



European Network of  
Transmission System Operators  
for Electricity

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# REMEDIAL ACTION PROFILE SPECIFICATION

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2024-10-16

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ICTC APPROVED  
VERSION 2.3.1

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32

## Revision History

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34	<b>CONTENTS</b>		
35	Copyright notice:.....		2
36	Revision History.....		3
37	CONTENTS .....		4
38	1 Introduction .....		11
39	2 Application profile specification .....		11
40	2.1 Version information .....		11
41	2.2 Constraints naming convention .....		11
42	2.3 Profile constraints .....		12
43	2.4 Metadata.....		15
44	2.4.1 Constraints .....		15
45	2.4.2 Reference metadata .....		15
46	3 Detailed Profile Specification .....		16
47	3.1 General.....		16
48	3.2 (NC) ShuntCompensatorModification .....		21
49	3.3 (NC) Stage.....		22
50	3.4 (NC) StageTrigger.....		22
51	3.5 (NC) StaticPropertyRange.....		23
52	3.6 (abstract) StaticVarCompensator root class .....		23
53	3.7 (NC) StaticVarCompensatorAction .....		24
54	3.8 (Description) Substation root class .....		24
55	3.9 (abstract) Switch root class .....		24
56	3.10 (abstract) ACDCCConverter root class .....		24
57	3.11 (NC) ACDCCConverterAction .....		24
58	3.12 (abstract) ACDCTerminal .....		25
59	3.13 (NC) AvailabilityRemedialAction.....		25
60	3.14 (abstract) BatteryUnit root class .....		26
61	3.15 (NC) BatteryUnitAction.....		26
62	3.16 (abstract,NC) BiddingZone root class .....		27
63	3.17 (NC) CountertradeRemedialAction .....		27
64	3.18 (abstract) Contingency root class .....		28
65	3.19 (NC) ContingencyWithRemedialAction root class .....		28
66	3.20 (NC) ControlFunctionBlockAction .....		29
67	3.21 (abstract) DCTerminal root class.....		29
68	3.22 (abstract) EnergyConsumer root class .....		29
69	3.23 (abstract) EnergySource root class .....		29
70	3.24 (NC) EnergySourceModification .....		29
71	3.25 (abstract) EquivalentInjection root class.....		30
72	3.26 (NC) EquivalentInjectionAction.....		30
73	3.27 (abstract) ExternalNetworkInjection root class.....		31
74	3.28 (NC) ExternalNetworkInjectionAction .....		31
75	3.29 (NC) Gate .....		31
76	3.30 (abstract,NC) GateInputPin .....		32
77	3.31 (abstract,NC) GridStateAlteration.....		32

