,NC) DirectCurrentSubstationController**
3268 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3269 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3270 Control system used for the controlling, monitoring and protection within a DC substation (IEC
3271 60633). A DC substation control may be implemented at the bipole and/or pole level and may
3272 be referred to as local control.
3273 Table 341 shows all attributes of DirectCurrentSubstationController.

3274 **Table 341 – Attributes of**
3275 **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

3276
3277 Table 342 shows all association ends of DirectCurrentSubstationController with other classes.

3278 **Table 342 – Association ends of**
3279 **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

3280
3281 **3.216 (NC) DirectCurrentSubstationPoleController**

3282 Inheritance path = [DirectCurrentSubstationController](#) : [DirectCurrentEquipmentController](#) :
3283 [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
3284 Control system of a substation pole (IEC 60633).

3285 Table 343 shows all attributes of DirectCurrentSubstationPoleController.

3286 **Table 343 – Attributes of**
3287 **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

3288
3289 Table 344 shows all association ends of DirectCurrentSubstationPoleController with other
3290 classes.

3291 **Table 344 – Association ends of**
3292 **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

3293

3294 **3.217 (NC) DirectCurrentSubstationBipoleController**

3295 Inheritance path = [DirectCurrentSubstationController](#) : [DirectCurrentEquipmentController](#) :
3296 [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3297 Control system of a substation bipole (IEC 60633).

3298 Table 345 shows all attributes of DirectCurrentSubstationBipoleController.

3299 **Table 345 – Attributes of**
3300 **EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController**

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

3301

3302 Table 346 shows all association ends of DirectCurrentSubstationBipoleController with other
3303 classes.

3304 **Table 346 – Association ends of**
3305 **EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController with other**
3306 **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

3307

3308 **3.218 (NC) DCSubstation**

3309 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3310 [PowerSystemResource](#) : [IdentifiedObject](#)

3311 DC substation or DC converter station (IEC 60633) is part of an DC system which consists of
3312 one or more converter units installed in a single location together with buildings, reactors, filters,
3313 reactive power supply, control, monitoring, protective, measuring and auxiliary equipment. A

3314 DC substation forming part of an DC transmission system may be referred to as an DC
3315 transmission substation.
3316 Table 347 shows all attributes of DCSubstation.

3317 **Table 347 – 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

3318
3319 Table 348 shows all association ends of DCSubstation with other classes.

3320 **Table 348 – Association ends of EquipmentReliabilityProfile::DCSubstation with other**
3321 **classes**

mult from	name	mult to	type	description
0..*	Substation	0..1	Substation	(NC) Substation that contains this DC substation.

3322
3323 **3.219 (NC) DCSubstationPole**

3324 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3325 [PowerSystemResource](#) : [IdentifiedObject](#)
3326 Part of an DC system pole (IEC 60633) which is contained within a DC substation.
3327 Table 349 shows all attributes of DCSubstationPole.

3328 **Table 349 – 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

3329
3330 Table 350 shows all association ends of DCSubstationPole with other classes.

3331 **Table 350 – Association ends of EquipmentReliabilityProfile::DCSubstationPole with**
3332 **other classes**

mult from	name	mult to	type	description
0..*	DCSubstation	0..1	DCSubstation	(NC) DC substation that contains this DC substation pole part.

3333
3334 **3.220 (NC) DCSubstationBipole**

3335 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3336 [PowerSystemResource](#) : [IdentifiedObject](#)

3337 Part of a bipolar DC system (IEC 60633) contained within a DC substation.
3338 Table 351 shows all attributes of DCSubstationBipole.

3339 **Table 351 – 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

3340
3341 Table 352 shows all association ends of DCSubstationBipole with other classes.

3342 **Table 352 – Association ends of EquipmentReliabilityProfile::DCSubstationBipole with**
3343 **other classes**

mult from	name	mult to	type	description
0..*	DCSubstation	0..1	DCSubstation	(NC) DC substation that contains this DC substation bipole part.

3344
3345 **3.221 (abstract,NC) DCSystem**

3346 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)
3347 Electrical power system which transfers energy in the form of direct current between two or
3348 more AC buses (defined in IEC 60633).
3349 Table 353 shows all attributes of DCSystem.

