



European Network of
Transmission System Operators
for Electricity

EQUIPMENT RELIABILITY PROFILE SPECIFICATION

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32

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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34

CONTENTS

35	Copyright notice:.....	2
36	Revision History.....	3
37	CONTENTS	4
38	1 Introduction	23
39	2 Application profile specification	23
40	2.1 Version information	23
41	2.2 Constraints naming convention	23
42	2.3 Profile constraints	24
43	2.4 Metadata.....	27
44	2.4.1 Constraints	27
45	2.4.2 Reference metadata	27
46	3 Detailed Profile Specification	28
47	3.1 General.....	28
48	3.2 (abstract) ACDCTerminal root class	40
49	3.3 (NC) ActivePowerControlFunction	40
50	3.4 (NC) AmbientTemperatureDependencyCurve	41
51	3.5 (NC) AreaDispatchableUnit	41
52	3.6 (abstract,NC) AutomationFunction	42
53	3.7 (NC) BaseOverloadLimitCurve	43
54	3.8 (NC) BiddingZone	43
55	3.9 (NC) BiddingZoneBorder	44
56	3.10 (NC) CapacityCalculationRegion	44
57	3.11 (NC) ChargingUnit	45
58	3.12 (abstract,NC) Circuit	46
59	3.13 (NC) CircuitShare	46
60	3.14 (NC) ClosedDistributionSystemOperator	47
61	3.15 (NC) CompensatorController	47
62	3.16 (abstract) ConductingEquipment	48
63	3.17 (abstract) ConnectivityNodeContainer	48
64	3.18 (Description) ControlArea.....	49
65	3.19 (abstract,NC) ControlFunctionBlock	50
66	3.20 (abstract) Curve	50
67	3.21 CurveData root class	51
68	3.22 (Description) DCConverterUnit.....	51
69	3.23 (abstract) DCEquipmentContainer	52
70	3.24 (Description) DCLine root class.....	52
71	3.25 (NC) DCPole	52
72	3.26 (NC) DCTieCorridor	53
73	3.27 (NC) DirectCurrentMasterController	54
74	3.28 (NC) DirectCurrentSystemOperator	55
75	3.29 (NC) DistributionSystemOperator	55
76	3.30 (NC) DurationOverloadLimitCurve	56
77	3.31 (NC) EnergyAlignmentCoordinator	56

78	3.32	(NC) EnergyBlockComponent	57
79	3.33	(NC) EnergyBlockOrder	57
80	3.34	(abstract,NC) EnergyComponent	58
81	3.35	(abstract) EnergyConnection.....	59
82	3.36	(Description) EnergyConsumer	59
83	3.37	(NC) EnergyCoordinationRegion	60
84	3.38	(NC) EnergyType	60
85	3.39	(abstract,Description) Equipment	61
86	3.40	(abstract) EquipmentContainer.....	61
87	3.41	(abstract,NC) EquipmentController	62
88	3.42	(NC) ExceptionalPowerTransferCorridor	62
89	3.43	(abstract,NC) FACTSEquipment.....	63
90	3.44	Feeder	63
91	3.45	(NC) FlexibleEnergyUnit	64
92	3.46	(abstract,NC) FunctionBlock	65
93	3.47	(abstract,NC) FunctionInputVariable	66
94	3.48	(NC) FunctionOutputVariable	66
95	3.49	(NC) GateInputPin	67
96	3.50	(Description) GeneratingUnit.....	67
97	3.51	(NC) GeothermalGeneratingUnit	69
98	3.52	(Description) HydroPump	70
99	3.53	(abstract) IdentifiedObject root class	71
100	3.54	(NC) ImpedanceControlFunction	71
101	3.55	(abstract,NC) LimitDependencyCurve	72
102	3.56	(Description) Line	72
103	3.57	(NC) LineCircuit	73
104	3.58	(NC) LoadFrequencyControlArea	73
105	3.59	(NC) LoadFrequencyControlBlock	74
106	3.60	(NC) LoadFrequencyControlOperator	75
107	3.61	(NC) ModularStaticSynchronousSeriesCompensator	75
108	3.62	(Description) NuclearGeneratingUnit	76
109	3.63	(abstract) OperationalLimit.....	77
110	3.64	(Description) OperationalLimitSet	78
111	3.65	OperationalLimitType	78
112	3.66	(NC) OrdinaryPowerTransferCorridor	79
113	3.67	Organisation	79
114	3.68	(abstract) OrganisationRole	80
115	3.69	(NC) OutageCoordinationRegion.....	80
116	3.70	(NC) OutageCoordinator	81
117	3.71	(NC) OutagePlanningAgent	81
118	3.72	(NC) PinTerminal	82
119	3.73	(NC) PowerElectricalChemicalUnit	82
120	3.74	(NC) PowerElectronicsMarineUnit	83
121	3.75	(Description) PowerElectronicsUnit	84
122	3.76	(NC) PowerFactorControlFunction	85
123	3.77	(abstract,NC) PowerSystemOrganisationRole	85

124	3.78	(abstract) PowerSystemResource	86
125	3.79	(abstract,NC) PowerTransferCorridor	86
126	3.80	(NC) PowerTransformerCircuit	86
127	3.81	(abstract,NC) PropertyReference root class	87
128	3.82	(NC) ProportionalEnergyComponent	87
129	3.83	(NC,Description) PTCTriggeredEquipment	88
130	3.84	(NC) ReactivePowerControlFunction	88
131	3.85	(NC) RecoveryOverloadLimitCurve	89
132	3.86	(abstract,NC) Region	89
133	3.87	(abstract) RegulatingCondEq	90
134	3.88	(NC) ScheduleResource	90
135	3.89	(NC) SchedulingArea	91
136	3.90	(NC) SecurityCoordinator	92
137	3.91	(NC) SolarRadiationDependencyCurve	92
138	3.92	(NC) StaticSynchronousCompensator	93
139	3.93	(NC) StaticSynchronousSeriesCompensator	94
140	3.94	(NC) SubSchedulingArea	95
141	3.95	(Description) Substation.....	96
142	3.96	(NC) SubstationController	96
143	3.97	(NC) SynchronousArea	97
144	3.98	(abstract,NC) SystemOperationCoordinator	97
145	3.99	(abstract,NC) SystemOperator	97
146	3.100	(abstract,Description) TapChanger root class	98
147	3.101	(abstract) Terminal.....	98
148	3.102	(NC) TieCorridor	98
149	3.103	(NC) ThyristorControlledSeriesCompensator.....	99
150	3.104	(NC) TransmissionSystemOperator	100
151	3.105	(NC) UnifiedPowerFlowController.....	100
152	3.106	(NC) VoltageAngleLimit.....	101
153	3.107	(NC) VoltageControlFunction	101
154	3.108	Currency enumeration.....	102
155	3.109	CurveStyle enumeration.....	106
156	3.110	(NC) MarineUnitKind enumeration.....	106
157	3.111	OperationalLimitDirectionKind enumeration.....	107
158	3.112	(NC) PinTerminalKind enumeration	107
159	3.113	(NC) NuclearReactorKind enumeration	107
160	3.114	(NC) GeothermalUnitKind enumeration	108
161	3.115	(NC) LogicalOperatorsKind enumeration	108
162	3.116	(NC) PowerElectricalChemicalUnitKind enumeration	109
163	3.117	UnitMultiplier enumeration	109
164	3.118	UnitSymbol enumeration	109
165	3.119	ActivePower datatype	111
166	3.120	ActivePowerChangeRate datatype	111
167	3.121	AngleDegrees datatype.....	111
168	3.122	Frequency datatype	111
169	3.123	Impedance datatype.....	112

170	3.124	Money datatype	112
171	3.125	PerCent datatype	112
172	3.126	Reactance datatype	112
173	3.127	Seconds datatype	113
174	3.128	VoltagePerReactivePower datatype	113
175	3.129	Boolean primitive	113
176	3.130	Decimal primitive	113
177	3.131	Duration primitive	113
178	3.132	Float primitive	113
179	3.133	Integer primitive	113
180	3.134	String primitive	113
181	3.135	(NC) ACTieCorridor	113
182	3.136	(abstract) Conductor	114
183	3.137	(NC) CurrentControlFunction	115
184	3.138	(NC) TCSCCompensationPoint root class	115
185	3.139	(NC) StaticVarCompensator	116
186	3.140	(NC) LossCurve	117
187	3.141	(Description) DCSwitch	117
188	3.142	(abstract) DCConductingEquipment	118
189	3.143	(Description) DCDisconnecter	118
190	3.144	(Description) DCBreaker	119
191	3.145	(Description) DCGround	119
192	3.146	(Description) DCBusbar	120
193	3.147	(Description) DCShunt	120
194	3.148	(Description) DCSeriesDevice	121
195	3.149	(Description) DCLineSegment	121
196	3.150	(Description) DCChopper	122
197	3.151	(Description) TieFlow	122
198	3.152	(NC) PowerPlantController	123
199	3.153	(NC) TCSCController	123
200	3.154	(NC) DCCurrentControlFunction	124
201	3.155	(NC) DCVoltageControlFunction	125
202	3.156	(NC) PhaseControlFunction	125
203	3.157	(NC) RampingPrincipleKind enumeration	126
204	3.158	(NC) DirectCurrentCircuit	126
205	3.159	(NC) OverlappingZone	127
206	3.160	(NC) TapChangerController	127
207	3.161	(NC) CurrentDroopControlFunction	128
208	3.162	(NC) VoltageInjectionControlFunction	128
209	3.163	(NC) SSSCController	129
210	3.164	(NC) CurrentDroopOverride root class	130
211	3.165	CurrentFlow datatype	131
212	3.166	Voltage datatype	131
213	3.167	PU datatype	131
214	3.168	Resistance datatype	131
215	3.169	(abstract) SynchronousMachine root class	131

216	3.170	ReactiveCapabilityCurve	132
217	3.171	Temperature datatype	132
218	3.172	Pressure datatype	133
219	3.173	(abstract) VsConverter root class	133
220	3.174	VsCapabilityCurve	133
221	3.175	(Description) EquivalentInjection root class	134
222	3.176	(NC) SSSCSimulationSettings root class	134
223	3.177	(NC) RotatingMachineController	134
224	3.178	(NC) InjectionController	135
225	3.179	(abstract) ACDCCConverter	135
226	3.180	Reservoir	136
227	3.181	(Description) HydroPowerPlant root class	136
228	3.182	(NC) InfeedLimit	137
229	3.183	(NC) InfeedTerminal root class	137
230	3.184	(NC) FuelStorage	138
231	3.185	(Description) FossilFuel root class	138
232	3.186	(NC) PowerCapacity root class	138
233	3.187	(NC) PowerShiftKeyStrategy	138
234	3.188	(NC) ShiftMethodKind enumeration	139
235	3.189	(NC) PowerShiftKeyKind enumeration	139
236	3.190	(NC) PowerBlockKind enumeration	140
237	3.191	(NC) EnergyGroup	141
238	3.192	(NC) EnergyKind enumeration	141
239	3.193	(abstract,NC) EnergySourceReference root class	142
240	3.194	(NC) DCHarmonicFilter	142
241	3.195	(NC) DCsmoothingReactor	143
242	3.196	(NC) DCsmoothingReactorArrester	143
243	3.197	(abstract,NC) DCHighSpeedSwitch	144
244	3.198	(abstract,NC) DCCommutationSwitch	144
245	3.199	(NC) DCConverterParallelingSwitch	145
246	3.200	(NC) DCBypassSwitch	145
247	3.201	(NC) DCNeutralBusGroundingSwitch	146
248	3.202	(NC) DCNeutralBusSwitch	147
249	3.203	(NC) DCMetalicReturnSwitch	147
250	3.204	(NC) DCEarthReturnTransferSwitch	148
251	3.205	(NC) DCLineParallelingSwitch	148
252	3.206	(abstract,NC) DirectCurrentEquipmentController	149
253	3.207	(NC) ACDCCConverterController	149
254	3.208	(NC) DirectCurrentPoleController	150
255	3.209	(NC) DirectCurrentBipoleController	151
256	3.210	(abstract,NC) DirectCurrentSubstationController	151
257	3.211	(NC) DirectCurrentSubstationPoleController	152
258	3.212	(NC) DirectCurrentSubstationBipoleController	152
259	3.213	(NC) DCSubstation	153
260	3.214	(NC) DCSubstationPole	154
261	3.215	(NC) DCSubstationBipole	154

262	3.216	(abstract,NC) DCSystem	155
263	3.217	(NC) BipolarDCSystem	155
264	3.218	(NC) MonopolarDCSystem	156
265	3.219	(NC) DCBiPole.....	156
266	3.220	(abstract,NC) PointOfCommonCoupling	157
267	3.221	(NC) ACPointOfCommonCoupling	157
268	3.222	(NC) DCPointOfCommonCoupling	158
269	3.223	ConnectivityNode	158
270	3.224	DCNode	158
271	3.225	(NC) AutomationBlockGroup root class	159
272	3.226	(NC) FrequencyControlFuntion	159
273	3.227	(abstract,NC) SystemControl	160
274	3.228	(NC) AreaInterchangeController	160
275	3.229	(NC) PowerFrequencyController	161
276	3.230	(NC) PowerFrequencyControlKind enumeration	162
277	3.231	(abstract,NC) MonitoringArea.....	162
278	3.232	(NC) FrequencyMonitoringTerminal root class.....	162
279	3.233	(NC) PowerElectronicsUnitController	163
280	3.234	(NC) ScheduleResourceController	163
281	3.235	(NC) PowerElectronicsConnectionController	164
282	3.236	(NC) DCSystemDirectionKind enumeration	164
283	3.237	(NC) DCSystemTransmissionKind enumeration	165
284	3.238	ReactivePower datatype	165
285	3.239	(NC) CoordinatedCapacityCalculator.....	165
286	3.240	(NC) ACEmulationControlFunction	166
287	Annex A (informative): Sample data		168
288	A.1	General.....	168
289	A.2	Sample instance data.....	168
290			
291	List of figures		
292	Figure 1 – Class diagram EquipmentReliabilityProfile::ControlMain		28
293	Figure 2 – Class diagram EquipmentReliabilityProfile::ControlFunctionBlock		29
294	Figure 3 – Class diagram EquipmentReliabilityProfile::DirectCurrentControl		29
295	Figure 4 – Class diagram EquipmentReliabilityProfile::DirectCurrentEquipment		30
296	Figure 5 – Class diagram EquipmentReliabilityProfile::DirectCurrentStructure		31
297	Figure 6 – Class diagram EquipmentReliabilityProfile::EnergyType		32
298	Figure 7 – Class diagram EquipmentReliabilityProfile::EquipmentController		32
299	Figure 8 – Class diagram EquipmentReliabilityProfile::SystemControl.....		33
300	Figure 9 – Class diagram EquipmentReliabilityProfile::Core		34
301	Figure 10 – Class diagram EquipmentReliabilityProfile::DirectCurrent.....		35
302	Figure 11 – Class diagram EquipmentReliabilityProfile::EnergyArea		36
303	Figure 12 – Class diagram EquipmentReliabilityProfile::ControllersAndFACTS		36
304	Figure 13 – Class diagram EquipmentReliabilityProfile::PowerShiftKey		37

305	Figure 14 – Class diagram EquipmentReliabilityProfile::PowerSystemOrganizationRole	38
306	Figure 15 – Class diagram EquipmentReliabilityProfile::PowerTransferCorridor	38
307	Figure 16 – Class diagram EquipmentReliabilityProfile::Production	39
308	Figure 17 – Class diagram EquipmentReliabilityProfile::ReactiveCapabilityCurve	39
309	Figure 18 – Class diagram EquipmentReliabilityProfile::ReliabilityLimits	40
310		
311	List of tables	
312	Table 1 – Attributes of EquipmentReliabilityProfile::ActivePowerControlFunction	40
313	Table 2 – Association ends of EquipmentReliabilityProfile::ActivePowerControlFunction	
314	with other classes	41
315	Table 3 – Attributes of	
316	EquipmentReliabilityProfile::AmbientTemperatureDependencyCurve	41
317	Table 4 – Attributes of EquipmentReliabilityProfile::AreaDispatchableUnit	42
318	Table 5 – Association ends of EquipmentReliabilityProfile::AreaDispatchableUnit with	
319	other classes	42
320	Table 6 – Attributes of EquipmentReliabilityProfile::AutomationFunction	42
321	Table 7 – Association ends of EquipmentReliabilityProfile::AutomationFunction with	
322	other classes	43
323	Table 8 – Attributes of EquipmentReliabilityProfile::BaseOverloadLimitCurve	43
324	Table 9 – Attributes of EquipmentReliabilityProfile::BiddingZone	43
325	Table 10 – Association ends of EquipmentReliabilityProfile::BiddingZone with other	
326	classes	44
327	Table 11 – Attributes of EquipmentReliabilityProfile::BiddingZoneBorder	44
328	Table 12 – Association ends of EquipmentReliabilityProfile::BiddingZoneBorder with	
329	other classes	44
330	Table 13 – Attributes of EquipmentReliabilityProfile::CapacityCalculationRegion	45
331	Table 14 – Association ends of EquipmentReliabilityProfile::CapacityCalculationRegion	
332	with other classes	45
333	Table 15 – Attributes of EquipmentReliabilityProfile::ChargingUnit	45
334	Table 16 – Association ends of EquipmentReliabilityProfile::ChargingUnit with other	
335	classes	46
336	Table 17 – Attributes of EquipmentReliabilityProfile::Circuit	46
337	Table 18 – Association ends of EquipmentReliabilityProfile::Circuit with other classes	46
338	Table 19 – Attributes of EquipmentReliabilityProfile::CircuitShare	46
339	Table 20 – Association ends of EquipmentReliabilityProfile::CircuitShare with other	
340	classes	47
341	Table 21 – Attributes of EquipmentReliabilityProfile::ClosedDistributionSystemOperator	47
342	Table 22 – Association ends of	
343	EquipmentReliabilityProfile::ClosedDistributionSystemOperator with other classes	47
344	Table 23 – Attributes of EquipmentReliabilityProfile::CompensatorController	48
345	Table 24 – Association ends of EquipmentReliabilityProfile::CompensatorController	
346	with other classes	48
347	Table 25 – Attributes of EquipmentReliabilityProfile::ConductingEquipment	48

348	Table 26 – Association ends of EquipmentReliabilityProfile::ConductingEquipment with	
349	other classes	48
350	Table 27 – Attributes of EquipmentReliabilityProfile::ConnectivityNodeContainer	49
351	Table 28 – Attributes of EquipmentReliabilityProfile::ControlArea	49
352	Table 29 – Association ends of EquipmentReliabilityProfile::ControlArea with other	
353	classes	49
354	Table 30 – Attributes of EquipmentReliabilityProfile::ControlFunctionBlock	50
355	Table 31 – Association ends of EquipmentReliabilityProfile::ControlFunctionBlock with	
356	other classes	50
357	Table 32 – Attributes of EquipmentReliabilityProfile::Curve	50
358	Table 33 – Attributes of EquipmentReliabilityProfile::CurveData	51
359	Table 34 – Association ends of EquipmentReliabilityProfile::CurveData with other	
360	classes	51
361	Table 35 – Attributes of EquipmentReliabilityProfile::DCConverterUnit.....	51
362	Table 36 – Association ends of EquipmentReliabilityProfile::DCConverterUnit with	
363	other classes	52
364	Table 37 – Attributes of EquipmentReliabilityProfile::DCEquipmentContainer	52
365	Table 38 – Association ends of EquipmentReliabilityProfile::DCLine with other classes	52
366	Table 39 – Attributes of EquipmentReliabilityProfile::DCPole	53
367	Table 40 – Association ends of EquipmentReliabilityProfile::DCPole with other classes	53
368	Table 41 – Attributes of EquipmentReliabilityProfile::DCTieCorridor.....	53
369	Table 42 – Association ends of EquipmentReliabilityProfile::DCTieCorridor with other	
370	classes	54
371	Table 43 – Attributes of EquipmentReliabilityProfile::DirectCurrentMasterController	54
372	Table 44 – Association ends of	
373	EquipmentReliabilityProfile::DirectCurrentMasterController with other classes	55
374	Table 45 – Attributes of EquipmentReliabilityProfile::DirectCurrentSystemOperator	55
375	Table 46 – Association ends of	
376	EquipmentReliabilityProfile::DirectCurrentSystemOperator with other classes	55
377	Table 47 – Attributes of EquipmentReliabilityProfile::DistributionSystemOperator	55
378	Table 48 – Association ends of	
379	EquipmentReliabilityProfile::DistributionSystemOperator with other classes	56
380	Table 49 – Attributes of EquipmentReliabilityProfile::DurationOverloadLimitCurve	56
381	Table 50 – Attributes of EquipmentReliabilityProfile::EnergyAlignmentCoordinator	56
382	Table 51 – Association ends of	
383	EquipmentReliabilityProfile::EnergyAlignmentCoordinator with other classes	57
384	Table 52 – Attributes of EquipmentReliabilityProfile::EnergyBlockComponent	57
385	Table 53 – Association ends of EquipmentReliabilityProfile::EnergyBlockComponent	
386	with other classes	57
387	Table 54 – Attributes of EquipmentReliabilityProfile::EnergyBlockOrder.....	57
388	Table 55 – Association ends of EquipmentReliabilityProfile::EnergyBlockOrder with	
389	other classes	58
390	Table 56 – Attributes of EquipmentReliabilityProfile::EnergyComponent	58

391	Table 57 – Association ends of EquipmentReliabilityProfile::EnergyComponent with	
392	other classes	58
393	Table 58 – Attributes of EquipmentReliabilityProfile::EnergyConnection	59
394	Table 59 – Association ends of EquipmentReliabilityProfile::EnergyConnection with	
395	other classes	59
396	Table 60 – Attributes of EquipmentReliabilityProfile::EnergyConsumer	59
397	Table 61 – Association ends of EquipmentReliabilityProfile::EnergyConsumer with	
398	other classes	60
399	Table 62 – Attributes of EquipmentReliabilityProfile::EnergyCoordinationRegion	60
400	Table 63 – Association ends of EquipmentReliabilityProfile::EnergyCoordinationRegion	
401	with other classes	60
402	Table 64 – Attributes of EquipmentReliabilityProfile::EnergyType	61
403	Table 65 – Association ends of EquipmentReliabilityProfile::EnergyType with other	
404	classes	61
405	Table 66 – Attributes of EquipmentReliabilityProfile::Equipment	61
406	Table 67 – Association ends of EquipmentReliabilityProfile::Equipment with other	
407	classes	61
408	Table 68 – Attributes of EquipmentReliabilityProfile::EquipmentContainer	62
409	Table 69 – Attributes of EquipmentReliabilityProfile::EquipmentController	62
410	Table 70 – Association ends of EquipmentReliabilityProfile::EquipmentController with	
411	other classes	62
412	Table 71 – Attributes of EquipmentReliabilityProfile::ExceptionalPowerTransferCorridor	62
413	Table 72 – Attributes of EquipmentReliabilityProfile::FACTSEquipment	63
414	Table 73 – Association ends of EquipmentReliabilityProfile::FACTSEquipment with	
415	other classes	63
416	Table 74 – Attributes of EquipmentReliabilityProfile::Feeder	64
417	Table 75 – Association ends of EquipmentReliabilityProfile::Feeder with other classes	64
418	Table 76 – Attributes of EquipmentReliabilityProfile::FlexibleEnergyUnit	64
419	Table 77 – Association ends of EquipmentReliabilityProfile::FlexibleEnergyUnit with	
420	other classes	65
421	Table 78 – Attributes of EquipmentReliabilityProfile::FunctionBlock	65
422	Table 79 – Association ends of EquipmentReliabilityProfile::FunctionBlock with other	
423	classes	66
424	Table 80 – Attributes of EquipmentReliabilityProfile::FunctionInputVariable	66
425	Table 81 – Association ends of EquipmentReliabilityProfile::FunctionInputVariable with	
426	other classes	66
427	Table 82 – Attributes of EquipmentReliabilityProfile::FunctionOutputVariable	66
428	Table 83 – Association ends of EquipmentReliabilityProfile::FunctionOutputVariable	
429	with other classes	67
430	Table 84 – Attributes of EquipmentReliabilityProfile::GateInputPin	67
431	Table 85 – Association ends of EquipmentReliabilityProfile::GateInputPin with other	
432	classes	67
433	Table 86 – Attributes of EquipmentReliabilityProfile::GeneratingUnit	68

434	Table 87 – Association ends of EquipmentReliabilityProfile::GeneratingUnit with other	
435	classes	69
436	Table 88 – Attributes of EquipmentReliabilityProfile::GeothermalGeneratingUnit.....	69
437	Table 89 – Association ends of EquipmentReliabilityProfile::GeothermalGeneratingUnit	
438	with other classes	70
439	Table 90 – Attributes of EquipmentReliabilityProfile::HydroPump	70
440	Table 91 – Association ends of EquipmentReliabilityProfile::HydroPump with other	
441	classes	71
442	Table 92 – Attributes of EquipmentReliabilityProfile::IdentifiedObject.....	71
443	Table 93 – Attributes of EquipmentReliabilityProfile::ImpedanceControlFunction	71
444	Table 94 – Association ends of EquipmentReliabilityProfile::ImpedanceControlFunction	
445	with other classes	72
446	Table 95 – Attributes of EquipmentReliabilityProfile::LimitDependencyCurve	72
447	Table 96 – Attributes of EquipmentReliabilityProfile::Line	73
448	Table 97 – Association ends of EquipmentReliabilityProfile::Line with other classes	73
449	Table 98 – Attributes of EquipmentReliabilityProfile::LineCircuit	73
450	Table 99 – Association ends of EquipmentReliabilityProfile::LineCircuit with other	
451	classes	73
452	Table 100 – Attributes of EquipmentReliabilityProfile::LoadFrequencyControlArea.....	74
453	Table 101 – Association ends of	
454	EquipmentReliabilityProfile::LoadFrequencyControlArea with other classes	74
455	Table 102 – Attributes of EquipmentReliabilityProfile::LoadFrequencyControlBlock	74
456	Table 103 – Association ends of	
457	EquipmentReliabilityProfile::LoadFrequencyControlBlock with other classes	75
458	Table 104 – Attributes of EquipmentReliabilityProfile::LoadFrequencyControlOperator	75
459	Table 105 – Association ends of	
460	EquipmentReliabilityProfile::LoadFrequencyControlOperator with other classes	75
461	Table 106 – Attributes of	
462	EquipmentReliabilityProfile::ModularStaticSynchronousSeriesCompensator	75
463	Table 107 – Association ends of	
464	EquipmentReliabilityProfile::ModularStaticSynchronousSeriesCompensator with other	
465	classes	76
466	Table 108 – Attributes of EquipmentReliabilityProfile::NuclearGeneratingUnit	76
467	Table 109 – Association ends of EquipmentReliabilityProfile::NuclearGeneratingUnit	
468	with other classes	77
469	Table 110 – Attributes of EquipmentReliabilityProfile::OperationalLimit.....	77
470	Table 111 – Association ends of EquipmentReliabilityProfile::OperationalLimit with	
471	other classes	77
472	Table 112 – Attributes of EquipmentReliabilityProfile::OperationalLimitSet	78
473	Table 113 – Association ends of EquipmentReliabilityProfile::OperationalLimitSet with	
474	other classes	78
475	Table 114 – Attributes of EquipmentReliabilityProfile::OperationalLimitType	78
476	Table 115 – Association ends of EquipmentReliabilityProfile::OperationalLimitType	
477	with other classes	79
478	Table 116 – Attributes of EquipmentReliabilityProfile::OrdinaryPowerTransferCorridor	79