78	3.32	(NC) GridStateAlterationCollection .....	33
79	3.33	(NC) GridStateAlterationRemedialAction .....	33
80	3.34	(abstract) IdentifiedObject root class .....	34
81	3.35	(NC) IntertemporalPropertyRange .....	34
82	3.36	(Description) Line root class .....	35
83	3.37	(NC) LoadAction .....	35
84	3.38	(abstract) Measurement root class .....	36
85	3.39	(NC) MeasurementCalculator .....	36
86	3.40	(NC) MeasurementCalculatorInput .....	36
87	3.41	(NC) PinContingency .....	37
88	3.42	(NC) PinDCTerminal .....	38
89	3.43	(NC) PinEquipment .....	38
90	3.44	(NC) PinGate .....	39
91	3.45	(NC) PinMeasurement.....	40
92	3.46	(NC) PinPowerTransferCorridor .....	40
93	3.47	(NC) PinTerminal .....	41
94	3.48	(NC) PinOperationalLimit .....	41
95	3.49	(abstract) PowerElectronicsConnection root class .....	42
96	3.50	(NC) PowerElectronicsConnectionAction.....	42
97	3.51	(abstract) PowerSystemResource .....	43
98	3.52	(abstract,NC) PowerTransferCorridor root class .....	43
99	3.53	(abstract,NC) PropertyReference root class .....	43
100	3.54	(NC) PTCActivePowerSupport root class .....	43
101	3.55	(NC) RedispatchRemedialAction .....	44
102	3.56	(abstract,NC) Region root class .....	44
103	3.57	(abstract) RegulatingControl root class .....	44
104	3.58	(NC) RegulatingControlAction .....	45
105	3.59	(abstract,NC) RemedialAction .....	46
106	3.60	(NC) RemedialActionScheme .....	47
107	3.61	(abstract) RotatingMachine root class .....	47
108	3.62	(NC) RotatingMachineAction .....	47
109	3.63	(NC) SchemeRemedialAction .....	48
110	3.64	(abstract,NC) SetPointAction .....	49
111	3.65	(abstract) ShuntCompensator root class .....	49
112	3.66	(abstract,NC) SystemOperator root class .....	49
113	3.67	(abstract) TapChanger root class .....	49
114	3.68	(NC) TapPositionAction.....	49
115	3.69	(abstract) Terminal root class.....	50
116	3.70	(NC) TopologyAction.....	50
117	3.71	(NC) TriggerCondition .....	51
118	3.72	(NC) CalculationKind enumeration .....	51
119	3.73	Currency enumeration.....	52
120	3.74	(NC) GateLogicKind enumeration.....	56
121	3.75	(NC) LogicalOperatorsKind enumeration .....	56
122	3.76	(NC) PinDCTerminalKind enumeration .....	56
123	3.77	(NC) PinPowerTransferCorridorKind enumeration .....	57

124	3.78	(NC) RelativeDirectionKind enumeration .....	57
125	3.79	(NC) RemedialActionKind enumeration .....	57
126	3.80	(NC) RemedialActionSchemeKind enumeration .....	57
127	3.81	UnitSymbol enumeration .....	58
128	3.82	UnitMultiplier enumeration .....	59
129	3.83	(NC) ValueOffsetKind enumeration .....	59
130	3.84	ActivePower datatype .....	59
131	3.85	PerCent datatype .....	60
132	3.86	ReactivePower datatype .....	60
133	3.87	Seconds datatype .....	60
134	3.88	Boolean primitive .....	60
135	3.89	Duration primitive .....	60
136	3.90	Float primitive .....	60
137	3.91	Integer primitive .....	61
138	3.92	String primitive .....	61
139	3.93	(NC) ElementCombinationConstraintKind enumeration .....	61
140	3.94	(abstract) OperationalLimit root class .....	61
141	3.95	(NC) BiddingZoneAction .....	61
142	3.96	(abstract,NC) ControlFunctionBlock root class .....	62
143	3.97	(abstract,NC) RangeConstraint .....	62
144	3.98	(NC) PinEquipmentTripping .....	62
145	3.99	(abstract) Equipment root class .....	63
146	3.100	(NC) RemedialActionDependency root class .....	63
147	3.101	(abstract,NC) FunctionInputVariable .....	64
148	3.102	(NC) RemedialActionDependencyKind enumeration .....	64
149	3.103	(abstract,NC) PowerRemedialAction .....	65
150	3.104	(NC) EquipmentControllerAction .....	65
151	3.105	(abstract,NC) EquipmentController root class .....	66
152	3.106	(NC) RemedialActionGroup .....	66
153	3.107	(NC,Description) PowerShiftKeyStrategy .....	66
154	3.108	(abstract,NC) BiddingZoneBorder root class .....	67
155	3.109	(NC) PinTerminalKind enumeration .....	67
156	3.110	(NC) InServiceAction .....	67
157	Annex A (informative): Sample data .....		69
158	A.1	General .....	69
159	A.2	Sample instance data .....	69
160			
161	<b>List of figures</b>		
162	Figure 1 – Class diagram RemedialActionProfile::Core .....		16
163	Figure 2 – Class diagram RemedialActionProfile::GridStateAlterationPart1 .....		17
164	Figure 3 – Class diagram RemedialActionProfile::GridStateAlterationPart2 .....		18
165	Figure 4 – Class diagram RemedialActionProfile::IntensityAndRange .....		19
166	Figure 5 – Class diagram RemedialActionProfile::RemedialAction .....		20
167	Figure 6 – Class diagram RemedialActionProfile::RemedialActionScheme .....		20