3350 **Table 353 – 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

3351
3352 **3.222 (NC) BipolarDCSystem**

3353 Inheritance path = [DCSystem](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
3354 Bipolar DC system (IEC 60633) consists of two poles of opposite polarity with respect to earth.
3355 The overhead lines, if any, of the two poles may be carried on common or separate towers.
3356 Table 354 shows all attributes of BipolarDCSystem.

3357 **Table 354 – 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

name	mult	type	description
			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

3358

3359 **3.223 (NC) MonopolarDCSystem**3360 Inheritance path = [DCSystem](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3361 Monopolar DC system (IEC 60633) is a DC system with only one pole.

3362 Table 355 shows all attributes of MonopolarDCSystem.

3363 **Table 355 – 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

3364

3365 **3.224 (NC) DCBiPole**3366 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3367 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.

3368

3369 Table 356 shows all attributes of DCBiPole.

3370

3371

Table 356 – 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

3372

3373

Table 357 shows all association ends of DCBiPole with other classes.

3374

3375

Table 357 – Association ends of EquipmentReliabilityProfile::DCBiPole with other classes

mult from	name	mult to	type	description
0..1	BipolarDCSystem	0..1	BipolarDCSystem	(NC) Bipolar DC system that has this DC bipole.

3376

3.225 (abstract,NC) PointOfCommonCoupling

Inheritance path = [IdentifiedObject](#)

Point of Common Coupling (PCC) refers to the location where multiple electrical sources or loads are electrically connected and provide a reference point where the voltages and currents from different parts of the system are considered to be common. The PCC is used to support system analysis, control, and monitoring, as it provides a reference for understanding the interactions and power flow between various components within the system. It is also relevant to define the requirement and responsibility between different actors in operating a power system.

Table 358 shows all attributes of PointOfCommonCoupling.

Table 358 – 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

3388

3.226 (NC) ACPointOfCommonCoupling

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

Point of interconnection of the DC converter station to the adjacent AC system (IEC 60633).

Table 359 shows all attributes of ACPointOfCommonCoupling.

Table 359 – 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

3394
3395 Table 360 shows all association ends of ACPointOfCommonCoupling with other classes.

3396 **Table 360 – Association ends of**
3397 **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.

3398

3399 **3.227 (NC) DCPointOfCommonCoupling**

3400 Inheritance path = [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3401 Point of interconnection of the DC converter station to the DC transmission line (IEC 60633).

3402 Table 361 shows all attributes of DCPointOfCommonCoupling.

3403 **Table 361 – 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

3404

3405 Table 362 shows all association ends of DCPointOfCommonCoupling with other classes.

3406 **Table 362 – Association ends of**
3407 **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.

3408

3409 **3.228 ConnectivityNode**

3410 Inheritance path = [IdentifiedObject](#)

3411 Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.

3412 Table 363 shows all attributes of ConnectivityNode.

3414 **Table 363 – 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

3415

3416 **3.229 DCNode**

3417 Inheritance path = [IdentifiedObject](#)

3418 DC nodes are points where terminals of DC conducting equipment are connected together with
3419 zero impedance.

3420 Table 364 shows all attributes of DCNode.

3421 **Table 364 – 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

3422

3423 3.230 (NC) AutomationBlockGroup root class

3424 Grouping of function block that are operated with the same priority as settings.

3425 Table 365 shows all attributes of AutomationBlockGroup.

3426 **Table 365 – 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.

3427

3428 Table 366 shows all association ends of AutomationBlockGroup with other classes.

3429 **Table 366 – Association ends of EquipmentReliabilityProfile::AutomationBlockGroup**
3430 **with other classes**

mult from	name	mult to	type	description
0..*	AutomationFunction	1..1	AutomationFunction	(NC) Automation function which has automation block group.

3431

3432 3.231 (NC) FrequencyMonitoringTerminal root class

3433 Frequency monitoring terminal provides location in the model where the frequency is monitored
3434 for the purpose of power frequency control.

3435 Table 367 shows all attributes of FrequencyMonitoringTerminal.

3436 **Table 367 – 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.

3437

3438 Table 368 shows all association ends of FrequencyMonitoringTerminal with other classes.

3439
3440**Table 368 – 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.