479	Table 117 – Attributes of EquipmentReliabilityProfile::Organisation	79
480	Table 118 – Attributes of EquipmentReliabilityProfile::OrganisationRole	80
481	Table 119 – Association ends of EquipmentReliabilityProfile::OrganisationRole with	
482	other classes	80
483	Table 120 – Attributes of EquipmentReliabilityProfile::OutageCoordinationRegion	80
484	Table 121 – Association ends of	
485	EquipmentReliabilityProfile::OutageCoordinationRegion with other classes	81
486	Table 122 – Attributes of EquipmentReliabilityProfile::OutageCoordinator	81
487	Table 123 – Association ends of EquipmentReliabilityProfile::OutageCoordinator with	
488	other classes	81
489	Table 124 – Attributes of EquipmentReliabilityProfile::OutagePlanningAgent	81
490	Table 125 – Association ends of EquipmentReliabilityProfile::OutagePlanningAgent	
491	with other classes	82
492	Table 126 – Attributes of EquipmentReliabilityProfile::PinTerminal	82
493	Table 127 – Association ends of EquipmentReliabilityProfile::PinTerminal with other	
494	classes	82
495	Table 128 – Attributes of EquipmentReliabilityProfile::PowerElectricalChemicalUnit	83
496	Table 129 – Association ends of	
497	EquipmentReliabilityProfile::PowerElectricalChemicalUnit with other classes	83
498	Table 130 – Attributes of EquipmentReliabilityProfile::PowerElectronicsMarineUnit	83
499	Table 131 – Association ends of	
500	EquipmentReliabilityProfile::PowerElectronicsMarineUnit with other classes	84
501	Table 132 – Attributes of EquipmentReliabilityProfile::PowerElectronicsUnit	84
502	Table 133 – Association ends of EquipmentReliabilityProfile::PowerElectronicsUnit	
503	with other classes	84
504	Table 134 – Attributes of EquipmentReliabilityProfile::PowerFactorControlFunction	85
505	Table 135 – Association ends of	
506	EquipmentReliabilityProfile::PowerFactorControlFunction with other classes	85
507	Table 136 – Attributes of EquipmentReliabilityProfile::PowerSystemOrganisationRole	85
508	Table 137 – Association ends of	
509	EquipmentReliabilityProfile::PowerSystemOrganisationRole with other classes	86
510	Table 138 – Attributes of EquipmentReliabilityProfile::PowerSystemResource	86
511	Table 139 – Attributes of EquipmentReliabilityProfile::PowerTransferCorridor	86
512	Table 140 – Attributes of EquipmentReliabilityProfile::PowerTransformerCircuit	87
513	Table 141 – Association ends of EquipmentReliabilityProfile::PowerTransformerCircuit	
514	with other classes	87
515	Table 142 – Attributes of EquipmentReliabilityProfile::ProportionalEnergyComponent.....	87
516	Table 143 – Association ends of	
517	EquipmentReliabilityProfile::ProportionalEnergyComponent with other classes	87
518	Table 144 – Attributes of EquipmentReliabilityProfile::PTCTriggeredEquipment	88
519	Table 145 – Association ends of EquipmentReliabilityProfile::PTCTriggeredEquipment	
520	with other classes	88
521	Table 146 – Attributes of EquipmentReliabilityProfile::ReactivePowerControlFunction	88

522	Table 147 – Association ends of	
523	EquipmentReliabilityProfile::ReactivePowerControlFunction with other classes	89
524	Table 148 – Attributes of EquipmentReliabilityProfile::RecoveryOverloadLimitCurve	89
525	Table 149 – Attributes of EquipmentReliabilityProfile::Region	89
526	Table 150 – Association ends of EquipmentReliabilityProfile::Region with other classes	89
527	Table 151 – Attributes of EquipmentReliabilityProfile::RegulatingCondEq	90
528	Table 152 – Association ends of EquipmentReliabilityProfile::RegulatingCondEq with	
529	other classes	90
530	Table 153 – Attributes of EquipmentReliabilityProfile::ScheduleResource	90
531	Table 154 – Association ends of EquipmentReliabilityProfile::ScheduleResource with	
532	other classes	91
533	Table 155 – Attributes of EquipmentReliabilityProfile::SchedulingArea.....	91
534	Table 156 – Association ends of EquipmentReliabilityProfile::SchedulingArea with	
535	other classes	92
536	Table 157 – Attributes of EquipmentReliabilityProfile::SecurityCoordinator	92
537	Table 158 – Association ends of EquipmentReliabilityProfile::SecurityCoordinator with	
538	other classes	92
539	Table 159 – Attributes of EquipmentReliabilityProfile::SolarRadiationDependencyCurve	93
540	Table 160 – Attributes of EquipmentReliabilityProfile::StaticSynchronousCompensator	93
541	Table 161 – Association ends of	
542	EquipmentReliabilityProfile::StaticSynchronousCompensator with other classes	94
543	Table 162 – Attributes of	
544	EquipmentReliabilityProfile::StaticSynchronousSeriesCompensator	94
545	Table 163 – Association ends of	
546	EquipmentReliabilityProfile::StaticSynchronousSeriesCompensator with other classes	95
547	Table 164 – Attributes of EquipmentReliabilityProfile::SubSchedulingArea	95
548	Table 165 – Association ends of EquipmentReliabilityProfile::SubSchedulingArea with	
549	other classes	95
550	Table 166 – Attributes of EquipmentReliabilityProfile::Substation.....	96
551	Table 167 – Association ends of EquipmentReliabilityProfile::Substation with other	
552	classes	96
553	Table 168 – Attributes of EquipmentReliabilityProfile::SubstationController	96
554	Table 169 – Association ends of EquipmentReliabilityProfile::SubstationController with	
555	other classes	96
556	Table 170 – Attributes of EquipmentReliabilityProfile::SynchronousArea.....	97
557	Table 171 – Attributes of EquipmentReliabilityProfile::SystemOperationCoordinator	97
558	Table 172 – Association ends of	
559	EquipmentReliabilityProfile::SystemOperationCoordinator with other classes.....	97
560	Table 173 – Attributes of EquipmentReliabilityProfile::SystemOperator	97
561	Table 174 – Association ends of EquipmentReliabilityProfile::SystemOperator with	
562	other classes	98
563	Table 175 – Association ends of EquipmentReliabilityProfile::TapChanger with other	
564	classes	98
565	Table 176 – Attributes of EquipmentReliabilityProfile::TieCorridor.....	98

566	Table 177 – Association ends of EquipmentReliabilityProfile::TieCorridor with other	
567	classes	99
568	Table 178 – Attributes of	
569	EquipmentReliabilityProfile::ThyristorControlledSeriesCompensator	99
570	Table 179 – Association ends of	
571	EquipmentReliabilityProfile::ThyristorControlledSeriesCompensator with other classes	100
572	Table 180 – Attributes of EquipmentReliabilityProfile::TransmissionSystemOperator	100
573	Table 181 – Association ends of	
574	EquipmentReliabilityProfile::TransmissionSystemOperator with other classes	100
575	Table 182 – Attributes of EquipmentReliabilityProfile::UnifiedPowerFlowController	100
576	Table 183 – Association ends of	
577	EquipmentReliabilityProfile::UnifiedPowerFlowController with other classes	101
578	Table 184 – Attributes of EquipmentReliabilityProfile::VoltageAngleLimit	101
579	Table 185 – Association ends of EquipmentReliabilityProfile::VoltageAngleLimit with	
580	other classes	101
581	Table 186 – Attributes of EquipmentReliabilityProfile::VoltageControlFunction	102
582	Table 187 – Association ends of EquipmentReliabilityProfile::VoltageControlFunction	
583	with other classes	102
584	Table 188 – Literals of EquipmentReliabilityProfile::Currency	102
585	Table 189 – Literals of EquipmentReliabilityProfile::CurveStyle.....	106
586	Table 190 – Literals of EquipmentReliabilityProfile::MarineUnitKind.....	107
587	Table 191 – Literals of EquipmentReliabilityProfile::OperationalLimitDirectionKind	107
588	Table 192 – Literals of EquipmentReliabilityProfile::PinTerminalKind	107
589	Table 193 – Literals of EquipmentReliabilityProfile::NuclearReactorKind	108
590	Table 194 – Literals of EquipmentReliabilityProfile::GeothermalUnitKind	108
591	Table 195 – Literals of EquipmentReliabilityProfile::LogicalOperatorsKind	108
592	Table 196 – Literals of EquipmentReliabilityProfile::PowerElectricalChemicalUnitKind	109
593	Table 197 – Literals of EquipmentReliabilityProfile::UnitMultiplier	109
594	Table 198 – Literals of EquipmentReliabilityProfile::UnitSymbol.....	110
595	Table 199 – Attributes of EquipmentReliabilityProfile::ActivePower	111
596	Table 200 – Attributes of EquipmentReliabilityProfile::ActivePowerChangeRate	111
597	Table 201 – Attributes of EquipmentReliabilityProfile::AngleDegrees	111
598	Table 202 – Attributes of EquipmentReliabilityProfile::Frequency	112
599	Table 203 – Attributes of EquipmentReliabilityProfile::Impedance	112
600	Table 204 – Attributes of EquipmentReliabilityProfile::Money	112
601	Table 205 – Attributes of EquipmentReliabilityProfile::PerCent	112
602	Table 206 – Attributes of EquipmentReliabilityProfile::Reactance.....	112
603	Table 207 – Attributes of EquipmentReliabilityProfile::Seconds.....	113
604	Table 208 – Attributes of EquipmentReliabilityProfile::VoltagePerReactivePower.....	113
605	Table 209 – Attributes of EquipmentReliabilityProfile::ACTieCorridor	114
606	Table 210 – Association ends of EquipmentReliabilityProfile::ACTieCorridor with other	
607	classes	114
608	Table 211 – Attributes of EquipmentReliabilityProfile::Conductor	114

609	Table 212 – Association ends of EquipmentReliabilityProfile::Conductor with other	
610	classes	114
611	Table 213 – Attributes of EquipmentReliabilityProfile::CurrentControlFunction	115
612	Table 214 – Association ends of EquipmentReliabilityProfile::CurrentControlFunction	
613	with other classes	115
614	Table 215 – Attributes of EquipmentReliabilityProfile::TCSCCompensationPoint	115
615	Table 216 – Association ends of EquipmentReliabilityProfile::TCSCCompensationPoint	
616	with other classes	116
617	Table 217 – Attributes of EquipmentReliabilityProfile::StaticVarCompensator	116
618	Table 218 – Association ends of EquipmentReliabilityProfile::StaticVarCompensator	
619	with other classes	116
620	Table 219 – Attributes of EquipmentReliabilityProfile::LossCurve	117
621	Table 220 – Association ends of EquipmentReliabilityProfile::LossCurve with other	
622	classes	117
623	Table 221 – Attributes of EquipmentReliabilityProfile::DCSwitch	117
624	Table 222 – Association ends of EquipmentReliabilityProfile::DCSwitch with other	
625	classes	118
626	Table 223 – Attributes of EquipmentReliabilityProfile::DCConductingEquipment	118
627	Table 224 – Association ends of EquipmentReliabilityProfile::DCConductingEquipment	
628	with other classes	118
629	Table 225 – Attributes of EquipmentReliabilityProfile::DCDisconnecter	118
630	Table 226 – Association ends of EquipmentReliabilityProfile::DCDisconnecter with	
631	other classes	119
632	Table 227 – Attributes of EquipmentReliabilityProfile::DCBreaker	119
633	Table 228 – Association ends of EquipmentReliabilityProfile::DCBreaker with other	
634	classes	119
635	Table 229 – Attributes of EquipmentReliabilityProfile::DCGround	119
636	Table 230 – Association ends of EquipmentReliabilityProfile::DCGround with other	
637	classes	120
638	Table 231 – Attributes of EquipmentReliabilityProfile::DCBusbar	120
639	Table 232 – Association ends of EquipmentReliabilityProfile::DCBusbar with other	
640	classes	120
641	Table 233 – Attributes of EquipmentReliabilityProfile::DCShunt	120
642	Table 234 – Association ends of EquipmentReliabilityProfile::DCShunt with other	
643	classes	121
644	Table 235 – Attributes of EquipmentReliabilityProfile::DCSeriesDevice	121
645	Table 236 – Association ends of EquipmentReliabilityProfile::DCSeriesDevice with	
646	other classes	121
647	Table 237 – Attributes of EquipmentReliabilityProfile::DCLineSegment	121
648	Table 238 – Association ends of EquipmentReliabilityProfile::DCLineSegment with	
649	other classes	122
650	Table 239 – Attributes of EquipmentReliabilityProfile::DCChopper	122
651	Table 240 – Association ends of EquipmentReliabilityProfile::DCChopper with other	
652	classes	122
653	Table 241 – Attributes of EquipmentReliabilityProfile::TieFlow	123

654	Table 242 – Association ends of EquipmentReliabilityProfile::TieFlow with other	
655	classes	123
656	Table 243 – Attributes of EquipmentReliabilityProfile::PowerPlantController	123
657	Table 244 – Association ends of EquipmentReliabilityProfile::PowerPlantController with	
658	other classes	123
659	Table 245 – Attributes of EquipmentReliabilityProfile::TCSCController	123
660	Table 246 – Association ends of EquipmentReliabilityProfile::TCSCController with	
661	other classes	124
662	Table 247 – Attributes of EquipmentReliabilityProfile::DCCurrentControlFunction	124
663	Table 248 – Association ends of	
664	EquipmentReliabilityProfile::DCCurrentControlFunction with other classes	124
665	Table 249 – Attributes of EquipmentReliabilityProfile::DCVoltageControlFunction	125
666	Table 250 – Association ends of	
667	EquipmentReliabilityProfile::DCVoltageControlFunction with other classes	125
668	Table 251 – Attributes of EquipmentReliabilityProfile::PhaseControlFunction	125
669	Table 252 – Association ends of EquipmentReliabilityProfile::PhaseControlFunction	
670	with other classes	126
671	Table 253 – Literals of EquipmentReliabilityProfile::RampingPrincipleKind	126
672	Table 254 – Attributes of EquipmentReliabilityProfile::DirectCurrentCircuit	127
673	Table 255 – Association ends of EquipmentReliabilityProfile::DirectCurrentCircuit with	
674	other classes	127
675	Table 256 – Attributes of EquipmentReliabilityProfile::OverlappingZone	127
676	Table 257 – Attributes of EquipmentReliabilityProfile::TapChangerController	127
677	Table 258 – Association ends of EquipmentReliabilityProfile::TapChangerController	
678	with other classes	128
679	Table 259 – Attributes of EquipmentReliabilityProfile::CurrentDroopControlFunction	128
680	Table 260 – Association ends of	
681	EquipmentReliabilityProfile::CurrentDroopControlFunction with other classes	128
682	Table 261 – Attributes of EquipmentReliabilityProfile::VoltageInjectionControlFunction	129
683	Table 262 – Association ends of	
684	EquipmentReliabilityProfile::VoltageInjectionControlFunction with other classes	129
685	Table 263 – Attributes of EquipmentReliabilityProfile::SSSCController	129
686	Table 264 – Association ends of EquipmentReliabilityProfile::SSSCController with	
687	other classes	130
688	Table 265 – Attributes of EquipmentReliabilityProfile::CurrentDroopOverride	130
689	Table 266 – Association ends of EquipmentReliabilityProfile::CurrentDroopOverride	
690	with other classes	130
691	Table 267 – Attributes of EquipmentReliabilityProfile::CurrentFlow	131
692	Table 268 – Attributes of EquipmentReliabilityProfile::Voltage	131
693	Table 269 – Attributes of EquipmentReliabilityProfile::PU	131
694	Table 270 – Attributes of EquipmentReliabilityProfile::Resistance	131
695	Table 271 – Attributes of EquipmentReliabilityProfile::ReactiveCapabilityCurve	132
696	Table 272 – Association ends of EquipmentReliabilityProfile::ReactiveCapabilityCurve	
697	with other classes	132

698	Table 273 – Attributes of EquipmentReliabilityProfile::Temperature	132
699	Table 274 – Attributes of EquipmentReliabilityProfile::Pressure	133
700	Table 275 – Attributes of EquipmentReliabilityProfile::VsCapabilityCurve	133
701	Table 276 – Association ends of EquipmentReliabilityProfile::VsCapabilityCurve with	
702	other classes	133
703	Table 277 – Association ends of EquipmentReliabilityProfile::EquivalentInjection with	
704	other classes	134
705	Table 278 – Attributes of EquipmentReliabilityProfile::SSCSimulationSettings	134
706	Table 279 – Attributes of EquipmentReliabilityProfile::RotatingMachineController	135
707	Table 280 – Association ends of	
708	EquipmentReliabilityProfile::RotatingMachineController with other classes	135
709	Table 281 – Attributes of EquipmentReliabilityProfile::InjectionController	135
710	Table 282 – Association ends of EquipmentReliabilityProfile::InjectionController with	
711	other classes	135
712	Table 283 – Attributes of EquipmentReliabilityProfile::ACDCConverter	136
713	Table 284 – Association ends of EquipmentReliabilityProfile::ACDCConverter with	
714	other classes	136
715	Table 285 – Attributes of EquipmentReliabilityProfile::Reservoir	136
716	Table 286 – Association ends of EquipmentReliabilityProfile::HydroPowerPlant with	
717	other classes	136
718	Table 287 – Attributes of EquipmentReliabilityProfile::InfeedLimit	137
719	Table 288 – Association ends of EquipmentReliabilityProfile::InfeedLimit with other	
720	classes	137
721	Table 289 – Attributes of EquipmentReliabilityProfile::InfeedTerminal	137
722	Table 290 – Association ends of EquipmentReliabilityProfile::InfeedTerminal with other	
723	classes	137
724	Table 291 – Attributes of EquipmentReliabilityProfile::FuelStorage	138
725	Table 292 – Association ends of EquipmentReliabilityProfile::FossilFuel with other	
726	classes	138
727	Table 293 – Attributes of EquipmentReliabilityProfile::PowerShiftKeyStrategy	138
728	Table 294 – Association ends of EquipmentReliabilityProfile::PowerShiftKeyStrategy	
729	with other classes	139
730	Table 295 – Literals of EquipmentReliabilityProfile::ShiftMethodKind	139
731	Table 296 – Literals of EquipmentReliabilityProfile::PowerShiftKeyKind	140
732	Table 297 – Literals of EquipmentReliabilityProfile::PowerBlockKind	140
733	Table 298 – Attributes of EquipmentReliabilityProfile::EnergyGroup	141
734	Table 299 – Association ends of EquipmentReliabilityProfile::EnergyGroup with other	
735	classes	141
736	Table 300 – Literals of EquipmentReliabilityProfile::EnergyKind	141
737	Table 301 – Attributes of EquipmentReliabilityProfile::DCHarmonicFilter	142
738	Table 302 – Association ends of EquipmentReliabilityProfile::DCHarmonicFilter with	
739	other classes	142
740	Table 303 – Attributes of EquipmentReliabilityProfile::DCSmoothingReactor	143

741	Table 304 – Association ends of EquipmentReliabilityProfile::DCSmoothingReactor	
742	with other classes	143
743	Table 305 – Attributes of EquipmentReliabilityProfile::DCSmoothingReactorArrester	143
744	Table 306 – Association ends of	
745	EquipmentReliabilityProfile::DCSmoothingReactorArrester with other classes	144
746	Table 307 – Attributes of EquipmentReliabilityProfile::DCHighSpeedSwitch	144
747	Table 308 – Association ends of EquipmentReliabilityProfile::DCHighSpeedSwitch with	
748	other classes	144
749	Table 309 – Attributes of EquipmentReliabilityProfile::DCCommutationSwitch	144
750	Table 310 – Association ends of EquipmentReliabilityProfile::DCCommutationSwitch	
751	with other classes	145
752	Table 311 – Attributes of EquipmentReliabilityProfile::DCConverterParallelingSwitch	145
753	Table 312 – Association ends of	
754	EquipmentReliabilityProfile::DCConverterParallelingSwitch with other classes	145
755	Table 313 – Attributes of EquipmentReliabilityProfile::DCBypassSwitch	146
756	Table 314 – Association ends of EquipmentReliabilityProfile::DCBypassSwitch with	
757	other classes	146
758	Table 315 – Attributes of EquipmentReliabilityProfile::DCNeutralBusGroundingSwitch	146
759	Table 316 – Association ends of	
760	EquipmentReliabilityProfile::DCNeutralBusGroundingSwitch with other classes	146
761	Table 317 – Attributes of EquipmentReliabilityProfile::DCNeutralBusSwitch	147
762	Table 318 – Association ends of EquipmentReliabilityProfile::DCNeutralBusSwitch with	
763	other classes	147
764	Table 319 – Attributes of EquipmentReliabilityProfile::DCMetalicReturnSwitch	147
765	Table 320 – Association ends of EquipmentReliabilityProfile::DCMetalicReturnSwitch	
766	with other classes	148
767	Table 321 – Attributes of EquipmentReliabilityProfile::DCEarthReturnTransferSwitch	148
768	Table 322 – Association ends of	
769	EquipmentReliabilityProfile::DCEarthReturnTransferSwitch with other classes	148
770	Table 323 – Attributes of EquipmentReliabilityProfile::DCLineParallelingSwitch	148
771	Table 324 – Association ends of EquipmentReliabilityProfile::DCLineParallelingSwitch	
772	with other classes	149
773	Table 325 – Attributes of	
774	EquipmentReliabilityProfile::DirectCurrentEquipmentController	149
775	Table 326 – Association ends of	
776	EquipmentReliabilityProfile::DirectCurrentEquipmentController with other classes	149
777	Table 327 – Attributes of EquipmentReliabilityProfile::ACDCConverterController	149
778	Table 328 – Association ends of EquipmentReliabilityProfile::ACDCConverterController	
779	with other classes	150
780	Table 329 – Attributes of EquipmentReliabilityProfile::DirectCurrentPoleController	150
781	Table 330 – Association ends of	
782	EquipmentReliabilityProfile::DirectCurrentPoleController with other classes	150
783	Table 331 – Attributes of EquipmentReliabilityProfile::DirectCurrentBipoleController	151
784	Table 332 – Association ends of	
785	EquipmentReliabilityProfile::DirectCurrentBipoleController with other classes	151

786	Table 333 – Attributes of	
787	EquipmentReliabilityProfile::DirectCurrentSubstationController	151
788	Table 334 – Association ends of	
789	EquipmentReliabilityProfile::DirectCurrentSubstationController with other classes	152
790	Table 335 – Attributes of	
791	EquipmentReliabilityProfile::DirectCurrentSubstationPoleController	152
792	Table 336 – Association ends of	
793	EquipmentReliabilityProfile::DirectCurrentSubstationPoleController with other classes	152
794	Table 337 – Attributes of	
795	EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController	152
796	Table 338 – Association ends of	
797	EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController with other classes	153
798	Table 339 – Attributes of EquipmentReliabilityProfile::DCSubstation	153
799	Table 340 – Association ends of EquipmentReliabilityProfile::DCSubstation with other	
800	classes	154
801	Table 341 – Attributes of EquipmentReliabilityProfile::DCSubstationPole	154
802	Table 342 – Association ends of EquipmentReliabilityProfile::DCSubstationPole with	
803	other classes	154
804	Table 343 – Attributes of EquipmentReliabilityProfile::DCSubstationBipole	154
805	Table 344 – Association ends of EquipmentReliabilityProfile::DCSubstationBipole with	
806	other classes	155
807	Table 345 – Attributes of EquipmentReliabilityProfile::DCSystem	155
808	Table 346 – Attributes of EquipmentReliabilityProfile::BipolarDCSystem	155
809	Table 347 – Attributes of EquipmentReliabilityProfile::MonopolarDCSystem	156
810	Table 348 – Attributes of EquipmentReliabilityProfile::DCBiPole	156
811	Table 349 – Association ends of EquipmentReliabilityProfile::DCBiPole with other	
812	classes	157
813	Table 350 – Attributes of EquipmentReliabilityProfile::PointOfCommonCoupling	157
814	Table 351 – Attributes of EquipmentReliabilityProfile::ACPointOfCommonCoupling	157
815	Table 352 – Association ends of	
816	EquipmentReliabilityProfile::ACPointOfCommonCoupling with other classes	157
817	Table 353 – Attributes of EquipmentReliabilityProfile::DCPointOfCommonCoupling	158
818	Table 354 – Association ends of	
819	EquipmentReliabilityProfile::DCPointOfCommonCoupling with other classes	158
820	Table 355 – Attributes of EquipmentReliabilityProfile::ConnectivityNode	158
821	Table 356 – Attributes of EquipmentReliabilityProfile::DCNode	158
822	Table 357 – Attributes of EquipmentReliabilityProfile::AutomationBlockGroup	159
823	Table 358 – Association ends of EquipmentReliabilityProfile::AutomationBlockGroup	
824	with other classes	159
825	Table 359 – Attributes of EquipmentReliabilityProfile::FrequencyControlFuntion	159
826	Table 360 – Association ends of EquipmentReliabilityProfile::FrequencyControlFuntion	
827	with other classes	159
828	Table 361 – Attributes of EquipmentReliabilityProfile::SystemControl	160
829	Table 362 – Association ends of EquipmentReliabilityProfile::SystemControl with other	
830	classes	160