168	Figure 7 – Class diagram RemedialActionProfile::RemedialActionSchemeGate .....	21
169		
170	<b>List of tables</b>	
171	Table 1 – Attributes of RemedialActionProfile::ShuntCompensatorModification .....	21
172	Table 2 – Association ends of RemedialActionProfile::ShuntCompensatorModification	
173	with other classes .....	21
174	Table 3 – Attributes of RemedialActionProfile::Stage .....	22
175	Table 4 – Association ends of RemedialActionProfile::Stage with other classes .....	22
176	Table 5 – Attributes of RemedialActionProfile::StageTrigger .....	22
177	Table 6 – Association ends of RemedialActionProfile::StageTrigger with other classes .....	22
178	Table 7 – Attributes of RemedialActionProfile::StaticPropertyRange .....	23
179	Table 8 – Association ends of RemedialActionProfile::StaticPropertyRange with other	
180	classes .....	23
181	Table 9 – Attributes of RemedialActionProfile::StaticVarCompensatorAction .....	24
182	Table 10 – Association ends of RemedialActionProfile::StaticVarCompensatorAction	
183	with other classes .....	24
184	Table 11 – Attributes of RemedialActionProfile::ACDCCConverterAction .....	25
185	Table 12 – Association ends of RemedialActionProfile::ACDCCConverterAction with	
186	other classes .....	25
187	Table 13 – Attributes of RemedialActionProfile::ACDCTerminal .....	25
188	Table 14 – Attributes of RemedialActionProfile::AvailabilityRemedialAction .....	25
189	Table 15 – Association ends of RemedialActionProfile::AvailabilityRemedialAction with	
190	other classes .....	26
191	Table 16 – Attributes of RemedialActionProfile::BatteryUnitAction .....	26
192	Table 17 – Association ends of RemedialActionProfile::BatteryUnitAction with other	
193	classes .....	26
194	Table 18 – Attributes of RemedialActionProfile::CountertradeRemedialAction .....	27
195	Table 19 – Association ends of RemedialActionProfile::CountertradeRemedialAction	
196	with other classes .....	28
197	Table 20 – Attributes of RemedialActionProfile::ContingencyWithRemedialAction .....	28
198	Table 21 – Association ends of	
199	RemedialActionProfile::ContingencyWithRemedialAction with other classes .....	28
200	Table 22 – Attributes of RemedialActionProfile::ControlFunctionBlockAction .....	29
201	Table 23 – Association ends of RemedialActionProfile::ControlFunctionBlockAction	
202	with other classes .....	29
203	Table 24 – Attributes of RemedialActionProfile::EnergySourceModification .....	30
204	Table 25 – Association ends of RemedialActionProfile::EnergySourceModification with	
205	other classes .....	30
206	Table 26 – Attributes of RemedialActionProfile::EquivalentInjectionAction .....	30
207	Table 27 – Association ends of RemedialActionProfile::EquivalentInjectionAction with	
208	other classes .....	31
209	Table 28 – Attributes of RemedialActionProfile::ExternalNetworkInjectionAction .....	31