3441

3.232 (NC) PowerElectronicsUnitController

3443 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3444 [IdentifiedObject](#)

3445 Power electronics unit controller is controlling the equipment to optimize the power electronics
3446 unit.

3447 Table 369 shows all attributes of PowerElectronicsUnitController.

Table 369 – 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

3449

3450 Table 370 shows all association ends of PowerElectronicsUnitController with other classes.

**Table 370 – 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

3453

3.233 (NC) ScheduleResourceController

3455 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3456 [IdentifiedObject](#)

3457 Schedule resource controller is controlling the equipment to optimize the schedule resource.

3458 Table 371 shows all attributes of ScheduleResourceController.

Table 371 – Attributes of EquipmentReliabilityProfile::ScheduleResourceController

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

3460

3461 Table 372 shows all association ends of ScheduleResourceController with other classes.

3462

3463

**Table 372 – Association ends of
EquipmentReliabilityProfile::ScheduleResourceController with other classes**

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

3464

3.234 (NC) PowerElectronicsConnectionController

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

Power electronics connection controller is controlling the equipment to optimize the power electronics connection.

Table 373 shows all attributes of PowerElectronicsConnectionController.

3471

3472

**Table 373 – 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

3473

Table 374 shows all association ends of PowerElectronicsConnectionController with other classes.

3476

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**Table 374 – Association ends of
EquipmentReliabilityProfile::PowerElectronicsConnectionController with other classes**

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

3478

3.235 (NC) DCSystemDirectionKind enumeration

Direction kinds of the DC system.

Table 375 shows all literals of DCSystemDirectionKind.

3482

Table 375 – 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

literal	value	description
		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.

3483

3484 **3.236 (NC) DCSystemTransmissionKind enumeration**

3485 DC system transmission kind.

3486 Table 376 shows all literals of DCSystemTransmissionKind.

3487 **Table 376 – 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.

3488

3489 **3.237 ReactivePower datatype**

3490 Product of RMS value of the voltage and the RMS value of the quadrature component of the current.

3492 Table 377 shows all attributes of ReactivePower.

3493 **Table 377 – Attributes of EquipmentReliabilityProfile::ReactivePower**

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

3494

3495 **3.238 (abstract) Conductor**3496 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3498 Combination of conducting material with consistent electrical characteristics, building a single electrical system, used to carry current between points in the power system.

3500 Table 378 shows all attributes of Conductor.

3501 **Table 378 – 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	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

3502

3503

Table 379 shows all association ends of Conductor with other classes.

3504

Table 379 – Association ends of EquipmentReliabilityProfile::Conductor with other classes

3505

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

3506

3507

3.239 (NC) CoordinatedCapacityCalculator

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

3509

3510

A role that coordinates and executes the task of calculating transmission capacity.

3511

Table 380 shows all attributes of CoordinatedCapacityCalculator.

3512

Table 380 – 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

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Table 381 shows all association ends of CoordinatedCapacityCalculator with other classes.

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Table 381 – Association ends of EquipmentReliabilityProfile::CoordinatedCapacityCalculator with other classes

3516

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

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3518

3.240 (NC) ACEmulationControlFunction

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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.

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The setpoint of the DC system is calculated by $P_{setpoint} = Pref + K_{dc} * (angle1 - angle2)$, where

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- Pref is the existing active power setpoint;

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- Kdc is the control system gain and

3529

- angle1 and angle2 are the phase angle measurement (measured at points of common coupling with the AC network) respectively at the side 1 and 2 of the DC system.

3530

3531

Table 382 shows all attributes of ACEmulationControlFunction.

3532 **Table 382 – 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

3533

3534 Table 383 shows all association ends of ACEmulationControlFunction with other classes.

3535

3536 **Table 383 – 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

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Annex A(informative): Sample data3541 **A.1 General**

3542 This Annex is designed to illustrate the profile by using fragments of sample data. It is not meant
3543 to be a complete set of examples covering all possibilities of using the profile. Defining a
3544 complete set of test data is considered a separate activity to be performed for the purpose of
3545 setting up interoperability testing and conformity related to this profile.

3546 **A.2 Sample instance data**

3547 Test data files are available in the CIM EG SharePoint.