831	Table 363 – Attributes of EquipmentReliabilityProfile::AreaInterchangeController	160
832	Table 364 – Association ends of	
833	EquipmentReliabilityProfile::AreaInterchangeController with other classes	161
834	Table 365 – Attributes of EquipmentReliabilityProfile::PowerFrequencyController	161
835	Table 366 – Association ends of	
836	EquipmentReliabilityProfile::PowerFrequencyController with other classes	161
837	Table 367 – Literals of EquipmentReliabilityProfile::PowerFrequencyControlKind	162
838	Table 368 – Attributes of EquipmentReliabilityProfile::MonitoringArea	162
839	Table 369 – Attributes of EquipmentReliabilityProfile::FrequencyMonitoringTerminal	162
840	Table 370 – Association ends of	
841	EquipmentReliabilityProfile::FrequencyMonitoringTerminal with other classes	163
842	Table 371 – Attributes of EquipmentReliabilityProfile::PowerElectronicsUnitController	163
843	Table 372 – Association ends of	
844	EquipmentReliabilityProfile::PowerElectronicsUnitController with other classes	163
845	Table 373 – Attributes of EquipmentReliabilityProfile::ScheduleResourceController	163
846	Table 374 – Association ends of	
847	EquipmentReliabilityProfile::ScheduleResourceController with other classes	164
848	Table 375 – Attributes of	
849	EquipmentReliabilityProfile::PowerElectronicsConnectionController	164
850	Table 376 – Association ends of	
851	EquipmentReliabilityProfile::PowerElectronicsConnectionController with other classes	164
852	Table 377 – Literals of EquipmentReliabilityProfile::DCSystemDirectionKind	165
853	Table 378 – Literals of EquipmentReliabilityProfile::DCSystemTransmissionKind	165
854	Table 379 – Attributes of EquipmentReliabilityProfile::ReactivePower	165
855	Table 380 – Attributes of EquipmentReliabilityProfile::CoordinatedCapacityCalculator	165
856	Table 381 – Association ends of	
857	EquipmentReliabilityProfile::CoordinatedCapacityCalculator with other classes	166
858	Table 382 – Attributes of EquipmentReliabilityProfile::ACEmulationControlFunction	166
859	Table 383 – Association ends of	
860	EquipmentReliabilityProfile::ACEmulationControlFunction with other classes	167
861		

862 1 Introduction

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

865 2 Application profile specification

866 2.1 Version information

867 The content is generated from UML model file CIM17-2_CGMES31v01_PROF-
868 20v02_NC23v66_MS10v01_DES10v01.eap.

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

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

881

882 2.2 Constraints naming convention

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

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

886 where

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

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

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

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

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

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

898 **2.3 Profile constraints**

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

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

- 904 • C:452:ALL:NA:datatypes

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

- 907 • R:452:ALL:NA:exchange

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

- 910 • R:452:ALL:NA:exchange1

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

- 916 • R:452:ALL:NA:exchange2

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

- 925 • R:452:ALL:NA:exchange3

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

- 929 • R:452:ALL:NA:exchange4

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

- 941 • R:452:ALL:NA:cardinality

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

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

984 • C:NC:ER:AreaDispatchableUnit:associations

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

987 • C:NC:ER:EnergyComponent:associations

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

990 • R:NC:ER:VoltageAngleLimit:AngleReferenceTerminal

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

995 • R:NC:ALL:NA:serialization

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

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

1001 Due to the complexity of the profiles, there are various cross profile associations that,
1002 from profiling and profile maintenance point of view, it is not practical to include the
1003 complete inheritance structure in all profiles. If this is done the documentation provided
1004 for all profiles would also include duplicated information on the description of classes
1005 defined in other profiles. The following cases are often observed in profiles:

- 1006 ○ Case 1: An association end refers to an abstract class
- 1007 ○ Case 2: An abstract class (stereotyped with "Description") has an association
1008 (direction to another class)
- 1009 ○ Case 3: An abstract class (not stereotyped with "Description") has an
1010 association (direction to another class)
- 1011 ○ Case 4: An abstract class has attributes and subclasses are not in the profile

1012 In all cases, the datasets shall only include the subtypes of the abstract classes with
1013 the related properties (i.e. association or attributes) defined in the profile. The
1014 information is taken from either canonical model or the profiles where complete
1015 (expected) inheritance structure for the related abstract class is described. SHACL
1016 based constraints include constraints only for the concrete classes that are subtypes of
1017 the abstract class in the profile, and this can be used to inform which are the concrete
1018 classes expected in a dataset that conforms to this profile.

1019 It should be taken into account that this approach deviates from MVAL5 (IEC 61970-
1020 600-1:2021), which creates multiple inheritance at serialization. For instance, with this
1021 more explicit exchange the serialization of the association between abstract class
1022 Equipment and abstract class Circuit for a PowerTransformer will be serialized as
1023 follows:

- 1024 ○ for association

1025 <cim:PowerTransformer rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">

1026 <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>

1027 </cim:PowerTransformer>

1028 ○ for attribute

1029 <cim:ACLineSegment rdf:about="_04f681aa-6999-4fb3-9775-aca5eb7ceff">

1030 <cim:Equipment.inService>true</cim:Equipment.inService>

1031 </cim:ACLineSegment>

1032 The usage of rdf:ID or rdf:about depends on the stereotype of the class. rdf:about is
1033 used if the class has the stereotype "Description".

1034 An example of not allowed serialization, as the Equipment is an abstract class

1035 <cim:Equipment rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">

1036 <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>

1037 </cim:Equipment>

1038 ● C:NC:ER:HydroPowerPlant:operatingMode

1039 The SynchronousMachine.operatingMode of all SynchronousMachine objects part of a
1040 HydroPowerPlant shall be consistent.

1041 ● C:NC:ER:Circuit:associations

1042 The Circuit shall be associated with either Equipment or Terminal.

1043 2.4 Metadata

1044 ENTSO-E agreed to extend the header and metadata definitions by IEC 61970-552 Ed2. This
1045 new header definitions rely on W3C recommendations which are used worldwide and are
1046 positively recognised by the European Commission. The new definitions of the header mainly
1047 use Provenance ontology (PROV-O), Time Ontology and Data Catalog Vocabulary (DCAT). The
1048 global new header applicable for this profile is included in the metadata and document header
1049 specification document.

1050 The header vocabulary contains all attributes defined in IEC 61970-552. This is done only for
1051 the purpose of having one vocabulary for header and to ensure transition for data exchanges
1052 that are using IEC 61970-552:2016 header. This profile does not use IEC 61970-552:2016
1053 header attributes and relies only on the extended attributes.

1054 2.4.1 Constraints

1055 The identification of the constraints related to the metadata follows the same convention for
1056 naming of the constraints as for profile constraints.

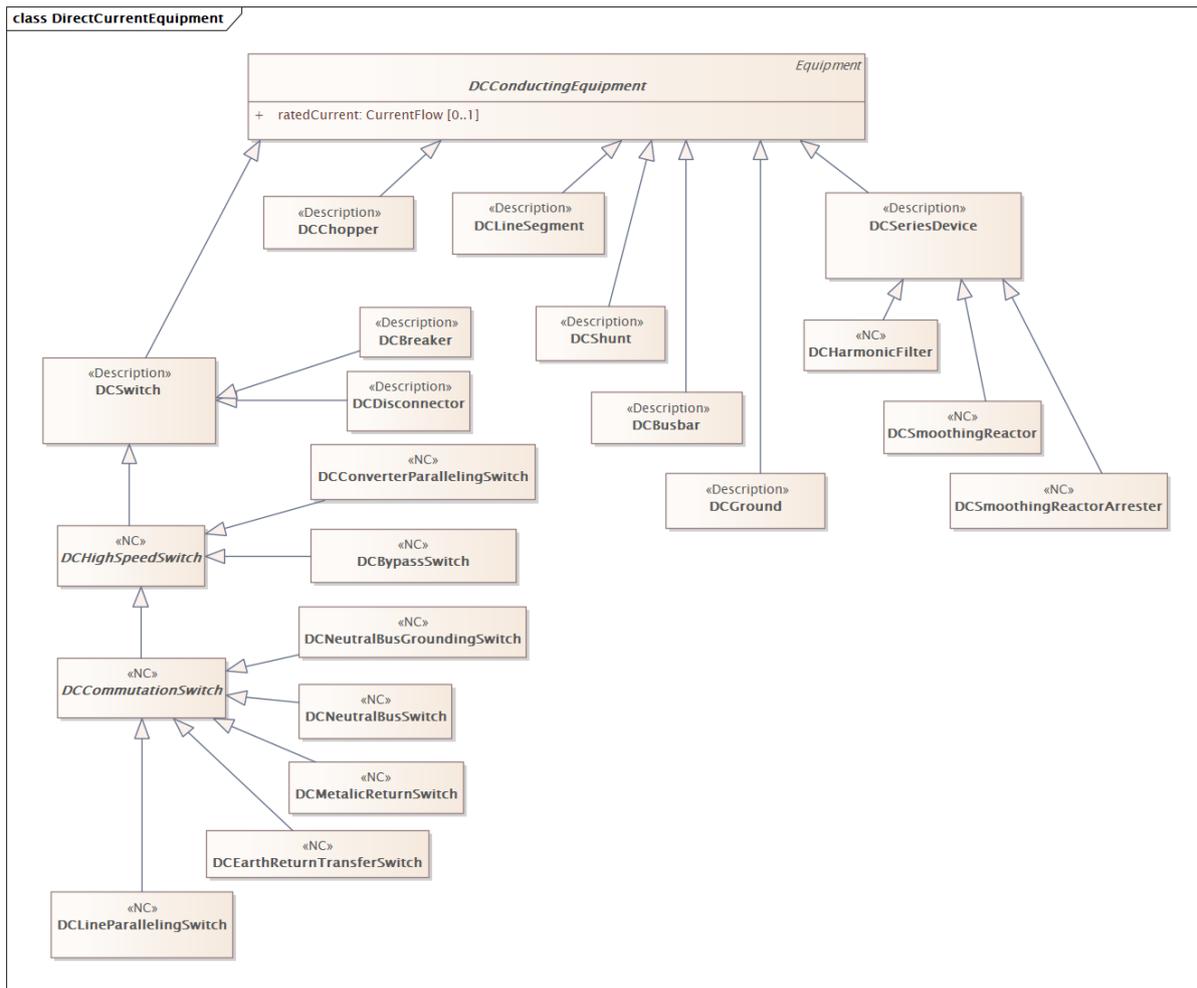
1057 ● R:NC:ALL:wasAttributedTo:usage

1058 The prov:wasAttributedTo should normally be the "X" EIC code of the actor or their URI
1059 (prov:Agent).

1060

1061 2.4.2 Reference metadata

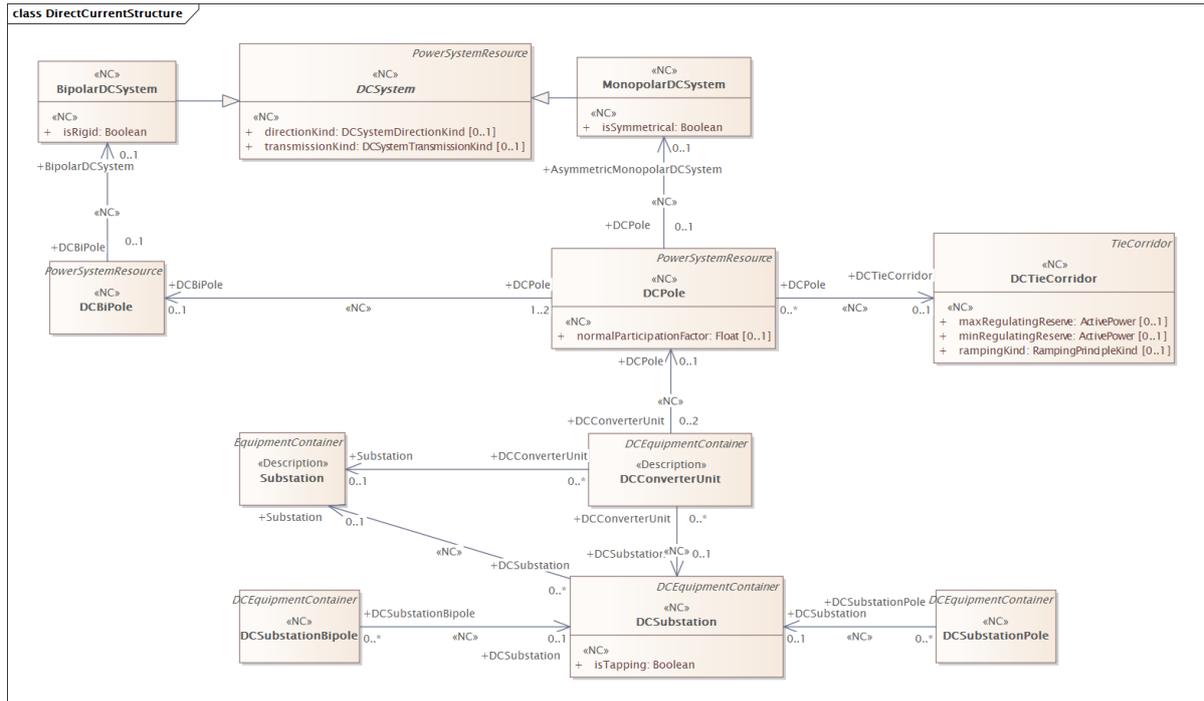
1062 The header defined for this profile requires availability of a set of reference metadata. For
1063 instance, the attribute prov:wasGeneratedBy requires a reference to an activity which produced



1082

1083 **Figure 4 – Class diagram EquipmentReliabilityProfile::DirectCurrentEquipment**

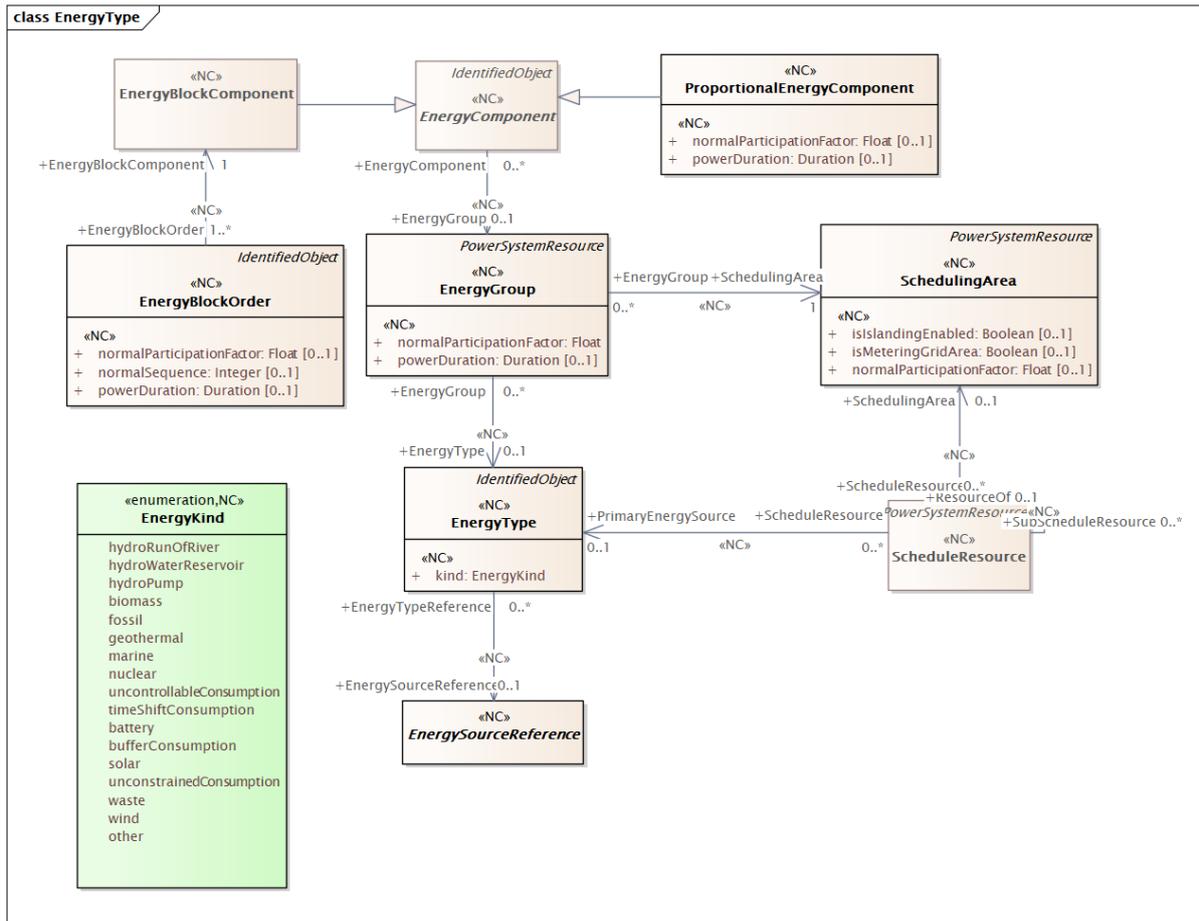
1084 Figure 4: The diagram shows the DC equipment model.



1085

1086 **Figure 5 – Class diagram EquipmentReliabilityProfile::DirectCurrentStructure**