210	Table 29 – Association ends of RemedialActionProfile::ExternalNetworkInjectionAction	
211	with other classes .....	31
212	Table 30 – Attributes of RemedialActionProfile::Gate .....	32
213	Table 31 – Attributes of RemedialActionProfile::GateInputPin .....	32
214	Table 32 – Association ends of RemedialActionProfile::GateInputPin with other classes .....	32
215	Table 33 – Attributes of RemedialActionProfile::GridStateAlteration .....	33
216	Table 34 – Association ends of RemedialActionProfile::GridStateAlteration with other	
217	classes .....	33
218	Table 35 – Attributes of RemedialActionProfile::GridStateAlterationCollection .....	33
219	Table 36 – Attributes of RemedialActionProfile::GridStateAlterationRemedialAction .....	34
220	Table 37 – Association ends of	
221	RemedialActionProfile::GridStateAlterationRemedialAction with other classes .....	34
222	Table 38 – Attributes of RemedialActionProfile::IdentifiedObject .....	34
223	Table 39 – Attributes of RemedialActionProfile::IntertemporalPropertyRange .....	35
224	Table 40 – Association ends of RemedialActionProfile::IntertemporalPropertyRange	
225	with other classes .....	35
226	Table 41 – Attributes of RemedialActionProfile::LoadAction .....	35
227	Table 42 – Association ends of RemedialActionProfile::LoadAction with other classes .....	36
228	Table 43 – Attributes of RemedialActionProfile::MeasurementCalculator .....	36
229	Table 44 – Attributes of RemedialActionProfile::MeasurementCalculatorInput .....	37
230	Table 45 – Association ends of RemedialActionProfile::MeasurementCalculatorInput	
231	with other classes .....	37
232	Table 46 – Attributes of RemedialActionProfile::PinContingency .....	37
233	Table 47 – Association ends of RemedialActionProfile::PinContingency with other	
234	classes .....	38
235	Table 48 – Attributes of RemedialActionProfile::PinDCTerminal .....	38
236	Table 49 – Association ends of RemedialActionProfile::PinDCTerminal with other	
237	classes .....	38
238	Table 50 – Attributes of RemedialActionProfile::PinEquipment .....	38
239	Table 51 – Association ends of RemedialActionProfile::PinEquipment with other	
240	classes .....	39
241	Table 52 – Attributes of RemedialActionProfile::PinGate .....	39
242	Table 53 – Association ends of RemedialActionProfile::PinGate with other classes .....	39
243	Table 54 – Attributes of RemedialActionProfile::PinMeasurement .....	40
244	Table 55 – Association ends of RemedialActionProfile::PinMeasurement with other	
245	classes .....	40
246	Table 56 – Attributes of RemedialActionProfile::PinPowerTransferCorridor .....	40
247	Table 57 – Association ends of RemedialActionProfile::PinPowerTransferCorridor with	
248	other classes .....	41
249	Table 58 – Attributes of RemedialActionProfile::PinTerminal .....	41
250	Table 59 – Association ends of RemedialActionProfile::PinTerminal with other classes .....	41
251	Table 60 – Attributes of RemedialActionProfile::PinOperationalLimit .....	42



252	Table 61 – Association ends of RemedialActionProfile::PinOperationalLimit with other	
253	classes .....	42
254	Table 62 – Attributes of RemedialActionProfile::PowerElectronicsConnectionAction .....	42
255	Table 63 – Association ends of	
256	RemedialActionProfile::PowerElectronicsConnectionAction with other classes .....	43
257	Table 64 – Attributes of RemedialActionProfile::PowerSystemResource .....	43
258	Table 65 – Attributes of RemedialActionProfile::PTCActivePowerSupport .....	43
259	Table 66 – Association ends of RemedialActionProfile::PTCActivePowerSupport with	
260	other classes .....	44
261	Table 67 – Attributes of RemedialActionProfile::RedispatchRemedialAction .....	44
262	Table 68 – Association ends of RemedialActionProfile::RedispatchRemedialAction with	
263	other classes .....	44
264	Table 69 – Attributes of RemedialActionProfile::RegulatingControlAction .....	45
265	Table 70 – Association ends of RemedialActionProfile::RegulatingControlAction with	
266	other classes .....	45
267	Table 71 – Attributes of RemedialActionProfile::RemedialAction .....	46
268	Table 72 – Association ends of RemedialActionProfile::RemedialAction with other	
269	classes .....	47
270	Table 73 – Attributes of RemedialActionProfile::RemedialActionScheme .....	47
271	Table 74 – Association ends of RemedialActionProfile::RemedialActionScheme with	
272	other classes .....	47
273	Table 75 – Attributes of RemedialActionProfile::RotatingMachineAction .....	47
274	Table 76 – Association ends of RemedialActionProfile::RotatingMachineAction with	
275	other classes .....	48
276	Table 77 – Attributes of RemedialActionProfile::SchemeRemedialAction .....	48
277	Table 78 – Association ends of RemedialActionProfile::SchemeRemedialAction with	
278	other classes .....	49
279	Table 79 – Attributes of RemedialActionProfile::SetPointAction .....	49
280	Table 80 – Association ends of RemedialActionProfile::SetPointAction with other	
281	classes .....	49
282	Table 81 – Attributes of RemedialActionProfile::TapPositionAction .....	50
283	Table 82 – Association ends of RemedialActionProfile::TapPositionAction with other	
284	classes .....	50
285	Table 83 – Attributes of RemedialActionProfile::TopologyAction .....	50
286	Table 84 – Association ends of RemedialActionProfile::TopologyAction with other	
287	classes .....	51
288	Table 85 – Attributes of RemedialActionProfile::TriggerCondition .....	51
289	Table 86 – Association ends of RemedialActionProfile::TriggerCondition with other	
290	classes .....	51
291	Table 87 – Literals of RemedialActionProfile::CalculationKind .....	51
292	Table 88 – Literals of RemedialActionProfile::Currency .....	52
293	Table 89 – Literals of RemedialActionProfile::GateLogicKind .....	56
294	Table 90 – Literals of RemedialActionProfile::LogicalOperatorsKind .....	56
295	Table 91 – Literals of RemedialActionProfile::PinDCTerminalKind .....	56

296	Table 92 – Literals of RemedialActionProfile::PinPowerTransferCorridorKind .....	57
297	Table 93 – Literals of RemedialActionProfile::RelativeDirectionKind .....	57
298	Table 94 – Literals of RemedialActionProfile::RemedialActionKind .....	57
299	Table 95 – Literals of RemedialActionProfile::RemedialActionSchemeKind .....	58
300	Table 96 – Literals of RemedialActionProfile::UnitSymbol .....	58
301	Table 97 – Literals of RemedialActionProfile::UnitMultiplier .....	59
302	Table 98 – Literals of RemedialActionProfile::ValueOffsetKind .....	59
303	Table 99 – Attributes of RemedialActionProfile::ActivePower .....	59
304	Table 100 – Attributes of RemedialActionProfile::PerCent .....	60
305	Table 101 – Attributes of RemedialActionProfile::ReactivePower .....	60
306	Table 102 – Attributes of RemedialActionProfile::Seconds .....	60
307	Table 103 – Literals of RemedialActionProfile::ElementCombinationConstraintKind .....	61
308	Table 104 – Attributes of RemedialActionProfile::BiddingZoneAction .....	61
309	Table 105 – Association ends of RemedialActionProfile::BiddingZoneAction with other	
310	classes .....	61
311	Table 106 – Attributes of RemedialActionProfile::RangeConstraint .....	62
312	Table 107 – Association ends of RemedialActionProfile::RangeConstraint with other	
313	classes .....	62
314	Table 108 – Attributes of RemedialActionProfile::PinEquipmentTripping .....	63
315	Table 109 – Association ends of RemedialActionProfile::PinEquipmentTripping with	
316	other classes .....	63
317	Table 110 – Attributes of RemedialActionProfile::RemedialActionDependency .....	63
318	Table 111 – Association ends of RemedialActionProfile::RemedialActionDependency	
319	with other classes .....	64
320	Table 112 – Attributes of RemedialActionProfile::FunctionInputVariable .....	64
321	Table 113 – Literals of RemedialActionProfile::RemedialActionDependencyKind .....	64
322	Table 114 – Attributes of RemedialActionProfile::PowerRemedialAction .....	65
323	Table 115 – Association ends of RemedialActionProfile::PowerRemedialAction with	
324	other classes .....	65
325	Table 116 – Attributes of RemedialActionProfile::EquipmentControllerAction .....	65
326	Table 117 – Association ends of RemedialActionProfile::EquipmentControllerAction	
327	with other classes .....	66
328	Table 118 – Attributes of RemedialActionProfile::RemedialActionGroup .....	66
329	Table 119 – Attributes of RemedialActionProfile::PowerShiftKeyStrategy .....	66
330	Table 120 – Association ends of RemedialActionProfile::PowerShiftKeyStrategy with	
331	other classes .....	67
332	Table 121 – Literals of RemedialActionProfile::PinTerminalKind .....	67
333	Table 122 – Attributes of RemedialActionProfile::InServiceAction .....	67
334	Table 123 – Association ends of RemedialActionProfile::InServiceAction with other	
335	classes .....	67
336		