1087 Figure 5: The diagram contains classes related to direct current structure.

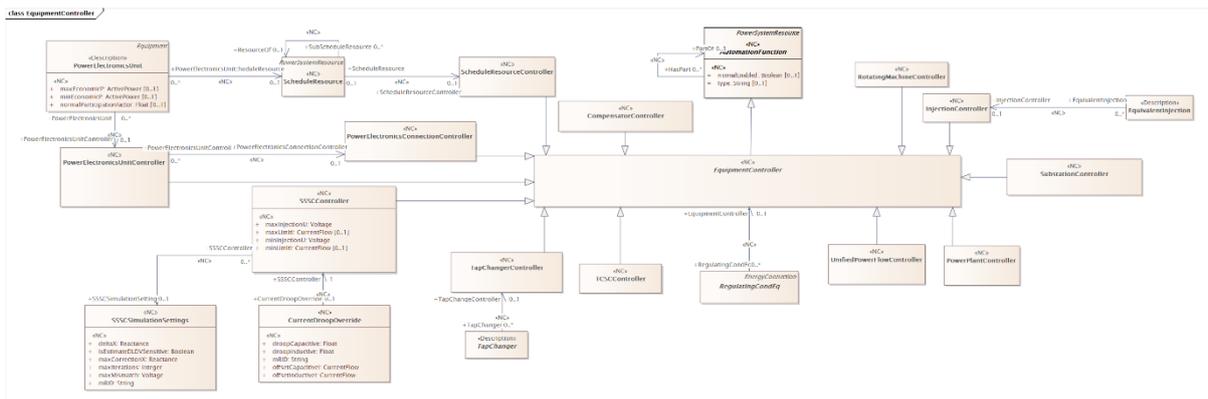


1088

Figure 6 – Class diagram EquipmentReliabilityProfile::EnergyType

1089

1090 Figure 6:

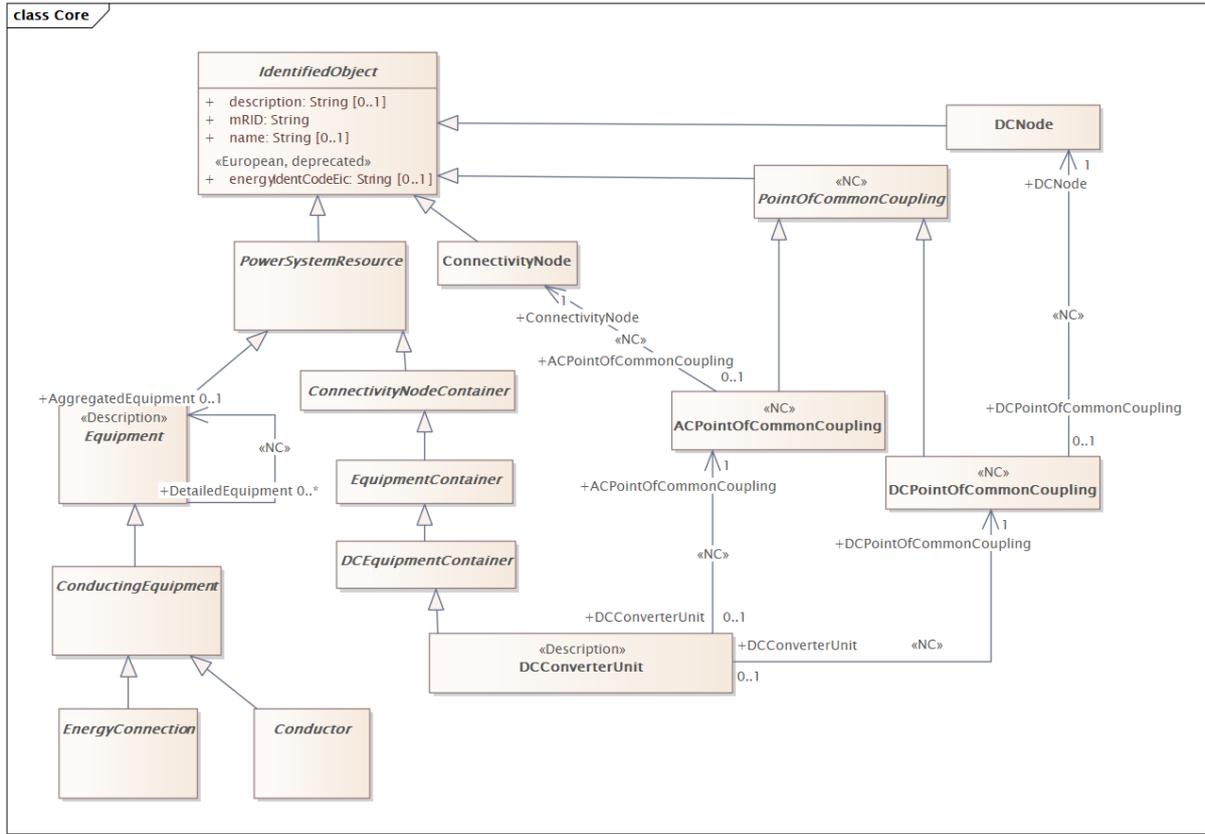


1091

Figure 7 – Class diagram EquipmentReliabilityProfile::EquipmentController

1092

1093 Figure 7: The diagram shows equipment controller related classes.



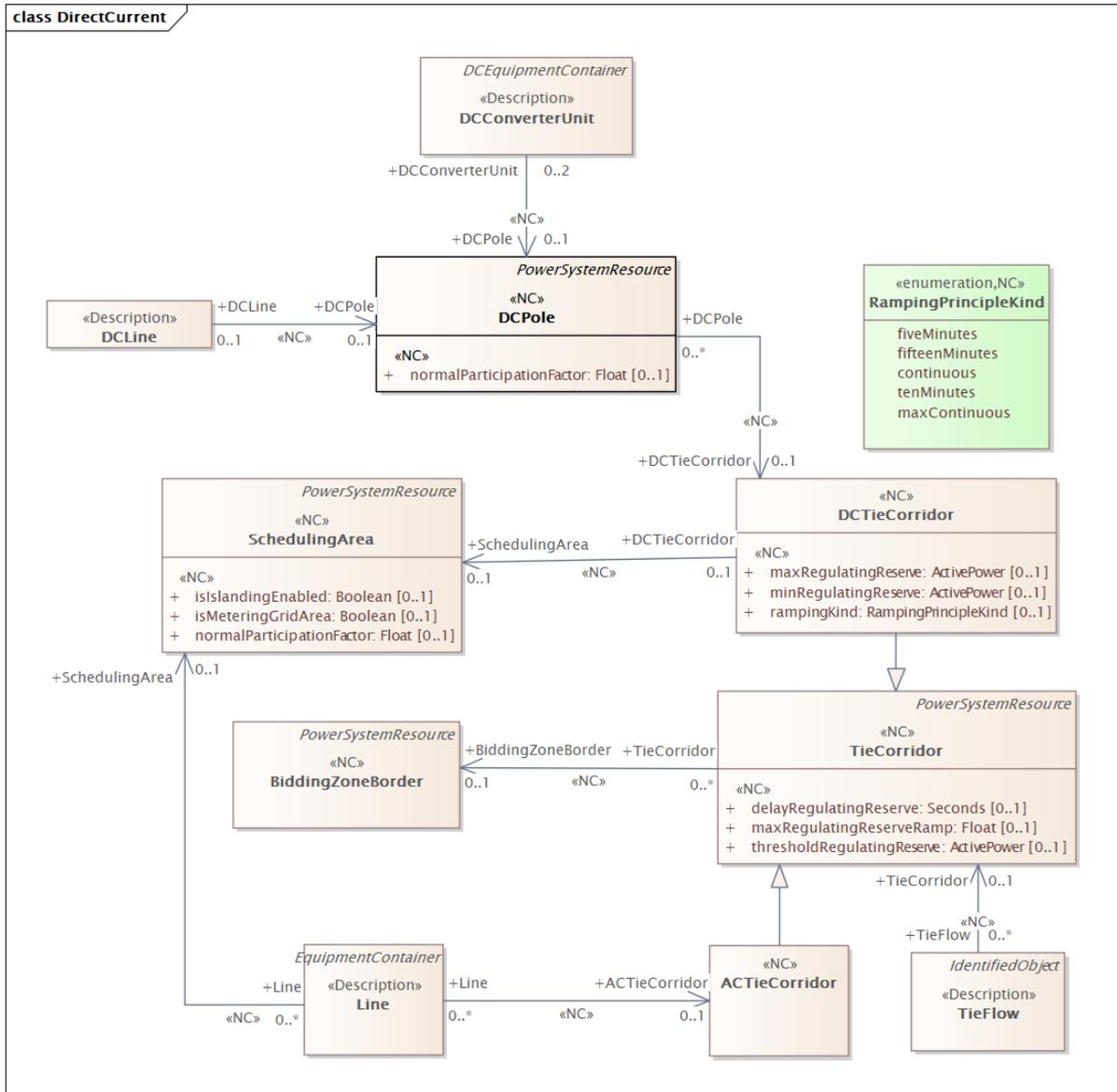
1097

1098

Figure 9 – Class diagram EquipmentReliabilityProfile::Core

1099

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



1100

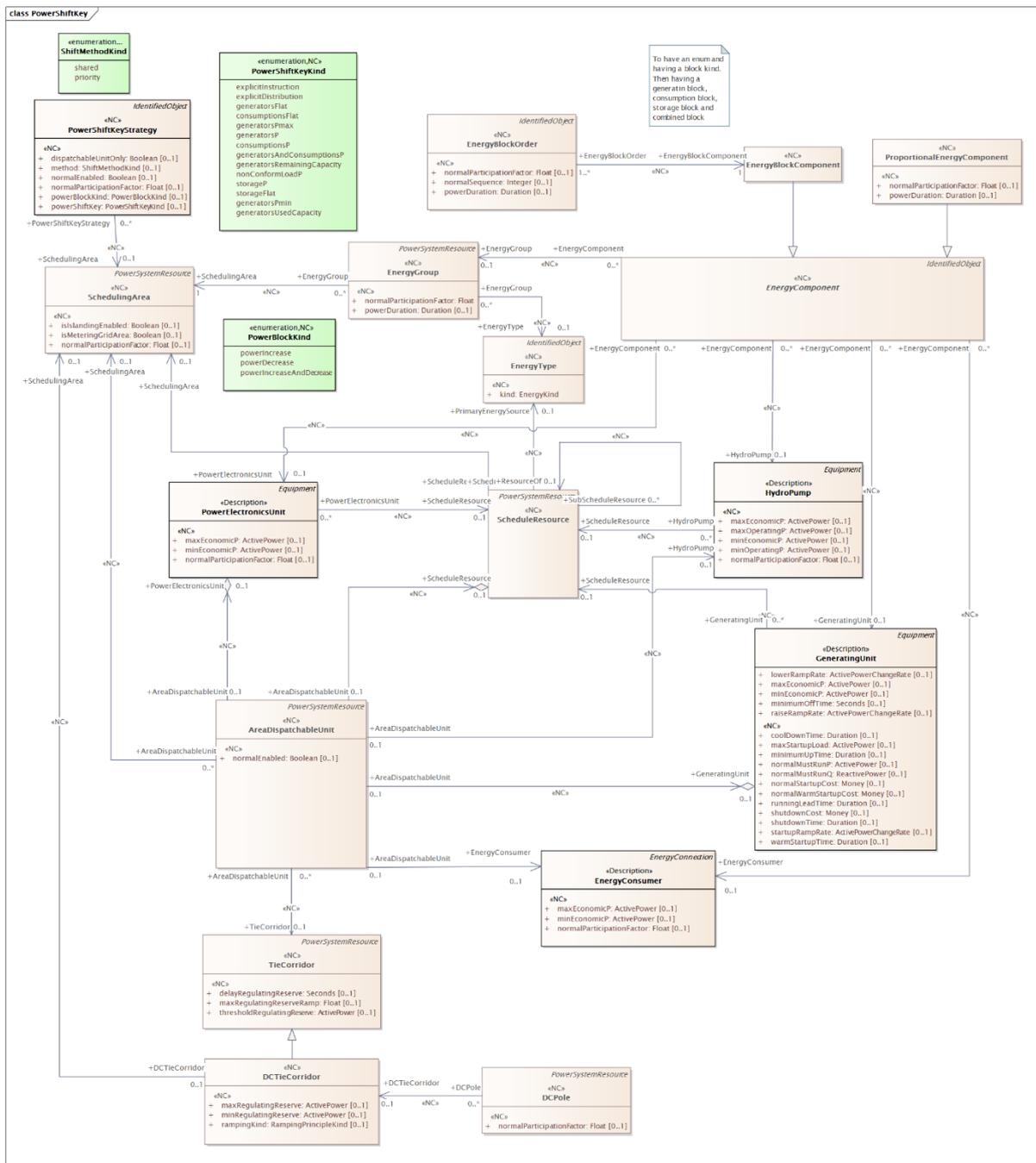
1101

Figure 10 – Class diagram EquipmentReliabilityProfile::DirectCurrent

1102

Figure 10: The diagram shows direct current related classes.

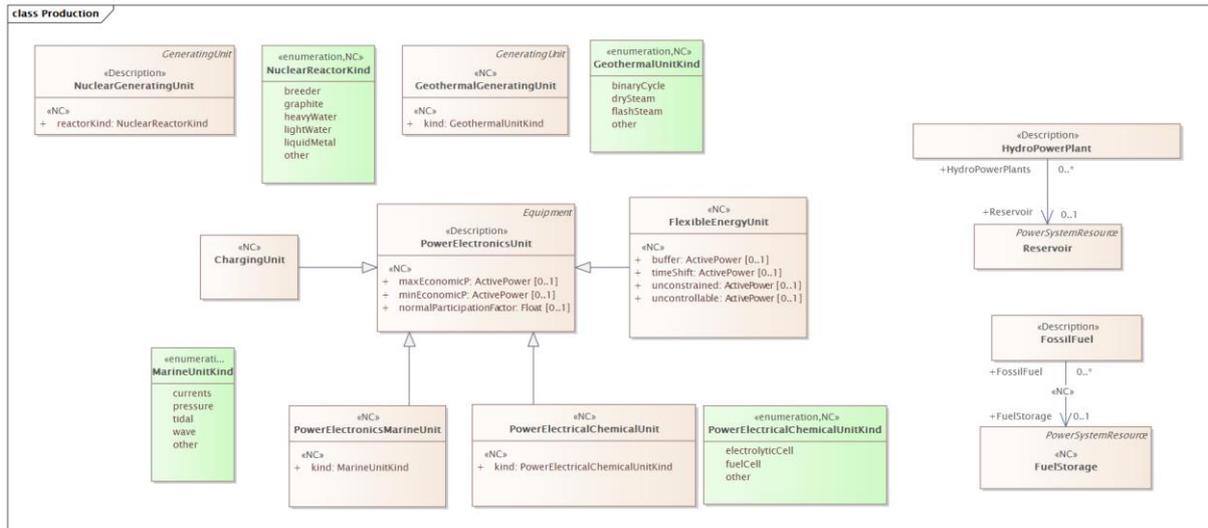
1108 Figure 12: The diagram shows Controllers and FACTS related classes.



1109

1110 Figure 13 – Class diagram EquipmentReliabilityProfile::PowerShiftKey

1111 Figure 13: The diagram shows generation and load shift keys related classes.



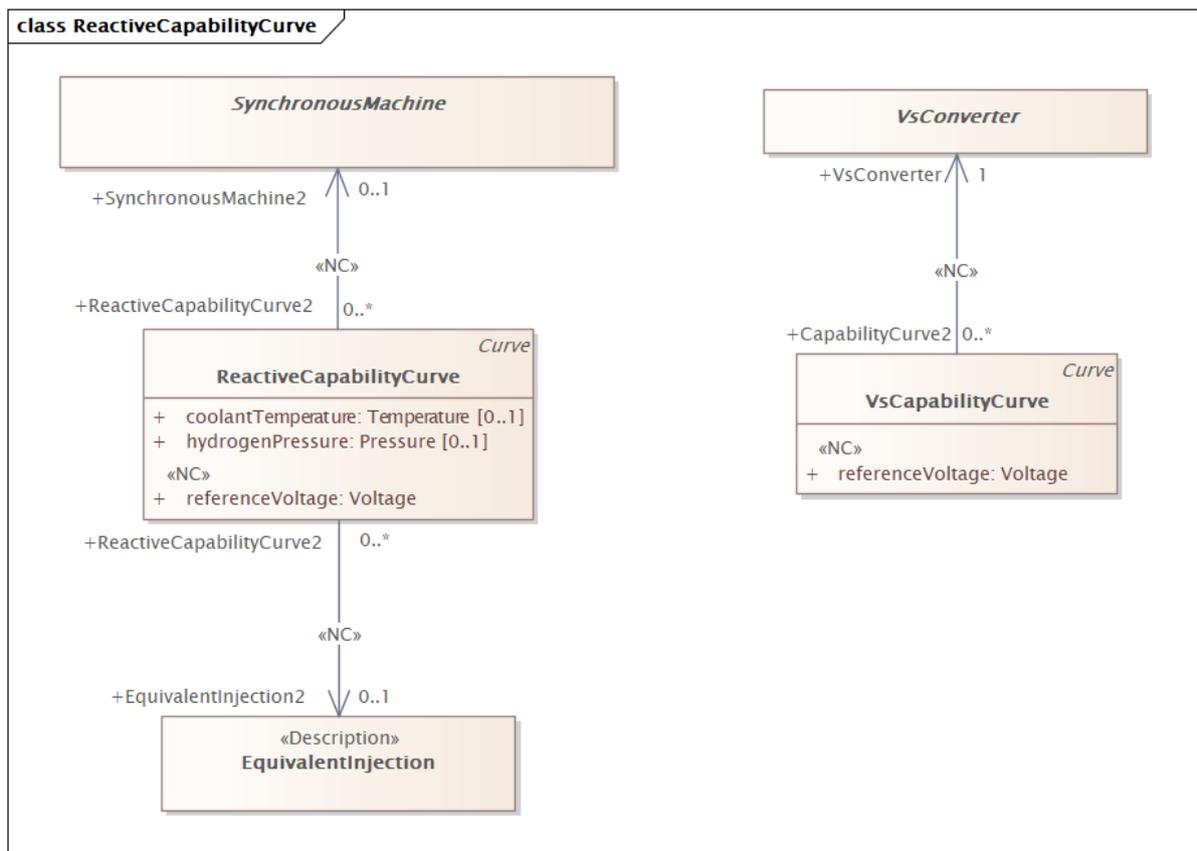
1118

1119

Figure 16 – Class diagram EquipmentReliabilityProfile::Production

1120

Figure 16: The diagram shows production related classes.



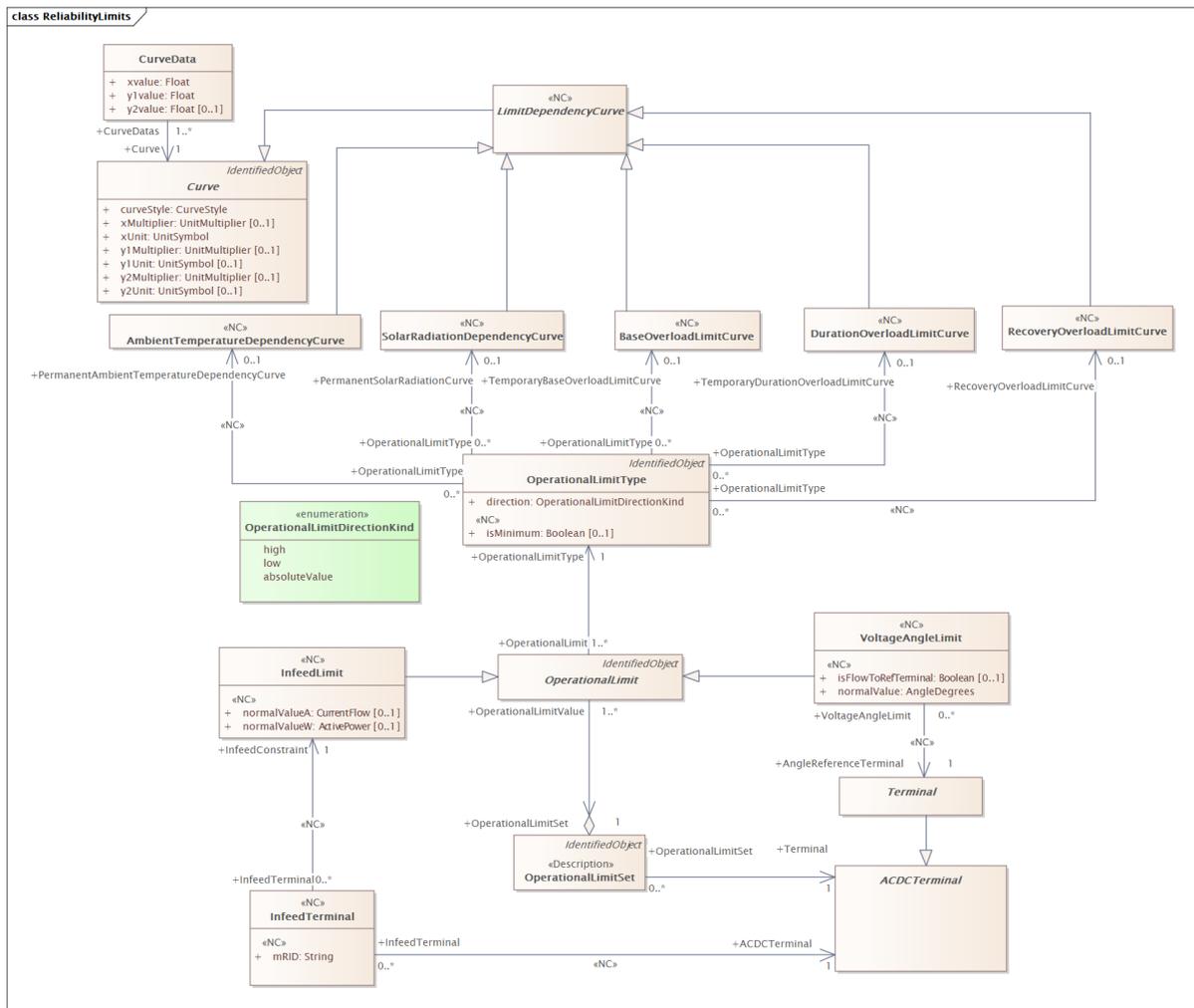
1121

1122

Figure 17 – Class diagram EquipmentReliabilityProfile::ReactiveCapabilityCurve

1123

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



1124

1125

Figure 18 – Class diagram EquipmentReliabilityProfile::ReliabilityLimits

1126

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

1127

3.2 (abstract) ACDCTerminal root class

1128

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

1129

3.3 (NC) ActivePowerControlFunction

1130

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

1131

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

1132

Table 1 shows all attributes of ActivePowerControlFunction.

1133

Table 1 – 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

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

1136

1137 Table 2 shows all association ends of ActivePowerControlFunction with other classes.

1138 **Table 2 – Association ends of EquipmentReliabilityProfile::ActivePowerControlFunction**
1139 **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

1140

1141 3.4 (NC) AmbientTemperatureDependencyCurve

1142 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1143 A curve or functional relationship between the ambient temperature independent variable (X-axis) and relative temperature dependent (Y-axis) variables.

1145 Table 3 shows all attributes of AmbientTemperatureDependencyCurve.

1146 **Table 3 – Attributes of**
1147 **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

1148

1149 3.5 (NC) AreaDispatchableUnit

1150 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)1151 Allocates a given producing or consuming unit, including direct current corridor and collection
1152 of units, to a given control area (through the scheduling area) for supporting the control of the
1153 given area through dispatch instruction.

1154 Table 4 shows all attributes of AreaDispatchableUnit.

1155

Table 4 – Attributes of EquipmentReliabilityProfile::AreaDispatchableUnit

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

1156

1157

Table 5 shows all association ends of AreaDispatchableUnit with other classes.

1158

Table 5 – Association ends of EquipmentReliabilityProfile::AreaDispatchableUnit with other classes

1159

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.

1160

1161

3.6 (abstract,NC) AutomationFunction

1162

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

1163

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

1164

1165

Table 6 shows all attributes of AutomationFunction.

1166

Table 6 – 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

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

1167

1168

Table 7 shows all association ends of AutomationFunction with other classes.

1169

Table 7 – Association ends of EquipmentReliabilityProfile::AutomationFunction with other classes

1170

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

1171

1172

3.7 (NC) BaseOverloadLimitCurve

1173

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

1174

A curve or functional relationship between

1175

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

1176

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

1177

Table 8 shows all attributes of BaseOverloadLimitCurve.

1178

Table 8 – Attributes of EquipmentReliabilityProfile::BaseOverloadLimitCurve

1179

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

1180

1181

3.8 (NC) BiddingZone

1182

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

1183

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.

1184

1185

1186

Table 9 shows all attributes of BiddingZone.

1187

Table 9 – 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

name	mult	type	description
			false, other mechanism determines the price of energy for a given bidding zone, e.g. virtual bidding zone.
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1188

1189 Table 10 shows all association ends of BiddingZone with other classes.

1190 **Table 10 – Association ends of EquipmentReliabilityProfile::BiddingZone with other**
1191 **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.

1192

1193 **3.9 (NC) BiddingZoneBorder**1194 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1195 Defines the aggregated connection capacity between two Bidding Zones.

1196 Table 11 shows all attributes of BiddingZoneBorder.

1197 **Table 11 – 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

1198

1199 Table 12 shows all association ends of BiddingZoneBorder with other classes.

1200 **Table 12 – Association ends of EquipmentReliabilityProfile::BiddingZoneBorder with**
1201 **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.

1202

1203 **3.10 (NC) CapacityCalculationRegion**1204 Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1205 Capacity calculation region is a coherent part of the interconnected system that is used for
1206 calculating the transmission capacity for a bidding zone or between bidding zones.
1207 Table 13 shows all attributes of CapacityCalculationRegion.

1208 **Table 13 – 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

1209
1210 Table 14 shows all association ends of CapacityCalculationRegion with other classes.

1211 **Table 14 – Association ends of EquipmentReliabilityProfile::CapacityCalculationRegion**
1212 **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

1213

1214 3.11 (NC) ChargingUnit

1215 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1216 [IdentifiedObject](#)

1217 A unit that supplies electrical power for charging electrical non-stationary entities, e.g. electrical
1218 vehicle, trucks, buses, ferries, boats and airplanes. The characteristic is that the energy
1219 consumption is highly schedule dependent.

1220 Table 15 shows all attributes of ChargingUnit.

1221 **Table 15 – 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

1222

1223 Table 16 shows all association ends of ChargingUnit with other classes.

1224 **Table 16 – Association ends of EquipmentReliabilityProfile::ChargingUnit with other**
1225 **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

1226

1227 3.12 (abstract,NC) Circuit

1228 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1229 A circuit is a collection of equipment in a network graph that provide common stability limits.

1230 The relevant equipment is in general given by the identifying terminal. A software application

1231 that can do topology processing shall calculate the equipment belonging to the circuit, if there

1232 are no stability limits associated to it. In case of stability limits, the containment reflects the

1233 equipments that were used in the calculation/analysis.

1234 Table 17 shows all attributes of Circuit.

1235

Table 17 – 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

1236

1237 Table 18 shows all association ends of Circuit with other classes.

1238 **Table 18 – 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.

1239

1240 3.13 (NC) CircuitShare

1241 Inheritance path = [IdentifiedObject](#)

1242 Defines the share of the circuit which is part of an associated power transfer corridor.

1243 Table 19 shows all attributes of CircuitShare.

1244

Table 19 – 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].

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

1245

1246

Table 20 shows all association ends of CircuitShare with other classes.

1247

Table 20 – Association ends of EquipmentReliabilityProfile::CircuitShare with other classes

1248

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.

1249

1250

3.14 (NC) ClosedDistributionSystemOperator

1251

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

1252

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

1253

Table 21 shows all attributes of ClosedDistributionSystemOperator.

1254

1255

1256

Table 21 – 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

1257

1258

Table 22 shows all association ends of ClosedDistributionSystemOperator with other classes.

1259

Table 22 – Association ends of EquipmentReliabilityProfile::ClosedDistributionSystemOperator with other classes

1260

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

1261

1262

3.15 (NC) CompensatorController

1263

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

1264

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

1265

Table 23 shows all attributes of CompensatorController.

1266

1267

Table 23 – Attributes of EquipmentReliabilityProfile::CompensatorController

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

1268

1269

Table 24 shows all association ends of CompensatorController with other classes.

1270

Table 24 – Association ends of EquipmentReliabilityProfile::CompensatorController with other classes

1271

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

1272

3.16 (abstract) ConductingEquipment

1274

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

1275

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

1276

1277

Table 25 shows all attributes of ConductingEquipment.

1278

Table 25 – 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

1279

1280

Table 26 shows all association ends of ConductingEquipment with other classes.

1281

Table 26 – Association ends of EquipmentReliabilityProfile::ConductingEquipment with other classes

1282

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

1283

3.17 (abstract) ConnectivityNodeContainer

1285

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

1286

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

1287

Table 27 shows all attributes of ConnectivityNodeContainer.

1288 **Table 27 – 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

1289

1290 **3.18 (Description) ControlArea**1291 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1292 A control area is a grouping of generating units and/or loads and a subset of tie lines (as
1293 terminals) which may be used for a variety of purposes including automatic generation control,
1294 power flow solution area interchange control specification, and input to load forecasting. All
1295 generation and load within the area defined by the terminals on the border are considered in
1296 the area interchange control. Note that any number of overlapping control area specifications
1297 can be superimposed on the physical model. The following general principles apply to
1298 ControlArea:

- 1299 1. The control area orientation for net interchange is positive for an import, negative for an
1300 export.
- 1301 2. The control area net interchange is determined by summing flows in Terminals. The
1302 Terminals are identified by creating a set of TieFlow objects associated with a ControlArea
1303 object. Each TieFlow object identifies one Terminal.
- 1304 3. In a single network model, a tie between two control areas must be modelled in both control
1305 area specifications, such that the two representations of the tie flow sum to zero.
- 1306 4. The normal orientation of Terminal flow is positive for flow into the conducting equipment
1307 that owns the Terminal. (i.e. flow from a bus into a device is positive.) However, the orientation
1308 of each flow in the control area specification must align with the control area convention, i.e.
1309 import is positive. If the orientation of the Terminal flow referenced by a TieFlow is positive into
1310 the control area, then this is confirmed by setting TieFlow.positiveFlowIn flag TRUE. If not, the
1311 orientation must be reversed by setting the TieFlow.positiveFlowIn flag FALSE.

1312 Table 28 shows all attributes of ControlArea.

1313 **Table 28 – 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

1314

1315 Table 29 shows all association ends of ControlArea with other classes.

1316 **Table 29 – Association ends of EquipmentReliabilityProfile::ControlArea with other
1317 classes**

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

1318

1319 **3.19 (abstract,NC) ControlFunctionBlock**1320 Inheritance path = [FunctionBlock](#) : [IdentifiedObject](#)

1321 Control function block is a function block that contains an algorithm for controlling the equipment.

1322 Table 30 shows all attributes of ControlFunctionBlock.

1324 **Table 30 – 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

1325

1326 Table 31 shows all association ends of ControlFunctionBlock with other classes.

1327 **Table 31 – Association ends of EquipmentReliabilityProfile::ControlFunctionBlock with other classes**

1328

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

1329

1330 **3.20 (abstract) Curve**1331 Inheritance path = [IdentifiedObject](#)

1332 A multi-purpose curve or functional relationship between an independent variable (X-axis) and dependent (Y-axis) variables.

1333 Table 32 shows all attributes of Curve.

1335 **Table 32 – 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.

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

1336

1337 **3.21 CurveData root class**

1338 Multi-purpose data points for defining a curve. The use of this generic class is discouraged if
1339 a more specific class can be used to specify the X and Y axis values along with their specific
1340 data types.

1341 Table 33 shows all attributes of CurveData.

1342

Table 33 – 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.

1343

1344 Table 34 shows all association ends of CurveData with other classes.

1345 **Table 34 – Association ends of EquipmentReliabilityProfile::CurveData with other**
1346 **classes**

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

1347

1348 **3.22 (Description) DCConverterUnit**

1349 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
1350 [PowerSystemResource](#) : [IdentifiedObject](#)

1351 Indivisible operative unit comprising all equipment between the point of common coupling on
1352 the AC side and the point of common coupling – DC side, essentially one or more converters,
1353 together with one or more converter transformers, converter control equipment, essential
1354 protective and switching devices and auxiliaries, if any, used for conversion.

1355 Table 35 shows all attributes of DCConverterUnit.

1356

Table 35 – Attributes of EquipmentReliabilityProfile::DCConverterUnit

name	mult	type	description
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

1357

1358

Table 36 shows all association ends of DCConverterUnit with other classes.

1359

1360

Table 36 – Association ends of EquipmentReliabilityProfile::DCConverterUnit with other 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.

1361

1362

3.23 (abstract) DCEquipmentContainer

1363

1364

1365

1366

1367

1368

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

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

Table 37 shows all attributes of DCEquipmentContainer.

1369

Table 37 – 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

1370

1371

3.24 (Description) DCLine root class

1372

1373

1374

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

Table 38 shows all association ends of DCLine with other classes.

Table 38 – 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.

1375

1376

3.25 (NC) DCPole

1377

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

1378 The direct current (DC) system pole (IEC 60633) is part of a DC system consisting of all the
1379 equipment in the DC substations and the interconnecting transmission lines, if any, which during
1380 normal operation exhibit a common direct voltage polarity with respect to earth.
1381 Table 39 shows all attributes of DCPole.

1382 **Table 39 – 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

1383
1384 Table 40 shows all association ends of DCPole with other classes.

1385 **Table 40 – 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.

1386
1387 **3.26 (NC) DCTieCorridor**

1388 Inheritance path = [TieCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)
1389 A collection of one or more direct current poles that connect two different control areas.
1390 Table 41 shows all attributes of DCTieCorridor.

1391 **Table 41 – 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

name	mult	type	description
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

1392
1393

Table 42 shows all association ends of DCTieCorridor with other classes.

1394
1395

Table 42 – Association ends of EquipmentReliabilityProfile::DCTieCorridor with other classes

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

1396

1397 3.27 (NC) DirectCurrentMasterController

1398 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
1399 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1400 Direct current system control is a control system which governs the operation of an entire DC
1401 system consisting of more than one DC substation and performs those functions of controlling,
1402 monitoring and protection which require information from more than one substation. This can
1403 also be a multiterminal control which is a DC system control for more that two DC substations
1404 or a DC master control, which is a general concept for control coordination of a DC system. The
1405 DC master control may be implemented at the bipole and/or pole level as defined in IEC 60633.
1406 The DC system control/multiterminal control/master control is part of the hierarchical structure
1407 of an HVDC control system that has an integrated AC/DC system control as the highest level
1408 of control which governs the integrated operation of AC and DC systems of a power system.
1409 This control system is under the responsibility of the system operator.

1410 Table 43 shows all attributes of DirectCurrentMasterController.

1411 **Table 43 – 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

1412

1413 Table 44 shows all association ends of DirectCurrentMasterController with other classes.

1414
1415**Table 44 – Association ends of
EquipmentReliabilityProfile::DirectCurrentMasterController with other classes**

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

1416

3.28 (NC) DirectCurrentSystemOperator

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

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

Table 45 shows all attributes of DirectCurrentSystemOperator.

Table 45 – 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

1425

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

**Table 46 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSystemOperator with other classes**

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

1429

3.29 (NC) DistributionSystemOperator

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

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

Table 47 shows all attributes of DistributionSystemOperator.

Table 47 – 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

1436

1437
1438 Table 48 shows all association ends of DistributionSystemOperator with other classes.

1439 **Table 48 – Association ends of**
1440 **EquipmentReliabilityProfile::DistributionSystemOperator with other classes**

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

1441

1442 3.30 (NC) DurationOverloadLimitCurve

1443 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

1444 A curve or functional relationship between

1445 - the overload duration independent variable (X-axis), and

1446 - temporary overloading (TATL) limiting dependent (Y-axis) variables.

1447 Table 49 shows all attributes of DurationOverloadLimitCurve.

1448 **Table 49 – 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

1449

1450 3.31 (NC) EnergyAlignmentCoordinator

1451 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
1452 [OrganisationRole](#) : [IdentifiedObject](#)

1453 A role that is responsible for alignment of forecast and schedule energy to a given energy
1454 coordination region.

1455 Table 50 shows all attributes of EnergyAlignmentCoordinator.

1456 **Table 50 – 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

1457

1458 Table 51 shows all association ends of EnergyAlignmentCoordinator with other classes.

1459
1460**Table 51 – Association ends of
EquipmentReliabilityProfile::EnergyAlignmentCoordinator with other classes**

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

1461

3.32 (NC) EnergyBlockComponent1463 Inheritance path = [EnergyComponent](#) : [IdentifiedObject](#)

1464 Energy block component where the energy group is distributed according to the energy block order of each energy component in an energy group.

1465 Table 52 shows all attributes of EnergyBlockComponent.

Table 52 – 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

1468

1469 Table 53 shows all association ends of EnergyBlockComponent with other classes.

**Table 53 – Association ends of EquipmentReliabilityProfile::EnergyBlockComponent
with other classes**

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

1472

3.33 (NC) EnergyBlockOrder1474 Inheritance path = [IdentifiedObject](#)

1475 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.

1476 Table 54 shows all attributes of EnergyBlockOrder.

Table 54 – 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.

1478

name	mult	type	description
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

1479

1480

Table 55 shows all association ends of EnergyBlockOrder with other classes.

1481

Table 55 – Association ends of EquipmentReliabilityProfile::EnergyBlockOrder with other classes

1482

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

1483

1484

3.34 (abstract,NC) EnergyComponent

1485

Inheritance path = [IdentifiedObject](#)

1486

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

1487

1488

Table 56 shows all attributes of EnergyComponent.

1489

Table 56 – 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

1490

1491

Table 57 shows all association ends of EnergyComponent with other classes.

1492

Table 57 – Association ends of EquipmentReliabilityProfile::EnergyComponent with other classes

1493

mult from	name	mult to	type	description
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..*	PowerElectronicsUnit	0..1	PowerElectronicsUnit	(NC) The power electronics unit that relates to this energy component.
0..*	EnergyGroup	0..1	EnergyGroup	(NC) The energy group that has this energy component.

1494

1495 **3.35 (abstract) EnergyConnection**1496 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
1497 [IdentifiedObject](#)

1498 A connection of energy generation or consumption on the power system model.

1499 Table 58 shows all attributes of EnergyConnection.

1500 **Table 58 – Attributes of EquipmentReliabilityProfile::EnergyConnection**

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

1501

1502 Table 59 shows all association ends of EnergyConnection with other classes.

1503 **Table 59 – Association ends of EquipmentReliabilityProfile::EnergyConnection with**
1504 **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

1505

1506 **3.36 (Description) EnergyConsumer**1507 Inheritance path = [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) :
1508 [PowerSystemResource](#) : [IdentifiedObject](#)

1509 Generic user of energy - a point of consumption on the power system model.

1510 EnergyConsumer.pfixed, .qfixed, .pfixedPct and .qfixedPct have meaning only if there is no

1511 LoadResponseCharacteristic associated with EnergyConsumer or if

1512 LoadResponseCharacteristic.exponentModel is set to False.

1513 Table 60 shows all attributes of EnergyConsumer.

1514 **Table 60 – Attributes of EquipmentReliabilityProfile::EnergyConsumer**

name	mult	type	description
normalParticipationFactor or	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

1515

1516

Table 61 shows all association ends of EnergyConsumer with other classes.

1517

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

1518

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

1519

1520

3.37 (NC) EnergyCoordinationRegion

1521

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

1522

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

1523

1524

Table 62 shows all attributes of EnergyCoordinationRegion.

1525

Table 62 – 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

1526

1527

Table 63 shows all association ends of EnergyCoordinationRegion with other classes.

1528

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

1529

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

1530

1531

3.38 (NC) EnergyType

1532

Inheritance path = [IdentifiedObject](#)

1533

A source of the energy.

1534

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

1535

1536

1537

1538

Table 64 shows all attributes of EnergyType.

1539

Table 64 – 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

1540

1541

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

1542

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

1543

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

1544

3.39 (abstract,Description) Equipment

1546

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

1547

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

1548

Table 66 shows all attributes of Equipment.

1549

Table 66 – 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

1550

1551

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

1552

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

1553

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.

1554

3.40 (abstract) EquipmentContainer

1556

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

1557

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

1558

Table 68 shows all attributes of EquipmentContainer.

1559 **Table 68 – 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

1560

1561 **3.41 (abstract,NC) EquipmentController**1562 Inheritance path = [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)1563 Equipment controller is an automation function that can control one or multiple equipment
1564 function to achieve all the targets inside the given tolerance.

1565 Table 69 shows all attributes of EquipmentController.

1566 **Table 69 – 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

1567

1568 Table 70 shows all association ends of EquipmentController with other classes.

1569 **Table 70 – Association ends of EquipmentReliabilityProfile::EquipmentController with
1570 other classes**

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

1571

1572 **3.42 (NC) ExceptionalPowerTransferCorridor**1573 Inheritance path = [PowerTransferCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)1574 Potential power transfer corridor that can be triggered by equipment which changes its in
1575 service status or it is operating in an island.

1576 Table 71 shows all attributes of ExceptionalPowerTransferCorridor.

1577 **Table 71 – Attributes of 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

1578

1579 **3.43 (abstract,NC) FACTSEquipment**

1580 Inheritance path = [RegulatingCondEq](#) : [EnergyConnection](#) : [ConductingEquipment](#) :

1581 [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1582 Flexible Alternating Current Transmission System regulating equipment.

1583 Table 72 shows all attributes of FACTSEquipment.

1584 **Table 72 – Attributes of EquipmentReliabilityProfile::FACTSEquipment**

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

1585 Table 73 shows all association ends of FACTSEquipment with other classes.

1586 **Table 73 – 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

1589 **3.44 Feeder**

1590 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) :

1591 [IdentifiedObject](#)

1592 A collection of equipment for organizational purposes, used for grouping distribution resources.

1593 The organization a feeder does not necessarily reflect connectivity or current operation state.

1594 Table 74 shows all attributes of Feeder.

1596

Table 74 – 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

1597

1598

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

1599

Table 75 – 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.

1600

3.45 (NC) FlexibleEnergyUnit

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

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

Table 76 shows all attributes of FlexibleEnergyUnit.

1606

Table 76 – 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.

name	mult	type	description
unconstrained	0..1	ActivePower	(NC) The active power, that has the flexibility to operate as production without any bound by a buffer. Example are alternative heating (wood, gas, diesel etc) or power generators. Load sign convention is used, i.e. positive sign means flow out from a node.
normalParticipationFactor	0..1	Float	(NC) inherited from: PowerElectronicsUnit
maxEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
minEconomicP	0..1	ActivePower	(NC) inherited from: PowerElectronicsUnit
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

1607

1608

Table 77 shows all association ends of FlexibleEnergyUnit with other classes.

1609

Table 77 – Association ends of EquipmentReliabilityProfile::FlexibleEnergyUnit with other classes

1610

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

1611

1612

3.46 (abstract,NC) FunctionBlock

1613

Inheritance path = [IdentifiedObject](#)

1614

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

1615

1616

Table 78 shows all attributes of FunctionBlock.

1617

Table 78 – 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

1618

1619

Table 79 shows all association ends of FunctionBlock with other classes.

1620 **Table 79 – Association ends of EquipmentReliabilityProfile::FunctionBlock with other**
1621 **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.

1622

1623 3.47 (abstract,NC) FunctionInputVariable

1624 Inheritance path = [IdentifiedObject](#)

1625 Functional input variable defines the domain of the function.

1626 Table 80 shows all attributes of FunctionInputVariable.

1627 **Table 80 – 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

1628

1629 Table 81 shows all association ends of FunctionInputVariable with other classes.

1630 **Table 81 – Association ends of EquipmentReliabilityProfile::FunctionInputVariable with**
1631 **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.

1632

1633 3.48 (NC) FunctionOutputVariable

1634 Inheritance path = [IdentifiedObject](#)

1635 Functional output variable defines the codomain of the function.

1636 Table 82 shows all attributes of FunctionOutputVariable.

1637 **Table 82 – 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

1638

1639 Table 83 shows all association ends of FunctionOutputVariable with other classes.

1640 **Table 83 – Association ends of EquipmentReliabilityProfile::FunctionOutputVariable**
1641 **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.

1642

1643 3.49 (NC) GateInputPin

1644 Inheritance path = [FunctionInputVariable](#) : [IdentifiedObject](#)

1645 Input pin for a logical gate. The condition described in the input pin gives a logical true or false.

1646 The result from measurement and calculation are converted to a true or false.

1647 Table 84 shows all attributes of GateInputPin.

1648 **Table 84 – 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

1649

1650 Table 85 shows all association ends of GateInputPin with other classes.

1651 **Table 85 – Association ends of EquipmentReliabilityProfile::GateInputPin with other**
1652 **classes**

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

1653

1654 3.50 (Description) GeneratingUnit

1655 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1656 A single or set of synchronous machines for converting mechanical power into alternating-
1657 current power. For example, individual machines within a set may be defined for scheduling
1658 purposes while a single control signal is derived for the set. In this case there would be a
1659 GeneratingUnit for each member of the set and an additional GeneratingUnit corresponding to
1660 the set.

1661 Table 86 shows all attributes of GeneratingUnit.

1662 **Table 86 – 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.
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.
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.
runningLeadTime	0..1	Duration	(NC) Time it takes to change the schedule when the unit is operating due to technical configuration of a supporting system, e.g. gas pipeline.
minimumUpTime	0..1	Duration	(NC) The time that a generating unit has to stay running after it has been switched on by the Remedial Action Optimizer.
normalStartupCost	0..1	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.

name	mult	type	description
			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

1663

1664

Table 87 shows all association ends of GeneratingUnit with other classes.

1665

Table 87 – Association ends of EquipmentReliabilityProfile::GeneratingUnit with other classes

1666

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

1667

1668

3.51 (NC) GeothermalGeneratingUnit

1669

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

1670

Generating unit that is generating electrical power from geothermal energy.

1671

Table 88 shows all attributes of GeothermalGeneratingUnit.

1672

Table 88 – 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
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
runningLeadTime	0..1	Duration	(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

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

1673

1674 Table 89 shows all association ends of GeothermalGeneratingUnit with other classes.

1675 **Table 89 – Association ends of EquipmentReliabilityProfile::GeothermalGeneratingUnit**
1676 **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

1677

1678 **3.52 (Description) HydroPump**1679 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1680 A synchronous motor-driven pump, typically associated with a pumped storage plant.

1681 Table 90 shows all attributes of HydroPump.

1682 **Table 90 – 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

1683

1684 Table 91 shows all association ends of HydroPump with other classes.

1685 **Table 91 – Association ends of EquipmentReliabilityProfile::HydroPump with other**
1686 **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
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment

1687

1688 3.53 (abstract) IdentifiedObject root class

1689 This is a root class to provide common identification for all classes needing identification and
1690 naming attributes.

1691 Table 92 shows all attributes of IdentifiedObject.

1692 **Table 92 – 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.

1693

1694 3.54 (NC) ImpedanceControlFunction

1695 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

1696 Impedance control function is a function block that calculates the operating point of the
1697 controlled equipment to achieve the target impedance.

1698 Table 93 shows all attributes of ImpedanceControlFunction.

1699 **Table 93 – 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

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

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Table 94 shows all association ends of ImpedanceControlFunction with other classes.

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

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

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3.55 (abstract,NC) LimitDependencyCurve

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

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

Table 95 shows all attributes of LimitDependencyCurve.

Table 95 – 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

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3.56 (Description) Line

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

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

Table 96 shows all attributes of Line.

1717

Table 96 – 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

1718

1719

Table 97 shows all association ends of Line with other classes.

1720

Table 97 – 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.

1721

1722

3.57 (NC) LineCircuit

1723

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

1724

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

1725

1726

Table 98 shows all attributes of LineCircuit.

1727

Table 98 – 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

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1729

Table 99 shows all association ends of LineCircuit with other classes.

1730

Table 99 – Association ends of EquipmentReliabilityProfile::LineCircuit with other classes

1731

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

1732

1733

3.58 (NC) LoadFrequencyControlArea

1734

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

1735

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.

1736

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1738

Table 100 shows all attributes of LoadFrequencyControlArea.

1739 **Table 100 – 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.
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

1740
1741 Table 101 shows all association ends of LoadFrequencyControlArea with other classes.

1742 **Table 101 – Association ends of**
1743 **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.

1744
1745 **3.59 (NC) LoadFrequencyControlBlock**

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

1747 A part of a synchronous area or an entire synchronous area, physically demarcated by points
1748 of measurement at interconnectors to other load frequency control (LFC) blocks, consisting of
1749 one or more LFC areas, operated by one or more TSOs fulfilling the obligations of load-
1750 frequency control.

1751 Table 102 shows all attributes of LoadFrequencyControlBlock.

1752 **Table 102 – 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

1753
1754 Table 103 shows all association ends of LoadFrequencyControlBlock with other classes.

1755
1756**Table 103 – Association ends of
EquipmentReliabilityProfile::LoadFrequencyControlBlock with other classes**

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

1757

3.60 (NC) LoadFrequencyControlOperator1759 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1760 A role that is responsible for operational security by operating the load frequency control (LFC) mechanism.

1762 Table 104 shows all attributes of LoadFrequencyControlOperator.

Table 104 – 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

1764

1765 Table 105 shows all association ends of LoadFrequencyControlOperator with other classes.

**Table 105 – Association ends of
EquipmentReliabilityProfile::LoadFrequencyControlOperator with other classes**

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

1768

3.61 (NC) ModularStaticSynchronousSeriesCompensator1770 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1772 Modular static synchronous series compensator (MSSSC) is a type of flexible AC transmission system regulating equipment which consists of solid-state voltage source inverter connected in series with a transmission line. This is similar to static synchronous series compensator (SSSC), but without injection transformer. This enables the MSSSC to be truly modular with the ability to simply install a number of equipment in series to provide a desired maximum level of impedance. MSSSC can be dispersed into multiple location in a circuit working collectively under the same controller scheme.

1779 Table 106 shows all attributes of ModularStaticSynchronousSeriesCompensator.

**Table 106 – Attributes of
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

1780
1781

name	mult	type	description
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

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Table 107 shows all association ends of ModularStaticSynchronousSeriesCompensator with other classes.

Table 107 – 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

1788

1789 3.62 (Description) NuclearGeneratingUnit

1790 Inheritance path = [GeneratingUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1791 A nuclear generating unit.

1792 Table 108 shows all attributes of NuclearGeneratingUnit.

1793 **Table 108 – 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
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

name	mult	type	description
runningLeadTime	0..1	Duration	(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

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1795

Table 109 shows all association ends of NuclearGeneratingUnit with other classes.

1796

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Table 109 – Association ends of EquipmentReliabilityProfile::NuclearGeneratingUnit with other classes

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

1798

1799

3.63 (abstract) OperationalLimit

1800

Inheritance path = [IdentifiedObject](#)

1801

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

1802

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

1803

1804

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

1805

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

1806

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

1807

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

1808

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

1809

Table 110 shows all attributes of OperationalLimit.

1810

Table 110 – 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

1811

1812

Table 111 shows all association ends of OperationalLimit with other classes.

1813

1814

Table 111 – Association ends of EquipmentReliabilityProfile::OperationalLimit with other classes

mult from	name	mult to	type	description
1..*	OperationalLimitType	1..1	OperationalLimitType	The limit type associated with this limit.

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

1815

1816 3.64 (Description) OperationalLimitSet

1817 Inheritance path = [IdentifiedObject](#)

1818 A set of limits associated with equipment. Sets of limits might apply to a specific temperature,
1819 or season for example. A set of limits may contain different severities of limit levels that would
1820 apply to the same equipment. The set may contain limits of different types such as apparent
1821 power and current limits or high and low voltage limits that are logically applied together as a
1822 set.

1823 Table 112 shows all attributes of OperationalLimitSet.

1824 **Table 112 – 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

1825

1826 Table 113 shows all association ends of OperationalLimitSet with other classes.

1827 **Table 113 – Association ends of EquipmentReliabilityProfile::OperationalLimitSet with**
1828 **other classes**

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

1829

1830 3.65 OperationalLimitType

1831 Inheritance path = [IdentifiedObject](#)

1832 The operational meaning of a category of limits.

1833 Table 114 shows all attributes of OperationalLimitType.

1834 **Table 114 – 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

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

1835

1836

Table 115 shows all association ends of OperationalLimitType with other classes.

1837

1838

Table 115 – Association ends of EquipmentReliabilityProfile::OperationalLimitType with other classes

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

1839

1840

3.66 (NC) OrdinaryPowerTransferCorridor

1841

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

1842

Power transfer corridor defined for normal operating network.

1843

Table 116 shows all attributes of OrdinaryPowerTransferCorridor.

1844

Table 116 – 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

1845

1846

3.67 Organisation

1847

Inheritance path = [IdentifiedObject](#)

1848

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

1849

Table 117 shows all attributes of Organisation.

1850

Table 117 – 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

1851

1852 **3.68 (abstract) OrganisationRole**1853 Inheritance path = [IdentifiedObject](#)1854 Identifies a way in which an organisation may participate in the utility enterprise (e.g., customer,
1855 manufacturer, etc).

1856 Table 118 shows all attributes of OrganisationRole.

1857 **Table 118 – 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

1858

1859 Table 119 shows all association ends of OrganisationRole with other classes.

1860 **Table 119 – Association ends of EquipmentReliabilityProfile::OrganisationRole with
1861 other classes**

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

1862

1863 **3.69 (NC) OutageCoordinationRegion**1864 Inheritance path = [Region](#) : [PowerSystemResource](#) : [IdentifiedObject](#)1865 A region that has a common organisation or service responsible for outage planning and
1866 coordination and its impact on grid operation.

1867 Table 120 shows all attributes of OutageCoordinationRegion.

1868 **Table 120 – 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

1869

1870 Table 121 shows all association ends of OutageCoordinationRegion with other classes.

1871
1872**Table 121 – Association ends of
EquipmentReliabilityProfile::OutageCoordinationRegion 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

1873

1874 3.70 (NC) OutageCoordinator

1875 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
1876 [OrganisationRole](#) : [IdentifiedObject](#)

1877 A role that coordinates the planned availability status of relevant power system equipment to
1878 meet the need by the asset owner or operator and the security of the power system.

1879 Table 122 shows all attributes of OutageCoordinator.

1880

Table 122 – 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

1881

1882 Table 123 shows all association ends of OutageCoordinator with other classes.

**1883 Table 123 – Association ends of EquipmentReliabilityProfile::OutageCoordinator with
1884 other classes**

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

1885

1886 3.71 (NC) OutagePlanningAgent

1887 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

1888 An entity with the task of planning the availability status of a relevant power generating module,
1889 a relevant demand facility or a relevant grid element.

1890 Table 124 shows all attributes of OutagePlanningAgent.

1891

Table 124 – 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

1892

1893 Table 125 shows all association ends of OutagePlanningAgent with other classes.

1894 **Table 125 – Association ends of EquipmentReliabilityProfile::OutagePlanningAgent with**
1895 **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

1896

1897 **3.72 (NC) PinTerminal**1898 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

1899 Input pin associated with a Terminal. It is used for comparison.

1900 Table 126 shows all attributes of PinTerminal.

1901 **Table 126 – 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

1902

1903 Table 127 shows all association ends of PinTerminal with other classes.

1904 **Table 127 – Association ends of EquipmentReliabilityProfile::PinTerminal with other**
1905 **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

1906

1907 **3.73 (NC) PowerElectricalChemicalUnit**1908 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) :
1909 [IdentifiedObject](#)1910 A unit capable of either generating electrical energy from chemical reactions or using electrical
1911 energy to cause chemical reactions.

1912 Table 128 shows all attributes of PowerElectricalChemicalUnit.

1913 **Table 128 – 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

1914

1915 Table 129 shows all association ends of PowerElectricalChemicalUnit with other classes.

1916

1917

Table 129 – Association ends of EquipmentReliabilityProfile::PowerElectricalChemicalUnit with other classes

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

1918

3.74 (NC) PowerElectronicsMarineUnit1920 Inheritance path = [PowerElectronicsUnit](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1921 A unit that capture energy from marine sources, e.g. waves, for generating electrical power.

1922 Table 130 shows all attributes of PowerElectronicsMarineUnit.

1924

Table 130 – 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

1925

1926 Table 131 shows all association ends of PowerElectronicsMarineUnit with other classes.

1927
1928**Table 131 – 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

1929

1930 3.75 (Description) PowerElectronicsUnit1931 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1932 A generating unit or battery or aggregation that connects to the AC network using power electronics rather than rotating machines.

1933 Table 132 shows all attributes of PowerElectronicsUnit.

1935 Table 132 – Attributes of EquipmentReliabilityProfile::PowerElectronicsUnit

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

1936

1937 Table 133 shows all association ends of PowerElectronicsUnit with other classes.

**1938 Table 133 – Association ends of EquipmentReliabilityProfile::PowerElectronicsUnit with
1939 other classes**

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

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

1940

1941 3.76 (NC) PowerFactorControlFunction

1942 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

1943 Power factor control function is a function block that calculates the operating point of the controlled equipment to achieve the target power factor.

1944 Table 134 shows all attributes of PowerFactorControlFunction.

1946 Table 134 – 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

1947

1948 Table 135 shows all association ends of PowerFactorControlFunction with other classes.

1949 Table 135 – Association ends of

1950 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

1951

1952 3.77 (abstract,NC) PowerSystemOrganisationRole

1953 Inheritance path = [OrganisationRole](#) : [IdentifiedObject](#)

1954 A role that is responsible for the functional operational of a power system resource.

1955 Table 136 shows all attributes of PowerSystemOrganisationRole.

1956 Table 136 – 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

1957

1958 Table 137 shows all association ends of PowerSystemOrganisationRole with other classes.

1959 **Table 137 – Association ends of**
1960 **EquipmentReliabilityProfile::PowerSystemOrganisationRole with other classes**

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

1961

1962 3.78 (abstract) PowerSystemResource

1963 Inheritance path = [IdentifiedObject](#)

1964 A power system resource (PSR) can be an item of equipment such as a switch, an equipment
1965 container containing many individual items of equipment such as a substation, or an
1966 organisational entity such as sub-control area. Power system resources can have
1967 measurements associated.

1968 Table 138 shows all attributes of PowerSystemResource.

1969 **Table 138 – 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

1970

1971 3.79 (abstract,NC) PowerTransferCorridor

1972 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1973 A power transfer corridor is defined as a set of circuits (transmission lines or transformers)
1974 separating two portions of the power system, or a subset of circuits exposed to a substantial
1975 portion of the transmission exchange between two parts of the system.

1976 Table 139 shows all attributes of PowerTransferCorridor.

1977 **Table 139 – Attributes of EquipmentReliabilityProfile::PowerTransferCorridor**

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

1978

1979 3.80 (NC) PowerTransformerCircuit

1980 Inheritance path = [Circuit](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

1981 A power transformer circuit is a circuit that has at least one PowerTransformer and may or may
1982 not include related switching and/or auxiliary equipment.

1983 Table 140 shows all attributes of PowerTransformerCircuit.

1984 **Table 140 – 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

1985

1986

Table 141 shows all association ends of PowerTransformerCircuit with other classes.

1987 **Table 141 – Association ends of EquipmentReliabilityProfile::PowerTransformerCircuit**
1988 **with other classes**

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

1989

1990 **3.81 (abstract,NC) PropertyReference root class**

1991 The reference to a class and one of its properties.

1992 **3.82 (NC) ProportionalEnergyComponent**1993 Inheritance path = [EnergyComponent](#) : [IdentifiedObject](#)1994 Serves for grouping components within an energy group, with proportional energy allocation to
1995 all components.

1996 Table 142 shows all attributes of ProportionalEnergyComponent.

1997 **Table 142 – Attributes of EquipmentReliabilityProfile::ProportionalEnergyComponent**

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

1998

1999 Table 143 shows all association ends of ProportionalEnergyComponent with other classes.

2000 **Table 143 – Association ends of**
2001 **EquipmentReliabilityProfile::ProportionalEnergyComponent with other classes**

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

2002

2003 **3.83 (NC,Description) PTCTriggeredEquipment**2004 Inheritance path = [IdentifiedObject](#)2005 Power Transfer Corridor triggered equipment connects the equipment that will create the
2006 exceptional power transfer corridor when taking out of service. e.g. A system with three lines
2007 gets an exceptional power transfer corridor when one of the lines is taken out of service.