## 337 1 Introduction

338 The remedial action profile enables an exchange of the remedial actions for the purpose of NC  
339 related business processes.

340 A remedial action means any measure applied by a TSO or several TSOs, manually or  
341 automatically, in order to maintain operational security.<sup>1</sup>

342 An available remedial action is a remedial action which is available to solve identified  
343 constraints. It includes the needed technical and cost information.<sup>2</sup>

344 The available remedial actions are input data for security analysis.

345 The available remedial action profile enables the exchange of both curative and preventive  
346 remedial actions. Grid state alterations (the change in the power system state that should be  
347 applied) are defined for each remedial action. The definition of grid state alterations allows for  
348 constraining or further precisising some of the properties available in the IGM. Grid state  
349 alterations can be configured for every parameter of the steady state hypothesis instance data  
350 from the IGM. The available remedial action profile provides information on the availability of  
351 the remedial actions. In cases where it is necessary to only update the status of the remedial  
352 action, only an instance of RemedialAction class can be exchanged without any other objects  
353 from the profile.

## 354 2 Application profile specification

### 355 2.1 Version information

356 The content is generated from UML model file CIM17-2\_CGMES31v01\_PROF-  
357 20v02\_NC23v65\_MS10v01\_DES10v01.eap.

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

- 359 - Title: Remedial action Vocabulary
- 360 - Keyword: RA
- 361 - Description: This vocabulary is describing the remedial action profile.
- 362 - Version IRI: <https://ap-voc.cim4.eu/RemedialAction/2.3>
- 363 - Version info: 2.3.1
- 364 - Prior version: <http://entsoe.eu/ns/CIM/RemedialAction-EU/2.2>
- 365 - Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-  
366 7:amd1|file://iec61970cim17v40\_iec61968cim13v13a\_iec62325cim03v17a.eap|urn:iso:  
367 std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-  
368 2|file://CIM100\_CGMES31v01\_501-20v02\_NC24v01\_MM10v02.eap
- 369 - Identifier: urn:uuid:57fcfe0e-258c-45f2-b2ed-ff5b6a9859bc

370

### 371 2.2 Constraints naming convention

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

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

---

<sup>1</sup> [SOURCE: CACM art.2.13]

<sup>2</sup> [SOURCE: 2019 Inter-RSC report]

375 where

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

377 rule.Standard: the number of the standard e.g. 301 for 61970-301, 456 for 61970-456, 13 for  
378 61968-13. 61970-600 specific constraints refer to 600 although they are related to one or  
379 combination of the 61970-450 series profiles. For NC profiles, NC is used.

380 rule.Profile: the abbreviation of the profile, e.g. TP for Topology profile. If set to “ALL” the  
381 constraint is applicable to all IEC 61970-600 profiles.

382 rule.Property: for UML classes, the name of the class, for attributes and associations, the name  
383 of the class and attribute or association end, e.g. EnergyConsumer, IdentifiedObject.name, etc.  
384 If set to “NA” the property is not applicable to a specific UML element.