2008 Table 144 shows all attributes of PTCTriggeredEquipment.

2009 **Table 144 – 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

2010

2011 Table 145 shows all association ends of PTCTriggeredEquipment with other classes.

2012 **Table 145 – Association ends of EquipmentReliabilityProfile::PTCTriggeredEquipment
2013 with other classes**

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

2014

2015 **3.84 (NC) ReactivePowerControlFunction**2016 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)2017 Reactive power control function is a function block that calculate the operating point of the
2018 controlled equipment to achieve the target reactive power.

2019 Table 146 shows all attributes of ReactivePowerControlFunction.

2020 **Table 146 – 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

2021

2022 Table 147 shows all association ends of ReactivePowerControlFunction with other classes.

2023
2024**Table 147 – 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

2025

3.85 (NC) RecoveryOverloadLimitCurve2027 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

2028 The relation between the recovery time and an overload limit.

2029 Table 148 shows all attributes of RecoveryOverloadLimitCurve.

2030

Table 148 – 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

2031

3.86 (abstract,NC) Region2033 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2034 A region where the system operator belongs to.

2035 Table 149 shows all attributes of Region.

2036

Table 149 – 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

2037

2038 Table 150 shows all association ends of Region with other classes.

2039

Table 150 – 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.

2040

2041 **3.87 (abstract) RegulatingCondEq**2042 Inheritance path = [EnergyConnection](#) : [ConductingEquipment](#) : [Equipment](#) :
2043 [PowerSystemResource](#) : [IdentifiedObject](#)2044 A type of conducting equipment that can regulate a quantity (i.e. voltage or flow) at a specific
2045 point in the network.

2046 Table 151 shows all attributes of RegulatingCondEq.

2047 **Table 151 – 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

2048

2049 Table 152 shows all association ends of RegulatingCondEq with other classes.

2050 **Table 152 – Association ends of EquipmentReliabilityProfile::RegulatingCondEq with
2051 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

2052

2053 **3.88 (NC) ScheduleResource**2054 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)2055 A schedule resource is a market-based method for handling participation of small units,
2056 particularly located on the lower voltage level that is controlled by a Distributed System
2057 Operator (DSO). It is a collection of units that can operate in the market by providing bids, offers
2058 and a resulting committed operational schedule for the collection.

2059 Table 153 shows all attributes of ScheduleResource.

2060 **Table 153 – 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

2061

2062 Table 154 shows all association ends of ScheduleResource with other classes.

2063 **Table 154 – Association ends of EquipmentReliabilityProfile::ScheduleResource with**
2064 **other classes**

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

2065

2066 3.89 (NC) SchedulingArea

2067 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2068 An area where production and/or consumption of energy can be forecasted, scheduled and
2069 measured. The area is operated by only one system operator, typically a Transmission System
2070 Operator (TSO). The area can consist of a sub area, which has the same definition as the main
2071 area, but it can be operated by another system operator (typically Distributed System Operator
2072 (DSO) or a Closed Distributed System Operator (CDSO)). This includes microgrid concept. A
2073 substation is the smallest grouping that can be included in the area. The area size should be
2074 considered in terms of the possibility of accumulated reading (settlement metering) and the
2075 capability of operating as an island.

2076 Table 155 shows all attributes of SchedulingArea.

2077

Table 155 – Attributes of EquipmentReliabilityProfile::SchedulingArea

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

2078

2079 Table 156 shows all association ends of SchedulingArea with other classes.

2080 **Table 156 – Association ends of EquipmentReliabilityProfile::SchedulingArea with other**
2081 **classes**

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

2082

2083 3.90 (NC) SecurityCoordinator

2084 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) :
2085 [OrganisationRole](#) : [IdentifiedObject](#)

2086 A role that coordinates the relevant remedial actions and their optimisation to ensure efficient
2087 use to achieve required operational security of the power system.

2088 Table 157 shows all attributes of SecurityCoordinator.

2089 **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

2090

2091 Table 158 shows all association ends of SecurityCoordinator with other classes.

2092 **Table 158 – Association ends of EquipmentReliabilityProfile::SecurityCoordinator with**
2093 **other classes**

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

2094

2095 3.91 (NC) SolarRadiationDependencyCurve

2096 Inheritance path = [LimitDependencyCurve](#) : [Curve](#) : [IdentifiedObject](#)

2097 A curve or functional relationship between

2098 - the solar radiation independent variable (X-axis), and

2099 - relative dependent (Y-axis) variables.

2100 Table 159 shows all attributes of SolarRadiationDependencyCurve.

2101 **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
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

2102

2103 **3.92 (NC) StaticSynchronousCompensator**

2104 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2105 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2106 Static synchronous compensator (STATCOM), also known as a static synchronous condenser
2107 (STATCON), is a type of flexible AC transmission system regulating equipment used on
2108 alternating current electricity transmission networks. It is based on a power electronics voltage-
2109 source converter and can act as either a source or sink of reactive AC power to an electricity
2110 network. If connected to a source of power it can also provide active AC power.

2111 Table 160 shows all attributes of StaticSynchronousCompensator.

2112 **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

2113

2114 Table 161 shows all association ends of StaticSynchronousCompensator with other classes.

2115
2116**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

2117

2118 3.93 (NC) StaticSynchronousSeriesCompensator

2119 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2120 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2121 Static synchronous series compensator (SSSC) is a type of flexible AC transmission system
2122 which consists of a solid-state voltage source inverter coupled with a transformer that is
2123 connected in series with a transmission line. This device can inject an almost sinusoidal voltage
2124 in series with the line. This injected voltage could be considered as an inductive or capacitive
2125 reactance, which is connected in series with the transmission line. This feature can provide
2126 controllable voltage compensation. In addition, SSSC is able to reverse the power flow by
2127 injecting a sufficiently large series reactive compensating voltage. Moreover it can inject a
2128 voltage proportional to the difference between the line current and the pre-configured current
2129 threshold. It shall have two Terminal-s associated with it.

2130 Table 162 shows all attributes of StaticSynchronousSeriesCompensator.

2131
2132**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

2133
2134
2135

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

2136
2137**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

2138

3.94 (NC) SubSchedulingArea2140 Inheritance path = [SchedulingArea](#) : [PowerSystemResource](#) : [IdentifiedObject](#)2141 An area that is a part of another scheduling area. Typically part of a Transmission System
2142 Operator (TSO) scheduling area operated by a Distributed System Operator (DSO) or a Close
2143 Distributed System Operator (CDSO). This includes microgrid concept. A sub scheduling area
2144 can contain other sub areas. A sub scheduling area leaf will form the smallest entity of any
2145 given energy area.

2146 Table 164 shows all attributes of SubSchedulingArea.

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

2148

2149 Table 165 shows all association ends of SubSchedulingArea with other classes.

**Table 165 – Association ends of EquipmentReliabilityProfile::SubSchedulingArea with
other classes**2150
2151

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

2152

2153 **3.95 (Description) Substation**2154 Inheritance path = [EquipmentContainer](#) : [ConnectivityNodeContainer](#) : [PowerSystemResource](#) : [IdentifiedObject](#)2155 A collection of equipment for purposes other than generation or utilization, through which
2157 electric energy in bulk is passed for the purposes of switching or modifying its characteristics.
2158 Table 166 shows all attributes of Substation.2159 **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

2160

2161 Table 167 shows all association ends of Substation with other classes.

2162 **Table 167 – Association ends of EquipmentReliabilityProfile::Substation with other classes**
2163

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

2164

2165 **3.96 (NC) SubstationController**2166 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)2168 Substation controller is controlling the equipment to optimize the use of the controlling
2169 equipment within a substation.

2170 Table 168 shows all attributes of SubstationController.

2171 **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

2172

2173 Table 169 shows all association ends of SubstationController with other classes.

2174 **Table 169 – Association ends of EquipmentReliabilityProfile::SubstationController with other classes**
2175

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

2176

2177 **3.97 (NC) SynchronousArea**2178 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)2179 A synchronous area is an electrical area covered by interconnect with a common system
2180 frequency in a steady-state.

2181 Table 170 shows all attributes of SynchronousArea.

2182 **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

2183

2184 **3.98 (abstract,NC) SystemOperationCoordinator**2185 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)2186 A role that coordinates relevant information and impact in regards to operating the power
2187 system.

2188 Table 171 shows all attributes of SystemOperationCoordinator.

2189 **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

2190

2191 Table 172 shows all association ends of SystemOperationCoordinator with other classes.

2192 **Table 172 – Association ends of**
2193 **EquipmentReliabilityProfile::SystemOperationCoordinator with other classes**

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

2194

2195 **3.99 (abstract,NC) SystemOperator**2196 Inheritance path = [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

2197 System operator.

2198 Table 173 shows all attributes of SystemOperator.

2199 **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

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

2200

2201

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

2202

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

2203

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

2204

2205

3.100 (abstract,Description) TapChanger root class

2206

Mechanism for changing transformer winding tap positions.

2207

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

2208

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

2209

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

2210

2211

3.101 (abstract) Terminal

2212

Inheritance path = [ACDCTerminal](#)

2213

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

2214

2215

3.102 (NC) TieCorridor

2216

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

2217

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

2218

2219

Table 176 shows all attributes of TieCorridor.

2220

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

2221

2222 Table 177 shows all association ends of TieCorridor with other classes.

2223 **Table 177 – Association ends of EquipmentReliabilityProfile::TieCorridor with other**
2224 **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.

2225

2226 3.103 (NC) ThyristorControlledSeriesCompensator

2227 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2228 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2229 Thyristor-controlled series capacitors (TCSC) is a type of flexible AC transmission system
2230 regulating equipment that is configured with controlled reactors in parallel with sections of a
2231 capacitor bank. This combination allows smooth control of the fundamental frequency
2232 capacitive reactance over a wide range. The thyristor valve contains a string of series connected
2233 high power thyristors. TCSC can control power flows in order to achieve eliminating of line
2234 overloads, reducing loop flows and minimising system losses.

2235 Table 178 shows all attributes of ThyristorControlledSeriesCompensator.

2236

2237 **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

2238
2239 Table 179 shows all association ends of ThyristorControlledSeriesCompensator with other
2240 classes.

2241 **Table 179 – Association ends of**
2242 **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

2243

2244 3.104 (NC) TransmissionSystemOperator

2245 Inheritance path = [SystemOperator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) :
2246 [IdentifiedObject](#)

2247 A system operator role that is responsible for operating of an energy transmission network.

2248 Table 180 shows all attributes of TransmissionSystemOperator.

2249 **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

2250

2251 Table 181 shows all association ends of TransmissionSystemOperator with other classes.

2252 **Table 181 – Association ends of**
2253 **EquipmentReliabilityProfile::TransmissionSystemOperator with other classes**

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

2254

2255 3.105 (NC) UnifiedPowerFlowController

2256 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2257 [IdentifiedObject](#)

2258 Unified power flow controller (UPFC) is providing fast-acting reactive power compensation on
2259 high-voltage electricity transmission networks.

2260 Table 182 shows all attributes of UnifiedPowerFlowController.

2261 **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

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

2262

2263

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

2264

2265

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

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

2266

2267

3.106 (NC) VoltageAngleLimit

2268

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

2269

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

2270

2271

2272

Table 184 shows all attributes of VoltageAngleLimit.

2273

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

2274

2275

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

2276

2277

Table 185 – Association ends of EquipmentReliabilityProfile::VoltageAngleLimit with other classes

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

2278

2279

3.107 (NC) VoltageControlFunction

2280

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

2281 Voltage control function is a function block that calculate the operating point of the controlled
2282 equipment to achieve the target voltage.
2283 Table 186 shows all attributes of VoltageControlFunction.

2284 **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

2285

2286 Table 187 shows all association ends of VoltageControlFunction with other classes.

2287 **Table 187 – Association ends of EquipmentReliabilityProfile::VoltageControlFunction**
2288 **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

2289

2290 3.108 Currency enumeration

2291 Monetary currencies. ISO 4217 standard including 3-character currency code.
2292 Table 188 shows all literals of Currency.

2293 **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.

literal	value	description
BHD	048	Bahraini dinar.
BIF	108	Burundian franc.
BMD	060	Bermudian dollar (customarily known as Bermuda dollar).
BND	096	Brunei dollar.
BOB	068	Boliviano.
BOV	984	Bolivian Mvdol (funds code).
BRL	986	Brazilian real.
BSD	044	Bahamian dollar.
BTN	064	Bhutanese ngultrum.
BWP	072	Botswana pula.
BYR	974	Belarusian ruble.
BZD	084	Belize dollar.
CAD	124	Canadian dollar.
CDF	976	Congolese franc.
CHF	756	Swiss franc.
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.

literal	value	description
GMD	270	Gambian dalasi.
GNF	324	Guinean franc.
GTQ	320	Guatemalan quetzal.
GYD	328	Guyanese dollar.
HKD	344	Hong Kong dollar.
HNL	340	Honduran lempira.
HRK	191	Croatian kuna.
HTG	332	Haitian gourde.
HUF	348	Hungarian forint.
IDR	360	Indonesian rupiah.
ILS	376	Israeli new sheqel.
INR	356	Indian rupee.
IQD	368	Iraqi dinar.
IRR	364	Iranian rial.
ISK	352	Icelandic króna.
JMD	388	Jamaican dollar.
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.

literal	value	description
MOP	446	Macanese pataca.
MRO	478	Mauritanian ouguiya.
MUR	480	Mauritian rupee.
MVR	462	Maldivian rufiyaa.
MWK	454	Malawian kwacha.
MXN	484	Mexican peso.
MYR	458	Malaysian ringgit.
MZN	943	Mozambican metical.
NAD	516	Namibian dollar.
NGN	566	Nigerian naira.
NIO	558	Cordoba oro.
NOK	578	Norwegian krone.
NPR	524	Nepalese rupee.
NZD	554	New Zealand dollar.
OMR	512	Omani rial.
PAB	590	Panamanian balboa.
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.

literal	value	description
TJS	972	Tajikistani somoni.
TMT	934	Turkmenistani manat.
TND	788	Tunisian dinar.
TOP	776	Tongan pa'anga.
TRY	949	Turkish lira.
TTD	780	Trinidad and Tobago dollar.
TWD	901	New Taiwan dollar.
TZS	834	Tanzanian shilling.
UAH	980	Ukrainian hryvnia.
UGX	800	Ugandan shilling.
USD	840	United States dollar.
UYU	858	Uruguayan peso.
UZS	860	Uzbekistan som.
VEF	937	Venezuelan bolívar fuerte.
VND	704	Vietnamese Dong.
VUV	548	Vanuatu vatu.
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.

2294

2295 **3.109 CurveStyle enumeration**

2296 Style or shape of curve.

2297 Table 189 shows all literals of CurveStyle.

2298

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.

2299

2300 **3.110 (NC) MarineUnitKind enumeration**

2301 Kind of marine energy capture.

2302 Table 190 shows all literals of MarineUnitKind.

2303

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.

2304

3.111 OperationalLimitDirectionKind enumeration

2306 The direction attribute describes the side of a limit that is a violation.

2307 Table 191 shows all literals of OperationalLimitDirectionKind.

2308

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.

2309

3.112 (NC) PinTerminalKind enumeration

2311 The kind of quantities that can serve as an input value for the pin.

2312 Table 192 shows all literals of PinTerminalKind.

2313

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.

2314

3.113 (NC) NuclearReactorKind enumeration

2316 Kind of nuclear reactor.

2317 Table 193 shows all literals of NuclearReactorKind.

2318

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.
other		Other type of nuclear reactors.

2319

2320 3.114 (NC) GeothermalUnitKind enumeration

2321 Kind of geothermal.

2322 Table 194 shows all literals of GeothermalUnitKind.

2323

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.

2324

2325 3.115 (NC) LogicalOperatorsKind enumeration

2326 Kinds of logical operators for comparison.

2327 Table 195 shows all literals of LogicalOperatorsKind.

2328

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.

literal	value	description
greaterThan		Greater than comparison operation.

2329

2330 **3.116 (NC) PowerElectricalChemicalUnitKind enumeration**

2331 Kind of power electrical chemical unit.

2332 Table 196 shows all literals of PowerElectricalChemicalUnitKind.

2333 **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.

2334

2335 **3.117 UnitMultiplier enumeration**

2336 The unit multipliers defined for the CIM. When applied to unit symbols, the unit symbol is
 2337 treated as a derived unit. Regardless of the contents of the unit symbol text, the unit symbol
 2338 shall be treated as if it were a single-character unit symbol. Unit symbols should not contain
 2339 multipliers, and it should be left to the multiplier to define the multiple for an entire data type.

2340 For example, if a unit symbol is "m2Pers" and the multiplier is "k", then the value is $k(m^{**2}/s)$,
 2341 and the multiplier applies to the entire final value, not to any individual part of the value. This
 2342 can be conceptualized by substituting a derived unit symbol for the unit type. If one imagines
 2343 that the symbol "P" represents the derived unit "m2Pers", then applying the multiplier "k" can
 2344 be conceptualized simply as "kP".

2345 For example, the SI unit for mass is "kg" and not "g". If the unit symbol is defined as "kg", then
 2346 the multiplier is applied to "kg" as a whole and does not replace the "k" in front of the "g". In
 2347 this case, the multiplier of "m" would be used with the unit symbol of "kg" to represent one gram.
 2348 As a text string, this violates the instructions in IEC 80000-1. However, because the unit symbol
 2349 in CIM is treated as a derived unit instead of as an SI unit, it makes more sense to conceptualize
 2350 the "kg" as if it were replaced by one of the proposed replacements for the SI mass symbol. If
 2351 one imagines that the "kg" were replaced by a symbol "P", then it is easier to conceptualize the
 2352 multiplier "m" as creating the proper unit "mP", and not the forbidden unit "mkg".

2353 Table 197 shows all literals of UnitMultiplier.

2354 **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} .

2355

2356 **3.118 UnitSymbol enumeration**

2357 The derived units defined for usage in the CIM. In some cases, the derived unit is equal to an
 2358 SI unit. Whenever possible, the standard derived symbol is used instead of the formula for the
 2359 derived unit. For example, the unit symbol Farad is defined as "F" instead of "CPerV". In cases
 2360 where a standard symbol does not exist for a derived unit, the formula for the unit is used as

2361 the unit symbol. For example, density does not have a standard symbol and so it is represented
2362 as "kgPerm3". With the exception of the "kg", which is an SI unit, the unit symbols do not contain
2363 multipliers and therefore represent the base derived unit to which a multiplier can be applied as
2364 a whole.

2365 Every unit symbol is treated as an unparseable text as if it were a single-letter symbol. The
2366 meaning of each unit symbol is defined by the accompanying descriptive text and not by the
2367 text contents of the unit symbol.

2368 To allow the widest possible range of serializations without requiring special character handling,
2369 several substitutions are made which deviate from the format described in IEC 80000-1. The
2370 division symbol "/" is replaced by the letters "Per". Exponents are written in plain text after the
2371 unit as "m3" instead of being formatted as "m" with a superscript of 3 or introducing a symbol
2372 as in "m^3". The degree symbol "°" is replaced with the letters "deg". Any clarification of the
2373 meaning for a substitution is included in the description for the unit symbol.

2374 Non-SI units are included in list of unit symbols to allow sources of data to be correctly labelled
2375 with their non-SI units (for example, a GPS sensor that is reporting numbers that represent feet
2376 instead of meters). This allows software to use the unit symbol information correctly convert
2377 and scale the raw data of those sources into SI-based units.

2378 The integer values are used for harmonization with IEC 61850.

2379 Table 198 shows all literals of UnitSymbol.

2380

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

literal	value	description
		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.

2381

2382 **3.119 ActivePower datatype**2383 Product of RMS value of the voltage and the RMS value of the in-phase component of the
2384 current.

2385 Table 199 shows all attributes of ActivePower.

2386

Table 199 – Attributes of EquipmentReliabilityProfile::ActivePower

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

2387

2388 **3.120 ActivePowerChangeRate datatype**

2389 Rate of change of active power per time.

2390 Table 200 shows all attributes of ActivePowerChangeRate.

2391

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	

2392

2393 **3.121 AngleDegrees datatype**

2394 Measurement of angle in degrees.

2395 Table 201 shows all attributes of AngleDegrees.

2396

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)

2397

2398 **3.122 Frequency datatype**

2399 Cycles per second.

2400 Table 202 shows all attributes of Frequency.

2401

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)

2402

3.123 Impedance datatype

2404 Ratio of voltage to current.

2405 Table 203 shows all attributes of Impedance.

2406

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)

2407

3.124 Money datatype

2409 Amount of money.

2410 Table 204 shows all attributes of Money.

2411

Table 204 – Attributes of EquipmentReliabilityProfile::Money

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

2412

3.125 PerCent datatype

2414 Percentage on a defined base. For example, specify as 100 to indicate at the defined base.

2415 Table 205 shows all attributes of PerCent.

2416

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)

2417

3.126 Reactance datatype

2419 Reactance (imaginary part of impedance), at rated frequency.

2420 Table 206 shows all attributes of Reactance.

2421

Table 206 – Attributes of EquipmentReliabilityProfile::Reactance

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

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=none)

2422

2423 **3.127 Seconds datatype**

2424 Time, in seconds.

2425 Table 207 shows all attributes of Seconds.

2426

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)

2427

2428 **3.128 VoltagePerReactivePower datatype**

2429 Voltage variation with reactive power.

2430 Table 208 shows all attributes of VoltagePerReactivePower.

2431

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	

2432

2433 **3.129 Boolean primitive**

2434 A type with the value space "true" and "false".

2435 **3.130 Decimal primitive**

2436 Decimal is the base-10 notational system for representing real numbers.

2437 **3.131 Duration primitive**

2438 Duration as "PnYnMnDTnHnMnS" which conforms to ISO 8601, where nY expresses a number
 2439 of years, nM a number of months, nD a number of days. The letter T separates the date
 2440 expression from the time expression and, after it, nH identifies a number of hours, nM a number
 2441 of minutes and nS a number of seconds. The number of seconds could be expressed as a
 2442 decimal number, but all other numbers are integers.

2443 **3.132 Float primitive**

2444 A floating point number. The range is unspecified and not limited.

2445 **3.133 Integer primitive**

2446 An integer number. The range is unspecified and not limited.

2447 **3.134 String primitive**

2448 A string consisting of a sequence of characters. The character encoding is UTF-8. The string
 2449 length is unspecified and unlimited.

2450 **3.135 (NC) ACTieCorridor**2451 Inheritance path = [TieCorridor](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2452 A collection of one or more AC tie lines that connect two different control areas.

2453 Table 209 shows all attributes of ACTieCorridor.

2454

Table 209 – 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

2455

2456

Table 210 shows all association ends of ACTieCorridor with other classes.

2457

Table 210 – Association ends of EquipmentReliabilityProfile::ACTieCorridor with other classes

2458

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

2459

2460

3.136 (abstract) Conductor

2461

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

2462

2463

Combination of conducting material with consistent electrical characteristics, building a single electrical system, used to carry current between points in the power system.

2464

2465

Table 211 shows all attributes of Conductor.

2466

Table 211 – Attributes of EquipmentReliabilityProfile::Conductor

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

2467

2468

Table 212 shows all association ends of Conductor with other classes.

2469

Table 212 – Association ends of EquipmentReliabilityProfile::Conductor with other classes

2470

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

2471

2472 **3.137 (NC) CurrentControlFunction**2473 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2474 Current control function is a function block that calculates the operating point of the controlled equipment to achieve the target current.

2476 Table 213 shows all attributes of CurrentControlFunction.

2477 **Table 213 – 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

2478

2479 Table 214 shows all association ends of CurrentControlFunction with other classes.

2480 **Table 214 – Association ends of EquipmentReliabilityProfile::CurrentControlFunction with other classes**

2481

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

2482

2483 **3.138 (NC) TCSCCompensationPoint root class**

2484 Compensation point of a TCSC compensator.

2485 Table 215 shows all attributes of TCSCCompensationPoint.

2486 **Table 215 – 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.

2487

2488 Table 216 shows all association ends of TCSCCompensationPoint with other classes.

2489 **Table 216 – Association ends of EquipmentReliabilityProfile::TCSCCompensationPoint**
2490 **with other classes**

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

2491

2492 3.139 (NC) StaticVarCompensator

2493 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#) : [EnergyConnection](#) :
2494 [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2495 A facility for providing variable and controllable shunt reactive power. The SVC typically
2496 consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched
2497 capacitor arms.

2498 The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage
2499 control mode, the output of the SVC will be proportional to the deviation of voltage at the
2500 controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion.
2501 If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.
2502 Table 217 shows all attributes of StaticVarCompensator.

2503 **Table 217 – 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
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2504

2505 Table 218 shows all association ends of StaticVarCompensator with other classes.

2506 **Table 218 – Association ends of EquipmentReliabilityProfile::StaticVarCompensator**
2507 **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

2508

2509 **3.140 (NC) LossCurve**2510 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2511 Represents the losses in the equipment due to operation position.

2512 Table 219 shows all attributes of LossCurve.

2513 **Table 219 – 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

2514

2515 Table 220 shows all association ends of LossCurve with other classes.

2516 **Table 220 – Association ends of EquipmentReliabilityProfile::LossCurve with other classes**

2517

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

2518

2519 **3.141 (Description) DCSwitch**2520 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2521 A switch within the DC system.

2522 Table 221 shows all attributes of DCSwitch.

2524 **Table 221 – Attributes of EquipmentReliabilityProfile::DCSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2525

2526 Table 222 shows all association ends of DCSwitch with other classes.

2527 **Table 222 – Association ends of EquipmentReliabilityProfile::DCSwitch with other**
2528 **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

2529

2530 3.142 (abstract) DCConductingEquipment

2531 Inheritance path = [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2532 The parts of the DC power system that are designed to carry current or that are conductively
2533 connected through DC terminals.