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

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

### 387 **2.3 Profile constraints**

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

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

- 393 • C:452:ALL:NA:datatypes

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

- 396 • R:452:ALL:NA:exchange

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

- 399 • R:452:ALL:NA:exchange1

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

- 405 • R:452:ALL:NA:exchange2

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

- 414 • R:452:ALL:NA:exchange3

- 415 An exporter may, at his or her discretion, produce a serialization containing additional  
416 class data described by the CIM Schema but not required by this document provided  
417 these data adhere to the conventions established in Clause 5.
- 418 • R:452:ALL:NA:exchange4
- 419 From the standpoint of the model import used by a data recipient, the document  
420 describes a subset of the CIM that importing software shall be able to interpret in order  
421 to import exported models. Data providers are free to exceed the minimum requirements  
422 described herein as long as their resulting data files are compliant with the CIM Schema  
423 and the conventions established in Clause 5. The document, therefore, describes  
424 additional classes and class data that, although not required, exporters will, in all  
425 likelihood, choose to include in their data files. The additional classes and data are  
426 labelled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them  
427 from their required counterparts. Please note, however, that data importers could  
428 potentially receive data containing instances of any and all classes described by the  
429 CIM Schema.
- 430 • R:452:ALL:NA:cardinality
- 431 The cardinality defined in the CIM model shall be followed, unless a more restrictive  
432 cardinality is explicitly defined in this document. For instance, the cardinality on the  
433 association between VoltageLevel and BaseVoltage indicates that a VoltageLevel shall  
434 be associated with one and only one BaseVoltage, but a BaseVoltage can be associated  
435 with zero to many VoltageLevels.
- 436 • R:452:ALL:NA:associations
- 437 Associations between classes referenced in this document and classes not referenced  
438 here are not required regardless of cardinality.
- 439 • R:452:ALL:IdentifiedObject.name:rule
- 440 The attribute “name” inherited by many classes from the abstract class IdentifiedObject  
441 is not required to be unique. It must be a human readable identifier without additional  
442 embedded information that would need to be parsed. The attribute is used for purposes  
443 such as User Interface and data exchange debugging. The MRID defined in the data  
444 exchange format is the only unique and persistent identifier used for this data exchange.  
445 The attribute IdentifiedObject.name is, however, always required for CoreEquipment  
446 profile and Short Circuit profile.
- 447 • R:452:ALL:IdentifiedObject.description:rule
- 448 The attribute “description” inherited by many classes from the abstract class  
449 IdentifiedObject must contain human readable text without additional embedded  
450 information that would need to be parsed.
- 451 • R:452:ALL:NA:uniqueIdentifier
- 452 All IdentifiedObject-s shall have a persistent and globally unique identifier (Master  
453 Resource Identifier - mRID).
- 454 • R:452:ALL:NA:unitMultiplier
- 455 For exchange of attributes defined using CIM Data Types (ActivePower, Susceptance,  
456 etc.) a unit multiplier of 1 is used if the UnitMultiplier specified in this document is “none”.
- 457 • C:452:ALL:IdentifiedObject.name:stringLength