2534 Table 223 shows all attributes of DCConductingEquipment.

2535 **Table 223 – Attributes of EquipmentReliabilityProfile::DCConductingEquipment**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2536

2537 Table 224 shows all association ends of DCConductingEquipment with other classes.

2538 **Table 224 – Association ends of EquipmentReliabilityProfile::DCConductingEquipment**
2539 **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

2540

2541 3.143 (Description) DCDisconnector

2542 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2543 [IdentifiedObject](#)

2544 A disconnector within a DC system.

2545 Table 225 shows all attributes of DCDisconnector.

2546 **Table 225 – Attributes of EquipmentReliabilityProfile::DCDisconnector**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2547
2548

Table 226 shows all association ends of DCDisconnector with other classes.

2549
2550**Table 226 – Association ends of EquipmentReliabilityProfile::DCDisconnector 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

2551

3.144 (Description) DCBreaker2553 Inheritance path = [DCSwitch](#) : [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2554 [IdentifiedObject](#)

2555 A breaker within a DC system.

2556 Table 227 shows all attributes of DCBreaker.

2557

Table 227 – Attributes of EquipmentReliabilityProfile::DCBreaker

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2558

2559 Table 228 shows all association ends of DCBreaker with other classes.

Table 228 – Association ends of EquipmentReliabilityProfile::DCBreaker with other classes

2560

2561

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

2562

3.145 (Description) DCGround2564 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2565 [IdentifiedObject](#)

2566 A ground within a DC system.

2567 Table 229 shows all attributes of DCGround.

2568

Table 229 – Attributes of EquipmentReliabilityProfile::DCGround

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2569
2570

Table 230 shows all association ends of DCGround with other classes.

2571
2572

Table 230 – Association ends of EquipmentReliabilityProfile::DCGround 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

2573

2574 3.146 (Description) DCBusbar

2575 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2576 [IdentifiedObject](#)

2577 A busbar within a DC system.

2578 Table 231 shows all attributes of DCBusbar.

2579

Table 231 – Attributes of EquipmentReliabilityProfile::DCBusbar

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2580

2581 Table 232 shows all association ends of DCBusbar with other classes.

2582
2583

Table 232 – Association ends of EquipmentReliabilityProfile::DCBusbar 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

2584

2585 3.147 (Description) DCShunt

2586 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2587 [IdentifiedObject](#)

2588 A shunt device within the DC system, typically used for filtering. Needed for transient and short
2589 circuit studies.

2590 Table 233 shows all attributes of DCShunt.

2591

Table 233 – Attributes of EquipmentReliabilityProfile::DCShunt

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2592

2593

Table 234 shows all association ends of DCShunt with other classes.

2594

Table 234 – Association ends of EquipmentReliabilityProfile::DCShunt with other classes

2595

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

2596

2597

3.148 (Description) DCSeriesDevice

2598

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

2599

2600

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

2601

2602

Table 235 shows all attributes of DCSeriesDevice.

2603

Table 235 – Attributes of EquipmentReliabilityProfile::DCSeriesDevice

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

2604

2605

Table 236 shows all association ends of DCSeriesDevice with other classes.

2606

Table 236 – Association ends of EquipmentReliabilityProfile::DCSeriesDevice with other classes

2607

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

2608

2609

3.149 (Description) DCLineSegment

2610

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

2611

2612

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

2613

2614

2615

Table 237 shows all attributes of DCLineSegment.

2616

Table 237 – Attributes of EquipmentReliabilityProfile::DCLineSegment

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	inherited from: DCConductingEquipment

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

2617

2618 Table 238 shows all association ends of DCLineSegment with other classes.

2619 **Table 238 – Association ends of EquipmentReliabilityProfile::DCLineSegment with other**
2620 **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

2621

2622 3.150 (Description) DCChopper

2623 Inheritance path = [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) :
2624 [IdentifiedObject](#)

2625 Low resistance equipment used in the internal DC circuit to balance voltages. It has typically
2626 positive and negative pole terminals and a ground.

2627 Table 239 shows all attributes of DCChopper.

2628 **Table 239 – Attributes of EquipmentReliabilityProfile::DCChopper**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

2629

2630 Table 240 shows all association ends of DCChopper with other classes.

2631 **Table 240 – Association ends of EquipmentReliabilityProfile::DCChopper with other**
2632 **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

2633

2634 3.151 (Description) TieFlow

2635 Inheritance path = [IdentifiedObject](#)

2636 Defines the structure (in terms of location and direction) of the net interchange constraint for a
2637 control area. This constraint may be used by either AGC or power flow.

2638 Table 241 shows all attributes of TieFlow.

2639

Table 241 – 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

2640

2641

Table 242 shows all association ends of TieFlow with other classes.

2642

Table 242 – 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.

2643

2644

3.152 (NC) PowerPlantController

2645

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

2646

2647

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

2648

Table 243 shows all attributes of PowerPlantController.

2649

Table 243 – 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

2650

2651

Table 244 shows all association ends of PowerPlantController with other classes.

2652

Table 244 – Association ends of EquipmentReliabilityProfile::PowerPlantController with other classes

2653

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

2654

2655

3.153 (NC) TCSCController

2656

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

2657

2658

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

2659

Table 245 shows all attributes of TCSCController.

2660

Table 245 – Attributes of EquipmentReliabilityProfile::TCSCController

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction

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

2661

2662

Table 246 shows all association ends of TCSCController with other classes.

2663

Table 246 – Association ends of EquipmentReliabilityProfile::TCSCController with other classes

2664

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

2665

2666

3.154 (NC) DCCurrentControlFunction

2667

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

2668

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

2669

2670

Table 247 shows all attributes of DCCurrentControlFunction.

2671

Table 247 – 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
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

2672

2673

Table 248 shows all association ends of DCCurrentControlFunction with other classes.

2674

Table 248 – Association ends of EquipmentReliabilityProfile::DCCurrentControlFunction with other classes

2675

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

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

2676

2677 **3.155 (NC) DCVoltageControlFunction**2678 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2679 DC voltage control function is a function block that calculate the operating point of the controlled equipment to achieve the target voltage.

2681 Table 249 shows all attributes of DCVoltageControlFunction.

2682 **Table 249 – 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

2683

2684 Table 250 shows all association ends of DCVoltageControlFunction with other classes.

2685 **Table 250 – Association ends of EquipmentReliabilityProfile::DCVoltageControlFunction with other classes**

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

2687

2688 **3.156 (NC) PhaseControlFunction**2689 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

2690 Phase control function is a function block that calculate the operating point of the controlled equipment to achieve the target voltage.

2692 Table 251 shows all attributes of PhaseControlFunction.

2693 **Table 251 – 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

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

2694

2695

Table 252 shows all association ends of PhaseControlFunction with other classes.

2696

2697

Table 252 – Association ends of EquipmentReliabilityProfile::PhaseControlFunction 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

2698

2699

3.157 (NC) RampingPrincipleKind enumeration

2700

Kind of ramping principle.

2701

Table 253 shows all literals of RampingPrincipleKind.

2702

Table 253 – 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.
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).

2703

2704

3.158 (NC) DirectCurrentCircuit

2705

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

2706

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

2707

Table 254 shows all attributes of DirectCurrentCircuit.

2708 **Table 254 – 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

2709

2710 Table 255 shows all association ends of DirectCurrentCircuit with other classes.

2711 **Table 255 – Association ends of EquipmentReliabilityProfile::DirectCurrentCircuit with other classes**
2712

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

2713

2714 **3.159 (NC) OverlappingZone**2715 Inheritance path = [IdentifiedObject](#)2716 A collection of all the overlapping cross border assessed elements which have the same sets
2717 of impacted and impacting regions.

2718 Table 256 shows all attributes of OverlappingZone.

2719 **Table 256 – Attributes of EquipmentReliabilityProfile::OverlappingZone**

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

2720

2721 **3.160 (NC) TapChangerController**2722 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2723 [IdentifiedObject](#)2724 Tap changer controller is an equipment controller that controls a tap changer, e.g. how the
2725 voltage at the end of a line varies with the load level and compensation of the voltage drop by
2726 tap adjustment.

2727 Table 257 shows all attributes of TapChangerController.

2728 **Table 257 – 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	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

2729

2730

Table 258 shows all association ends of TapChangerController with other classes.

2731

Table 258 – Association ends of EquipmentReliabilityProfile::TapChangerController with other classes

2732

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

2733

2734

3.161 (NC) CurrentDroopControlFunction

2735

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

2736

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

2737

2738

Table 259 shows all attributes of CurrentDroopControlFunction.

2739

Table 259 – 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

2740

2741

Table 260 shows all association ends of CurrentDroopControlFunction with other classes.

2742

Table 260 – Association ends of EquipmentReliabilityProfile::CurrentDroopControlFunction with other classes

2743

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

2744

2745

3.162 (NC) VoltageInjectionControlFunction

2746

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

2747 Voltage injection control function is a function block that calculates the operating point of the
2748 controlled equipment to achieve the target voltage injection. The controlled point is the Terminal
2749 with sequenceNumber =1.

2750 Table 261 shows all attributes of VoltageInjectionControlFunction.

2751 **Table 261 – 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

2752

2753 Table 262 shows all association ends of VoltageInjectionControlFunction with other classes.

2754

2755 **Table 262 – 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

2756

2757 3.163 (NC) SSSCController

2758 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2759 [IdentifiedObject](#)

2760 The controller of a Static synchronous series compensator (SSSC).

2761 Table 263 shows all attributes of SSSCController.

2762

Table 263 – 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.
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

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

2763

2764

Table 264 shows all association ends of SSSCController with other classes.

2765

2766

Table 264 – 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

2767

2768

3.164 (NC) CurrentDropOverride root class

2769

Current droop override uses the following logic:

2770

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

2771

2772

2773

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

2776

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

2777

Table 265 shows all attributes of CurrentDropOverride.

2778

Table 265 – 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.

2779

2780

Table 266 shows all association ends of CurrentDropOverride with other classes.

2781

2782

Table 266 – Association ends of EquipmentReliabilityProfile::CurrentDropOverride with other classes

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

2783

2784 **3.165 CurrentFlow datatype**

2785 Electrical current with sign convention: positive flow is out of the conducting equipment into the connectivity node. Can be both AC and DC.

2786 Table 267 shows all attributes of CurrentFlow.

2788 **Table 267 – Attributes of EquipmentReliabilityProfile::CurrentFlow**

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

2789

2790 **3.166 Voltage datatype**

2791 Electrical voltage, can be both AC and DC.

2792 Table 268 shows all attributes of Voltage.

2793 **Table 268 – Attributes of EquipmentReliabilityProfile::Voltage**

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

2794

2795 **3.167 PU datatype**

2796 Per Unit - a positive or negative value referred to a defined base. Values typically range from -10 to +10.

2797 Table 269 shows all attributes of PU.

2799 **Table 269 – Attributes of EquipmentReliabilityProfile::PU**

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

2800

2801 **3.168 Resistance datatype**

2802 Resistance (real part of impedance).

2803 Table 270 shows all attributes of Resistance.

2804 **Table 270 – Attributes of EquipmentReliabilityProfile::Resistance**

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

2805

2806 **3.169 (abstract) SynchronousMachine root class**

2807 An electromechanical device that operates with shaft rotating synchronously with the network.

2808 It is a single machine operating either as a generator or synchronous condenser or pump.

2809 **3.170 ReactiveCapabilityCurve**2810 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2811 Reactive power rating envelope versus the synchronous machine's active power, in both the
 2812 generating and motoring modes. For each active power value there is a corresponding high and
 2813 low reactive power limit value. Typically there will be a separate curve for each coolant
 2814 condition, such as hydrogen pressure. The Y1 axis values represent reactive minimum and the
 2815 Y2 axis values represent reactive maximum.

2816 Table 271 shows all attributes of ReactiveCapabilityCurve.

2817 **Table 271 – 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

2818

2819 Table 272 shows all association ends of ReactiveCapabilityCurve with other classes.

2820 **Table 272 – Association ends of EquipmentReliabilityProfile::ReactiveCapabilityCurve**
2821 **with other classes**

mult from	name	mult to	type	description
0..*	SynchronousMachine2	0..1	SynchronousMachine	(NC) Synchronous machine using this curve.
0..*	EquivalentInjection2	0..1	EquivalentInjection	(NC) The equivalent injection using this reactive capability curve.

2822

2823 **3.171 Temperature datatype**

2824 Value of temperature in degrees Celsius.

2825 Table 273 shows all attributes of Temperature.

2826 **Table 273 – Attributes of EquipmentReliabilityProfile::Temperature**

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

name	mult	type	description
value	0..1	Float	

2827

2828 **3.172 Pressure datatype**

2829 Pressure in pascals.

2830 Table 274 shows all attributes of Pressure.

2831

Table 274 – Attributes of EquipmentReliabilityProfile::Pressure

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

2832

2833 **3.173 (abstract) VsConverter root class**

2834 DC side of the voltage source converter (VSC).

2835 **3.174 VsCapabilityCurve**2836 Inheritance path = [Curve](#) : [IdentifiedObject](#)

2837 The P-Q capability curve for a voltage source converter, with P on X-axis and Qmin and Qmax

2838 on Y1-axis and Y2-axis.

2839 Table 275 shows all attributes of VsCapabilityCurve.

2840

Table 275 – 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
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

2841

2842 Table 276 shows all association ends of VsCapabilityCurve with other classes.

Table 276 – Association ends of EquipmentReliabilityProfile::VsCapabilityCurve with other classes

2844

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

2845

2846 **3.175 (Description) EquivalentInjection root class**2847 This class represents equivalent injections (generation or load). Voltage regulation is allowed
2848 only at the point of connection.

2849 Table 277 shows all association ends of EquivalentInjection with other classes.

2850 **Table 277 – Association ends of EquipmentReliabilityProfile::EquivalentInjection with**
2851 **other classes**

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

2852

2853 **3.176 (NC) SSSCSimulationSettings root class**

2854 SSSC control simulation settings used by the algorithm for power flow calculations.

2855 Table 278 shows all attributes of SSSCSimulationSettings.

2856 **Table 278 – 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.
isEstimateDLdVSensitive	1..1	Boolean	(NC) Defines if the estimate is considering the dI/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.

2857

2858 **3.177 (NC) RotatingMachineController**2859 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
2860 [IdentifiedObject](#)2861 Rotating machine controller is controlling the equipment which may be used as a generator or
2862 motor.

2863 Table 279 shows all attributes of RotatingMachineController.

2864 **Table 279 – 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

2865

2866 Table 280 shows all association ends of RotatingMachineController with other classes.

2867

2868

Table 280 – Association ends of EquipmentReliabilityProfile::RotatingMachineController with other classes

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

2869

3.178 (NC) InjectionController2871 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)2872
2873 Injection controller is controlling the equipment which represents an injection or an external network.2874
2875 Table 281 shows all attributes of InjectionController.2876 **Table 281 – Attributes of EquipmentReliabilityProfile::InjectionController**

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

2877

2878 Table 282 shows all association ends of InjectionController with other classes.

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

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

2881

3.179 (abstract) ACDCConverter2883 Inheritance path = [ConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

2884

2885 A unit with valves for three phases, together with unit control equipment, essential protective
2886 and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for
2887 conversion.
2888 Table 283 shows all attributes of ACDCConverter.

2889 **Table 283 – 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

2890
2891 Table 284 shows all association ends of ACDCConverter with other classes.

2892 **Table 284 – Association ends of EquipmentReliabilityProfile::ACDCConverter with other**
2893 **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

2894
2895 **3.180 Reservoir**

2896 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)
2897 A water storage facility within a hydro system, including: ponds, lakes, lagoons, and rivers. The
2898 storage is usually behind some type of dam.
2899 Table 285 shows all attributes of Reservoir.

2900 **Table 285 – 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

2901
2902 **3.181 (Description) HydroPowerPlant root class**

2903 A hydro power station which can generate or pump. When generating, the generator turbines
2904 receive water from an upper reservoir. When pumping, the pumps receive their water from a
2905 lower reservoir.
2906 Table 286 shows all association ends of HydroPowerPlant with other classes.

2907 **Table 286 – Association ends of EquipmentReliabilityProfile::HydroPowerPlant with**
2908 **other classes**

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.

2909

2910 **3.182 (NC) InfeedLimit**2911 Inheritance path = [OperationalLimit](#) : [IdentifiedObject](#)

2912 Infeed limit set constraints fed in to the network by two or more terminals.

2913 Table 287 shows all attributes of InfeedLimit.

2914 **Table 287 – 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

2915

2916 Table 288 shows all association ends of InfeedLimit with other classes.

2917 **Table 288 – Association ends of EquipmentReliabilityProfile::InfeedLimit with other classes**

2918

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

2919

2920 **3.183 (NC) InfeedTerminal root class**

2921 Infeed terminal defines the terminals that are linked to an infeed limit.

2922 Table 289 shows all attributes of InfeedTerminal.

2923 **Table 289 – 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.

2924

2925 Table 290 shows all association ends of InfeedTerminal with other classes.

2926 **Table 290 – Association ends of EquipmentReliabilityProfile::InfeedTerminal with other classes**

2927

mult from	name	mult to	type	description
0..*	ACDCTerminal	1..1	ACDCTerminal	(NC) ACDCTerminal which is connected to an infeed terminal.

mult from	name	mult to	type	description
0..*	InfeedConstraint	1..1	InfeedLimit	(NC) Infeed constraint which belongs to an infeed terminal.

2928

2929 **3.184 (NC) FuelStorage**2930 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2931 Fuel storage. e.g. pile of coal that can be shared between multiple thermal generating units.

2932 Table 291 shows all attributes of FuelStorage.

2933

Table 291 – 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

2934

2935 **3.185 (Description) FossilFuel root class**

2936 The fossil fuel consumed by the non-nuclear thermal generating unit. For example, coal, oil, gas, etc. These are the specific fuels that the generating unit can consume.

2938 Table 292 shows all association ends of FossilFuel with other classes.

2939

Table 292 – Association ends of EquipmentReliabilityProfile::FossilFuel with other classes

2940

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

2941

2942 **3.186 (NC) PowerCapacity root class**

2943 Power capacity defines the capacity in regard to generation, consumption and transmission (import and export) for a relevant power system resource, e.g. bidding zone, including maximum and minimum electrical power capacity and any capacity allocation.

2946 **3.187 (NC) PowerShiftKeyStrategy**2947 Inheritance path = [IdentifiedObject](#)

2948 Strategy of the power shift key.

2949 Table 293 shows all attributes of PowerShiftKeyStrategy.

2950

Table 293 – 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

name	mult	type	description
			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

2951

2952

Table 294 shows all association ends of PowerShiftKeyStrategy with other classes.

2953

Table 294 – Association ends of EquipmentReliabilityProfile::PowerShiftKeyStrategy with other classes

2954

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

2955

2956

3.188 (NC) ShiftMethodKind enumeration

2957

Kind of shift method. Describes the way a power schedule should be distributed amongst production and consumption. e.g. Type of generating and load shift key.

2958

2959

Table 295 shows all literals of ShiftMethodKind.

2960

Table 295 – Literals of EquipmentReliabilityProfile::ShiftMethodKind

literal	value	description
shared		Power schedule shift (distribution) is done by a shared fraction e.g. A two unit with the participation factor 60 and 40 will distribute a 10 MW schedule by 6 and 4 MW.
priority		Power schedule shift (distribution) is done by a shared fraction prioritizing the unit e.g. A two unit with the participation factor 60 and 40 will distribute a 10 MW increased schedule by first filling the highest participation factor (priority) until max economy power or maximum power allowed by the unit before it starts filling the next on the list. e.g. The unit with 60 will be getting its maximum shared first. The same logic applies with reducing the schedule. e.g. The 60 participation factor unit will be reduced to its min economy factor or minimum power.

2961

2962

3.189 (NC) PowerShiftKeyKind enumeration

2963

Kind of generating and load shift keys strategy.

2964

Table 296 shows all literals of PowerShiftKeyKind.

2965

Table 296 – Literals of EquipmentReliabilityProfile::PowerShiftKeyKind

literal	value	description
explicitInstruction		The distribution is done according to the individual participation factor on the unit.
explicitDistribution		The distribution is explicitly done according to the power shift key distribution in the power bid Schedule.
generatorsFlat		Flat adjustment, equal amount of power, on all active generators. e.g. 100 MW increase adjustment on 4 generators, it means that each of them get increased 25 MW, as long as no other constraints are violated.
consumptionsFlat		Flat adjustment, equal amount of power, on all active consumption units (Energy Consumers and Power Electronics like FlexibleEnergyUnit). e.g. 100 MW decrease adjustment on 4 loads, it means that each of them get reduced 25 MW, as long as no other constraints are violated.
generatorsPmax		The distribution is relative to the maximum p of the generator.
generatorsP		The distribution is based on the generators active power in the given case.
consumptionsP		The distribution is based on the consumptions active power in the given case.
generatorsAndConsumptionsP		The distribution is based on the generator and consumption active power in the given case.
generatorsRemainingCapacity		The distribution is based on the remaining capacity for generators in the given case.
nonConformLoadP		The distribution is based on the non conform load active power in the given case.
storageP		The distribution is based on the batteries and any operating hydro pumps active power in the given case.
storageFlat		Flat adjustment, equal amount of power, on all the batteries and any operating hydro pumps. e.g. 100 MW increase or decrease adjustment on 4 batteries, it means that each of them get increased or reduced 25 MW, as long as no other constraints are violated.
generatorsPmin		The distribution is relative to the minimum p of the generator.
generatorsUsedCapacity		The distribution is based on the used capacity, the difference between the minimum operation and operating p (GeneratingUnit.minOperatingP)

2966

2967 3.190 (NC) PowerBlockKind enumeration

2968 Power block kind describes the increase and/or decrease of power.

2969 Table 297 shows all literals of PowerBlockKind.

2970

Table 297 – 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.

literal	value	description
powerIncreaseAndDecrease		Increase and decrease in the power. The block represents action for increased and decreased power.

2971

2972 **3.191 (NC) EnergyGroup**2973 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

2974 An energy group is an aggregation of energy components which have the same energy characteristic, e.g. fuel type and technology. It can be used to allocate energy.

2975

2976 Table 298 shows all attributes of EnergyGroup.

2977

Table 298 – Attributes of EquipmentReliabilityProfile::EnergyGroup

name	mult	type	description
normalParticipationFactor or	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

2978

2979 Table 299 shows all association ends of EnergyGroup with other classes.

Table 299 – Association ends of EquipmentReliabilityProfile::EnergyGroup with other classes

2980

2981

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

2982

2983 **3.192 (NC) EnergyKind enumeration**

2984 Categories of energy used for energy groups.

2985 Table 300 shows all literals of EnergyKind.

2986

Table 300 – 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.

literal	value	description
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.

2987

2988 **3.193 (abstract,NC) EnergySourceReference root class**

2989 An energy source reference refers to a set of fuel types characteristic for reporting, e.g.
2990 European Energy Certificate System (EECS). The kind of energy should be possible to be linked
2991 with different type of energy forecast, e.g. wind production for a given area based on wind
2992 forecast.

2993 **3.194 (NC) DCHarmonicFilter**

2994 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
2995 [PowerSystemResource](#) : [IdentifiedObject](#)

2996 DC harmonic filter (IEC 60633) is a filter which, in conjunction with the DC reactor(s) and with
2997 the DC surge capacitor(s), if any, serves the primary function of reducing (current or voltage)
2998 ripple on the DC transmission line and/or earth electrode line.

2999 Table 301 shows all attributes of DCHarmonicFilter.

3000 **Table 301 – Attributes of EquipmentReliabilityProfile::DCHarmonicFilter**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3001

3002 Table 302 shows all association ends of DCHarmonicFilter with other classes.

3003 **Table 302 – Association ends of EquipmentReliabilityProfile::DCHarmonicFilter with**
3004 **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

3005

3006 **3.195 (NC) DCsmoothingReactor**

3007 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3008 [PowerSystemResource](#) : [IdentifiedObject](#)

3009 Reactor (IEC 60633) connected in series with a converter unit or converter units on the DC side
3010 for the primary purpose of smoothing the direct current and reducing current transients.

3011 Table 303 shows all attributes of DCsmoothingReactor.

3012

Table 303 – Attributes of EquipmentReliabilityProfile::DCsmoothingReactor

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3013

3014 Table 304 shows all association ends of DCsmoothingReactor with other classes.

3015 **Table 304 – Association ends of EquipmentReliabilityProfile::DCsmoothingReactor with**
3016 **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

3017

3018 **3.196 (NC) DCsmoothingReactorArrester**

3019 Inheritance path = [DCSeriesDevice](#) : [DCConductingEquipment](#) : [Equipment](#) :
3020 [PowerSystemResource](#) : [IdentifiedObject](#)

3021 Arrester (IEC 60633) connected between the terminals of a smoothing reactor.

3022 Table 305 shows all attributes of DCsmoothingReactorArrester.

3023

Table 305 – Attributes of EquipmentReliabilityProfile::DCsmoothingReactorArrester

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3024

3025 Table 306 shows all association ends of DCsmoothingReactorArrester with other classes.

3026
3027**Table 306 – Association ends of
EquipmentReliabilityProfile::DCSmoothingReactorArrester with other classes**

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

3028

3.197 (abstract,NC) DCHighSpeedSwitch

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

High-speed DC switch (IEC 60633) is a type of switchgear used on a DC scheme, required to open or close rapidly (< 1 s), including in some cases the need to commute load current into a parallel conducting path, but with no requirement to interrupt fault or load current. DC switchgear is usually based on a single-phase unit of an AC circuit-breaker, appropriately modified for their DC applications. Their capabilities to perform faster opening and closing than disconnect switches are used but the function of breaking short-circuit currents is not required. Table 307 shows all attributes of DCHighSpeedSwitch.

Table 307 – Attributes of EquipmentReliabilityProfile::DCHighSpeedSwitch

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3040

Table 308 shows all association ends of DCHighSpeedSwitch with other classes.

Table 308 – Association ends of EquipmentReliabilityProfile::DCHighSpeedSwitch with other classes3042
3043

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

3044

3.198 (abstract,NC) DCCommutationSwitch

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

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

Table 309 shows all attributes of DCCommutationSwitch.

Table 309 – Attributes of EquipmentReliabilityProfile::DCCommutationSwitch

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

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

3052

3053

Table 310 shows all association ends of DCCommutationSwitch with other classes.

3054

Table 310 – Association ends of EquipmentReliabilityProfile::DCCommutationSwitch with other classes

3055

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

3056

3057

3.199 (NC) DCConverterParallelingSwitch

3058

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

3059

3060

3061

3062

3063

3064

Converter paralleling switch (IEC 60633) is a high-speed DC switch connected in series with each converter at the DC terminal in DC schemes where two or more converters are connected in parallel onto a common pole conductor, designed to allow additional converter(s) to be connected in parallel or disconnected without affecting the load current in the other converter. Table 311 shows all attributes of DCConverterParallelingSwitch.

3065

Table 311 – Attributes of EquipmentReliabilityProfile::DCConverterParallelingSwitch

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3066

3067

Table 312 shows all association ends of DCConverterParallelingSwitch with other classes.

3068

Table 312 – Association ends of EquipmentReliabilityProfile::DCConverterParallelingSwitch with other classes

3069

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

3070

3071

3.200 (NC) DCBypassSwitch

3072

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

3073

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3079

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).

Table 313 shows all attributes of DCBypassSwitch.

3080 **Table 313 – Attributes of EquipmentReliabilityProfile::DCBypassSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3081
3082 Table 314 shows all association ends of DCBypassSwitch with other classes.

3083 **Table 314 – Association ends of EquipmentReliabilityProfile::DCBypassSwitch with**
3084 **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

3085
3086 **3.201 (NC) DCNeutralBusGroundingSwitch**

3087 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3088 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3089 Neutral bus grounding switch (IEC 60633) or a neutral bus earthing switch is a DC commutation
3090 switch connected from the neutral bus to the station earth mat on a bipolar DC scheme,
3091 designed to provide a temporary earth connection in the event of an open circuit fault on the
3092 electrode line until the imbalance of current between the two poles can be reduced to a safe
3093 minimum level or the electrode line connection can be restored.

3094 Table 315 shows all attributes of DCNeutralBusGroundingSwitch.

3095 **Table 315 – Attributes of EquipmentReliabilityProfile::DCNeutralBusGroundingSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3096
3097 Table 316 shows all association ends of DCNeutralBusGroundingSwitch with other classes.

3098 **Table 316 – Association ends of**
3099 **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

3100

3101 **3.202 (NC) DCNeutralBusSwitch**

3102 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3103 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3104 Neutral bus switch (IEC 60633) is a DC commutation switch connected in series with the neutral
3105 bus on a bipolar DC scheme, designed to commutate current out of the pole conductor or neutral
3106 bus and into the electrode line or dedicated metallic return conductor or earth in response to a
3107 fault in a converter or neutral bus.

3108 Table 317 shows all attributes of DCNeutralBusSwitch.

3109 **Table 317 – Attributes of EquipmentReliabilityProfile::DCNeutralBusSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3110

3111 Table 318 shows all association ends of DCNeutralBusSwitch with other classes.

3112 **Table 318 – Association ends of EquipmentReliabilityProfile::DCNeutralBusSwitch with
3113 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

3114

3115 **3.203 (NC) DCMetallicReturnSwitch**

3116 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3117 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3118 Metallic return transfer switch (IEC 60633) is a DC commutation switch used to transfer DC
3119 current from an earth return path to a metallic return path. Although the term "metallic return
3120 transfer breaker" has been widely used in the industry for many years, it is misleading since
3121 such switches have no ability to interrupt fault current.

3122 Table 319 shows all attributes of DCMetallicReturnSwitch.

3123 **Table 319 – Attributes of EquipmentReliabilityProfile::DCMetallicReturnSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3124

3125 Table 320 shows all association ends of DCMetallicReturnSwitch with other classes.

3126 **Table 320 – Association ends of EquipmentReliabilityProfile::DCMetalicReturnSwitch**
3127 **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

3128

3129 3.204 (NC) DCEarthReturnTransferSwitch

3130 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3131 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3132 Earth return transfer switch (IEC 60633) DC commutation switch used to transfer DC current
3133 from a metallic return path to an earth return path. In some applications, this function is
3134 performed by a by-pass switch. Although the term "earth return transfer breaker" has been
3135 widely used in the industry for many years, it is misleading since such switches have no ability
3136 to interrupt fault current.

3137 Table 321 shows all attributes of DCEarthReturnTransferSwitch.

3138 **Table 321 – Attributes of EquipmentReliabilityProfile::DCEarthReturnTransferSwitch**

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	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

3139

3140 Table 322 shows all association ends of DCEarthReturnTransferSwitch with other classes.

3141 **Table 322 – Association ends of**
3142 **EquipmentReliabilityProfile::DCEarthReturnTransferSwitch with other classes**

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

3143

3144 3.205 (NC) DCLineParallelingSwitch

3145 Inheritance path = [DCCommutationSwitch](#) : [DCHighSpeedSwitch](#) : [DCSwitch](#) :
3146 [DCConductingEquipment](#) : [Equipment](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3147 Line paralleling switch (IEC 60633) DC commutation switch placed in series with one or more
3148 high-voltage pole conductors, allowing two or more lines to be connected in parallel or to revert
3149 to single-line operation while conducting load current.

3150 Table 323 shows all attributes of DCLineParallelingSwitch.

3151 **Table 323 – Attributes of EquipmentReliabilityProfile::DCLineParallelingSwitch**

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

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

3152

3153 Table 324 shows all association ends of DCLineParallelingSwitch with other classes.

3154 **Table 324 – Association ends of EquipmentReliabilityProfile::DCLineParallelingSwitch**
3155 **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

3156

3157 **3.206 (abstract,NC) DirectCurrentEquipmentController**3158 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3159 [IdentifiedObject](#)3160 Direct current equipment controller used to control different parts of the hierarchical structure
3161 of the DC control system defined by IEC 60633.

3162 Table 325 shows all attributes of DirectCurrentEquipmentController.

3163 **Table 325 – Attributes of**
3164 **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

3165

3166 Table 326 shows all association ends of DirectCurrentEquipmentController with other classes.

3167 **Table 326 – Association ends of**
3168 **EquipmentReliabilityProfile::DirectCurrentEquipmentController with other classes**

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

3169

3170 **3.207 (NC) ACDCConverterController**3171 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3172 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)3173 ACDC converter unit control. According to IEC 60633, it is the control system used for the
3174 controlling, monitoring and protection of a single converter unit.

3175 Table 327 shows all attributes of ACDCConverterController.

3176 **Table 327 – Attributes of EquipmentReliabilityProfile::ACDCConverterController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction

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

3177

3178

Table 328 shows all association ends of ACDCConverterController with other classes.

3179

Table 328 – Association ends of EquipmentReliabilityProfile::ACDCConverterController with other classes

3180

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

3181

3182

3.208 (NC) DirectCurrentPoleController

3183

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

3184

3185

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

3186

Table 329 shows all attributes of DirectCurrentPoleController.

3187

Table 329 – Attributes of EquipmentReliabilityProfile::DirectCurrentPoleController

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

3188

3189

Table 330 shows all association ends of DirectCurrentPoleController with other classes.

3190

Table 330 – Association ends of EquipmentReliabilityProfile::DirectCurrentPoleController with other classes

3191

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

3192

3193 **3.209 (NC) DirectCurrentBipoleController**

3194 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3195 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3196 DC system bipole control that is the control system of a bipole in accordance with IEC 60633.

3197 Table 331 shows all attributes of DirectCurrentBipoleController.

3198 **Table 331 – 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

3199

3200 Table 332 shows all association ends of DirectCurrentBipoleController with other classes.

3201 **Table 332 – Association ends of**
3202 **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

3203

3204 **3.210 (abstract,NC) DirectCurrentSubstationController**

3205 Inheritance path = [DirectCurrentEquipmentController](#) : [EquipmentController](#) :
3206 [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3207 Control system used for the controlling, monitoring and protection within a DC substation (IEC
3208 60633). A DC substation control may be implemented at the bipole and/or pole level and may
3209 be referred to as local control.

3210 Table 333 shows all attributes of DirectCurrentSubstationController.

3211 **Table 333 – Attributes of**
3212 **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

3213

3214 Table 334 shows all association ends of DirectCurrentSubstationController with other classes.

3215
3216**Table 334 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSubstationController with other classes**

mult from	name	mult to	type	description
2..*	MultiterminalControl	0..1	DirectCurrentMasterController	(NC) Multiterminal control that controls more than two DC substation controllers.
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3217

3.211 (NC) DirectCurrentSubstationPoleController

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

3220
3221 Control system of a substation pole (IEC 60633).

3222 Table 335 shows all attributes of DirectCurrentSubstationPoleController.

3223
3224**Table 335 – Attributes of
EquipmentReliabilityProfile::DirectCurrentSubstationPoleController**

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

3225

3226 Table 336 shows all association ends of DirectCurrentSubstationPoleController with other
3227 classes.3228
3229**Table 336 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSubstationPoleController with other classes**

mult from	name	mult to	type	description
0..1	DCSubstationPole	1..1	DCSubstationPole	(NC) DC substation pole that is controlled by a DC substation pole controller.
2..*	MultiterminalControl	0..1	DirectCurrentMasterController	(NC) inherited from: DirectCurrentSubstationController
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3230

3.212 (NC) DirectCurrentSubstationBipoleController

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

3233
3234 Control system of a substation bipole (IEC 60633).

3235 Table 337 shows all attributes of DirectCurrentSubstationBipoleController.

3236
3237**Table 337 – Attributes of
EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController**

name	mult	type	description
type	0..1	String	(NC) inherited from: AutomationFunction

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

3238
3239
3240

Table 338 shows all association ends of `DirectCurrentSubstationBipoleController` with other classes.

3241
3242
3243

**Table 338 – Association ends of
EquipmentReliabilityProfile::DirectCurrentSubstationBipoleController with other
classes**

mult from	name	mult to	type	description
0..1	DCSubstationBipole	1..1	DCSubstationBipole	(NC) DC substation bipole that is controlled by a DC substation bipole controller.
2..*	MultiterminalControl	0..1	DirectCurrentMasterController	(NC) inherited from: DirectCurrentSubstationController
0..*	PartOf	0..1	AutomationFunction	(NC) inherited from: AutomationFunction

3244

3.213 (NC) DCSubstation

3246 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3247 [PowerSystemResource](#) : [IdentifiedObject](#)

3248 DC substation or DC converter station (IEC 60633) is part of an DC system which consists of
3249 one or more converter units installed in a single location together with buildings, reactors, filters,
3250 reactive power supply, control, monitoring, protective, measuring and auxiliary equipment. A
3251 DC substation forming part of an DC transmission system may be referred to as an DC
3252 transmission substation.

3253 Table 339 shows all attributes of `DCSubstation`.

3254

Table 339 – 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

3255
3256

Table 340 shows all association ends of `DCSubstation` with other classes.

3257 **Table 340 – Association ends of EquipmentReliabilityProfile::DCSubstation with other**
3258 **classes**

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

3259

3260 3.214 (NC) DCSubstationPole

3261 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3262 [PowerSystemResource](#) : [IdentifiedObject](#)

3263 Part of an DC system pole (IEC 60633) which is contained within a DC substation.

3264 Table 341 shows all attributes of DCSubstationPole.

3265 **Table 341 – 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

3266

3267 Table 342 shows all association ends of DCSubstationPole with other classes.

3268 **Table 342 – Association ends of EquipmentReliabilityProfile::DCSubstationPole with**
3269 **other classes**

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

3270

3271 3.215 (NC) DCSubstationBipole

3272 Inheritance path = [DCEquipmentContainer](#) : [EquipmentContainer](#) : [ConnectivityNodeContainer](#) :
3273 [PowerSystemResource](#) : [IdentifiedObject](#)

3274 Part of a bipolar DC system (IEC 60633) contained within a DC substation.

3275 Table 343 shows all attributes of DCSubstationBipole.

3276 **Table 343 – 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

3277

3278 Table 344 shows all association ends of DCSubstationBipole with other classes.

3279 **Table 344 – Association ends of EquipmentReliabilityProfile::DCSubstationBipole with**
3280 **other classes**

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

3281

3282 3.216 (abstract,NC) DCSystem

3283 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3284 Electrical power system which transfers energy in the form of direct current between two or
3285 more AC buses (defined in IEC 60633).

3286 Table 345 shows all attributes of DCSystem.

3287 **Table 345 – 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

3288

3289 3.217 (NC) BipolarDCSystem

3290 Inheritance path = [DCSystem](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3291 Bipolar DC system (IEC 60633) consists of two poles of opposite polarity with respect to earth.

3292 The overhead lines, if any, of the two poles may be carried on common or separate towers.

3293 Table 346 shows all attributes of BipolarDCSystem.

3294 **Table 346 – Attributes of EquipmentReliabilityProfile::BipolarDCSystem**

name	mult	type	description
isRigid	1..1	Boolean	(NC) If true, the bipolar DC system is a rigid DC current bipolar system (IEC 60633). It is a bipolar DC system without neutral connection between both converter stations. Since only two (pole) conductors exist, no unbalance current between both poles is possible. In case of interruption of power transfer of one converter pole, the current of the other pole has to be interrupted as well (at least for a limited time to allow reconfiguration of the DC circuit).
directionKind	0..1	DCSystemDirectionKind	(NC) inherited from: DCSystem
transmissionKind	0..1	DCSystemTransmissionKind	(NC) inherited from: DCSystem
energyIdentCodeEic	0..1	String	(deprecated,European) inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

3295

3296 **3.218 (NC) MonopolarDCSystem**3297 Inheritance path = [DCSystem](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3298 Monopolar DC system (IEC 60633) is a DC system with only one pole.

3299 Table 347 shows all attributes of MonopolarDCSystem.

3300 **Table 347 – 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

3301

3302 **3.219 (NC) DCBiPole**3303 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3304 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.

3307 Table 348 shows all attributes of DCBiPole.

3308 **Table 348 – 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

3309

3310 Table 349 shows all association ends of DCBiPole with other classes.

3311 **Table 349 – Association ends of EquipmentReliabilityProfile::DCBiPole with other**
3312 **classes**

mult from	name	mult to	type	description
0..1	BipolarDCSystem	0..1	BipolarDCSystem	(NC) Bipolar DC system that has this DC bipole.

3313

3314 **3.220 (abstract,NC) PointOfCommonCoupling**

3315 Inheritance path = [IdentifiedObject](#)

3316 Point of Common Coupling (PCC) refers to the location where multiple electrical sources or
3317 loads are electrically connected and provide a reference point where the voltages and currents
3318 from different parts of the system are considered to be common. The PCC is used to support
3319 system analysis, control, and monitoring, as it provides a reference for understanding the
3320 interactions and power flow between various components within the system. It is also relevant
3321 to define the requirement and responsibility between different actors in operating a power
3322 system.

3323 Table 350 shows all attributes of PointOfCommonCoupling.

3324 **Table 350 – 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

3325

3326 **3.221 (NC) ACPointOfCommonCoupling**

3327 Inheritance path = [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3328 Point of interconnection of the DC converter station to the adjacent AC system (IEC 60633).

3329 Table 351 shows all attributes of ACPointOfCommonCoupling.

3330 **Table 351 – 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

3331

3332 Table 352 shows all association ends of ACPointOfCommonCoupling with other classes.

3333 **Table 352 – Association ends of**
3334 **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.

3335

3336 **3.222 (NC) DCPointOfCommonCoupling**3337 Inheritance path = [PointOfCommonCoupling](#) : [IdentifiedObject](#)

3338 Point of interconnection of the DC converter station to the DC transmission line (IEC 60633).

3339 Table 353 shows all attributes of DCPointOfCommonCoupling.

3340 **Table 353 – 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

3341

3342 Table 354 shows all association ends of DCPointOfCommonCoupling with other classes.

3343 **Table 354 – Association ends of
EquipmentReliabilityProfile::DCPointOfCommonCoupling with other classes**

3344

mult from	name	mult to	type	description
0..1	DCNode	1..1	DCNode	(NC) The DCNode that is a point of common coupling DC.

3345

3346 **3.223 ConnectivityNode**3347 Inheritance path = [IdentifiedObject](#)

3348 Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.

3349 Table 355 shows all attributes of ConnectivityNode.

3351 **Table 355 – 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

3352

3353 **3.224 DCNode**3354 Inheritance path = [IdentifiedObject](#)

3355 DC nodes are points where terminals of DC conducting equipment are connected together with zero impedance.

3357 Table 356 shows all attributes of DCNode.

3358 **Table 356 – 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

3359

3360 **3.225 (NC) AutomationBlockGroup root class**

3361 Grouping of function block that are operated with the same priority as settings.

3362 Table 357 shows all attributes of AutomationBlockGroup.

3363 **Table 357 – 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.

3364

3365 Table 358 shows all association ends of AutomationBlockGroup with other classes.

3366 **Table 358 – Association ends of EquipmentReliabilityProfile::AutomationBlockGroup with other classes**

3367

mult from	name	mult to	type	description
0..*	AutomationFunction	1..1	AutomationFunction	(NC) Automation function which has automation block group.

3368

3369 **3.226 (NC) FrequencyControlFuntion**3370 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

3371 Frequency control function is a function block that calculate the operating point of the controlled equipment to achieve the target frequency.

3372 Table 359 shows all attributes of FrequencyControlFuntion.

3374 **Table 359 – Attributes of EquipmentReliabilityProfile::FrequencyControlFuntion**

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

3375

3376 Table 360 shows all association ends of FrequencyControlFuntion with other classes.

3377 **Table 360 – Association ends of EquipmentReliabilityProfile::FrequencyControlFuntion with other classes**

3378

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

3379

3380 **3.227 (abstract,NC) SystemControl**3381 Inheritance path = [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)3382 System control is the management and regulation of various parameters within the electrical
3383 grid to ensure its stable and reliable operation. The primary goal of system control is to maintain
3384 the balance between electricity generation and consumption, while also managing factors such
3385 as voltage, frequency, and power quality. This involves the use of control devices, automation,
3386 and monitoring systems to respond to changes in the grid and maintain its overall stability.3387 This serves as Integrated AC and DC control system (IEC 60633) which governs the integrated
3388 operation of AC and DC systems of a power system.

3389 Table 361 shows all attributes of SystemControl.

3390 **Table 361 – Attributes of EquipmentReliabilityProfile::SystemControl**

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

3391

3392 Table 362 shows all association ends of SystemControl with other classes.

3393 **Table 362 – Association ends of EquipmentReliabilityProfile::SystemControl with other**
3394 **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

3395

3396 **3.228 (NC) ArealInterchangeController**3397 Inheritance path = [SystemControl](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3398 [IdentifiedObject](#)

3399 Area interchange control is set to control active power of an area.

3400 Table 363 shows all attributes of ArealInterchangeController.

3401 **Table 363 – Attributes of EquipmentReliabilityProfile::ArealInterchangeController**

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

3402

3403 Table 364 shows all association ends of AreaInterchangeController with other classes.

3404 **Table 364 – Association ends of EquipmentReliabilityProfile::AreaInterchangeController**
3405 **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

3406

3407 3.229 (NC) PowerFrequencyController

3408 Inheritance path = [SystemControl](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3409 [IdentifiedObject](#)

3410 Power frequency controller is controlling the active power balance as typically done by the
3411 secondary control. If an unbalance between the scheduled active power values of each
3412 generation unit and the loads plus losses occurs, primary control will adapt (increase/decrease)
3413 the active power production of each unit (depending on the power shift key strategy), leading
3414 to an over- or under-frequency situation. The secondary frequency controller will then control
3415 the frequency back to its nominal value, re- establishing a cost-efficient generation delivered
3416 by each unit.

3417 Table 365 shows all attributes of PowerFrequencyController.

3418 **Table 365 – 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

3419

3420 Table 366 shows all association ends of PowerFrequencyController with other classes.

3421 **Table 366 – Association ends of**
3422 **EquipmentReliabilityProfile::PowerFrequencyController with other classes**

mult from	name	mult to	type	description
0..1	ControlArea	0..1	ControlArea	(NC) Control area which has a power frequency controller.
0..*	PowerShiftKeyStrategy	0..1	PowerShiftKeyStrategy	(NC) Power shift key strategy for this power frequency controller.
0..1	MonitoringArea	0..1	MonitoringArea	(NC) Monitoring area that has this power frequency controller.

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

3423

3424 **3.230 (NC) PowerFrequencyControlKind enumeration**

3425 Kinds of power frequency control modes.

3426 Table 367 shows all literals of PowerFrequencyControlKind.

3427 **Table 367 – Literals of EquipmentReliabilityProfile::PowerFrequencyControlKind**

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

3428

3429 **3.231 (abstract,NC) MonitoringArea**3430 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

3431 A coherent part of the interconnected electrical power system, that includes the system operators' responsibility area and the surrounding parts of other system operators' responsibility area, that need to be monitored for security assessment.

3434 Table 368 shows all attributes of MonitoringArea.

3435 **Table 368 – 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

3436

3437 **3.232 (NC) FrequencyMonitoringTerminal root class**

3438 Frequency monitoring terminal provides location in the model where the frequency is monitored for the purpose of power frequency control.

3440 Table 369 shows all attributes of FrequencyMonitoringTerminal.

3441 **Table 369 – 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.

3442

3443 Table 370 shows all association ends of FrequencyMonitoringTerminal with other classes.

3444

3445

**Table 370 – 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.

3446

3.233 (NC) PowerElectronicsUnitController

3448 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3449 Power electronics unit controller is controlling the equipment to optimize the power electronics unit.

3450 Table 371 shows all attributes of PowerElectronicsUnitController.

Table 371 – 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

3454

3455 Table 372 shows all association ends of PowerElectronicsUnitController with other classes.

3456

3457

**Table 372 – 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

3458

3.234 (NC) ScheduleResourceController

3460 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) : [IdentifiedObject](#)

3461 Schedule resource controller is controlling the equipment to optimize the schedule resource.

3462 Table 373 shows all attributes of ScheduleResourceController.

Table 373 – Attributes of EquipmentReliabilityProfile::ScheduleResourceController

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

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

3465
3466 Table 374 shows all association ends of ScheduleResourceController with other classes.

3467
3468 **Table 374 – Association ends of
EquipmentReliabilityProfile::ScheduleResourceController with other classes**

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

3469
3470 **3.235 (NC) PowerElectronicsConnectionController**
3471 Inheritance path = [EquipmentController](#) : [AutomationFunction](#) : [PowerSystemResource](#) :
3472 [IdentifiedObject](#)
3473 Power electronics connection controller is controlling the equipment to optimize the power
3474 electronics connection.
3475 Table 375 shows all attributes of PowerElectronicsConnectionController.

3476
3477 **Table 375 – 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

3478
3479 Table 376 shows all association ends of PowerElectronicsConnectionController with other
3480 classes.

3481
3482 **Table 376 – Association ends of
EquipmentReliabilityProfile::PowerElectronicsConnectionController with other classes**

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

3483
3484 **3.236 (NC) DCSystemDirectionKind enumeration**
3485 Direction kinds of the DC system.
3486 Table 377 shows all literals of DCSystemDirectionKind.

3487 **Table 377 – Literals of EquipmentReliabilityProfile::DCSystemDirectionKind**

literal	value	description
unidirectional		Unidirectional DC system used for the transfer of energy in only one direction. According to IEC 60633, most DC systems are inherently bidirectional. However, some systems may be optimized to transmit power in only one preferred direction. Such systems may still be considered as "bidirectional".
bidirectional		Bidirectional DC system used for the transfer of energy in either direction. According to IEC 60633 a multiterminal DC system is bidirectional if one or more substations are bidirectional.

3488

3489 **3.237 (NC) DCSystemTransmissionKind enumeration**

3490 DC system transmission kind.

3491 Table 378 shows all literals of DCSystemTransmissionKind.

3492 **Table 378 – 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.

3493

3494 **3.238 ReactivePower datatype**

3495 Product of RMS value of the voltage and the RMS value of the quadrature component of the current.

3497 Table 379 shows all attributes of ReactivePower.

3498 **Table 379 – Attributes of EquipmentReliabilityProfile::ReactivePower**

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

3499

3500 **3.239 (NC) CoordinatedCapacityCalculator**3501 Inheritance path = [SystemOperationCoordinator](#) : [PowerSystemOrganisationRole](#) : [OrganisationRole](#) : [IdentifiedObject](#)

3503 A role that coordinates and executes the task of calculating transmission capacity.

3504 Table 380 shows all attributes of CoordinatedCapacityCalculator.

3505 **Table 380 – Attributes of EquipmentReliabilityProfile::CoordinatedCapacityCalculator**

name	mult	type	description
globalLocationNumber	0..1	String	(NC) inherited from: OrganisationRole

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

3506

3507 Table 381 shows all association ends of CoordinatedCapacityCalculator with other classes.

3508

3509

**Table 381 – Association ends of
EquipmentReliabilityProfile::CoordinatedCapacityCalculator with other classes**

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

3510

3511 3.240 (NC) ACEmulationControlFunction

3512 Inheritance path = [ControlFunctionBlock](#) : [FunctionBlock](#) : [IdentifiedObject](#)

3513 The AC emulation control function is used when AC emulation model is activated for a DC
3514 system. It consists in computing the active power set point of the DC system as a function of
3515 the voltage angle difference between both points of common coupling with the AC network in
3516 order to mimic the behavior of an AC transmission line. This control mode enables the automatic
3517 adjustment of the active power reference following variations of the AC system operational
3518 point.

3519 The setpoint of the DC system is calculated by $P_{setpoint} = P_{ref} + K_{dc} * (\text{angle1} - \text{angle2})$, where

3520 - P_{ref} is the existing active power setpoint;

3521 - K_{dc} is the control system gain and

3522 - angle1 and angle2 are the phase angle measurement (measured at points of common coupling
3523 with the AC network) respectively at the side 1 and 2 of the DC system.

3524 Table 382 shows all attributes of ACEmulationControlFunction.

3525 **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

3526

3527 Table 383 shows all association ends of ACEmulationControlFunction with other classes.

3528
3529**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

3530

3531

3532

3533

Annex A(informative): Sample data3534 **A.1 General**

3535 This Annex is designed to illustrate the profile by using fragments of sample data. It is not meant
3536 to be a complete set of examples covering all possibilities of using the profile. Defining a
3537 complete set of test data is considered a separate activity to be performed for the purpose of
3538 setting up interoperability testing and conformity related to this profile.

3539 **A.2 Sample instance data**

3540 Test data files are available in the CIM EG SharePoint.