- 458 The string IdentifiedObject.name has a maximum of 128 characters.
- 459 • C:452:ALL:IdentifiedObject.description:stringLength
- 460 The string IdentifiedObject.description is maximum 256 characters.
- 461 • C:452:ALL:NA:float
- 462 An attribute that is defined as float (e.g. has a type Float or a type which is a Datatype  
463 with .value attribute of type Float) shall support ISO/IEC 60559:2020 for floating-point  
464 arithmetic using single precision floating point. A single precision float supports 7  
465 significant digits where the significant digits are described as an integer, or a decimal  
466 number with 6 decimal digits. Two float values are equal when the significant with 7  
467 digits are identical, e.g. 1234567 is equal 1.234567E6 and so are 1.2345678 and  
468 1.234567E0.
- 469 • R:NC:ALL:Region:reference
- 470 The reference to the Region is normally a reference to the capacity calculation region,  
471 which is identified by “Y” EIC code of the capacity calculation region.
- 472 • R:NC:ALL:SystemOperator:reference
- 473 The reference to the System Operator is normally identified by “X” EIC code of TSO.
- 474 • R:NC:ALL:NA:serialization
- 475 The profiles are defined in the EnterpriseArchitect application and have multiple artifacts  
476 that describe them. The main artifacts are:
- 477 1) the EAP file (EnterpriseArchitect project file),  
478 2) the profiles’ specification document and  
479 3) the application profiles (RDFS and SHACL).
- 480 Due to the complexity of the profiles, there are various cross profile associations that,  
481 from profiling and profile maintenance point of view, it is not practical to include the  
482 complete inheritance structure in all profiles. If this is done the documentation provided  
483 for all profiles would also include duplicated information on the description of classes  
484 defined in other profiles. The following cases are often observed in profiles:
- 485 ○ Case 1: An association end refers to an abstract class  
486 ○ Case 2: An abstract class (stereotyped with “Description”) has an association  
487 (direction to another class)  
488 ○ Case 3: An abstract class (not stereotyped with “Description”) has an  
489 association (direction to another class)  
490 ○ Case 4: An abstract class has attributes and subclasses are not in the profile
- 491 In all cases, the datasets shall only include the subtypes of the abstract classes with  
492 the related properties (i.e. association or attributes) defined in the profile. The  
493 information is taken from either canonical model or the profiles where complete  
494 (expected) inheritance structure for the related abstract class is described. SHACL  
495 based constraints include constraints only for the concrete classes that are subtypes of  
496 the abstract class in the profile, and this can be used to inform which are the concrete  
497 classes expected in a dataset that conforms to this profile.
- 498 It should be taken into account that this approach deviates from MVAL5 (IEC 61970-  
499 600-1:2021), which creates multiple inheritance at serialization. For instance, with this  
500 more explicit exchange the serialization of the association between abstract class  
501 Equipment and abstract class Circuit for a PowerTransformer will be serialized as  
502 follows:

503           ○ for association  
504           <cim:PowerTransformer rdf:about="\_c328f787-bc17-47ad-a59f-6ba7133340d0">  
505            <nc:Equipment.Circuit rdf:resource="#\_9ced16ac-d076-4ef9-a241-a998a579e77b"/>  
506           </cim:PowerTransformer>

507           ○ for attribute  
508           <cim:ACLineSegment rdf:about="\_04f681aa-6999-4fb3-9775-aca5eb7ceff">  
509            <cim:Equipment.inService>true</cim:Equipment.inService>  
510           </cim:ACLineSegment>

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

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

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

517           • C:NC:RA:GridStateAlteration:associations

518           A       GridStateAlteration       shall       have       either       association       to  
519           GridStateAlterationRemedialAction or GridStateAlterationCollection.

## 520   2.4   Metadata

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

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

### 531   2.4.1   Constraints

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

534           • R:NC:ALL:wasAttributedTo:usage

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

537

### 538   2.4.2   Reference metadata

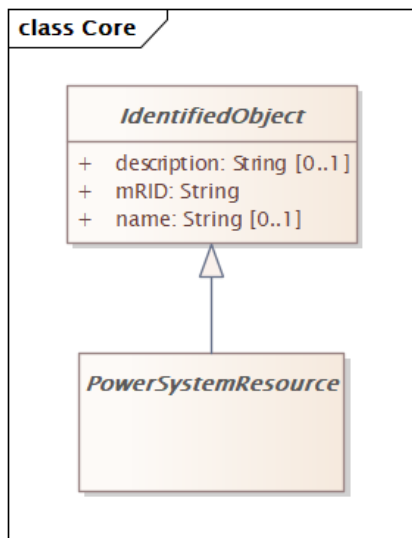
539           The header defined for this profile requires availability of a set of reference metadata. For  
540           instance, the attribute prov:wasGeneratedBy requires a reference to an activity which produced  
541           the model or the related process. The activities are defined as reference metadata and their

542 identifiers are referenced from the header to enable the receiving entity to retrieve the “static”  
543 (reference) information that is not modified frequently. This approach imposes a requirement  
544 that both the sending entity and the receiving entity have access to a unique version of the  
545 reference metadata. Therefore, each business process shall define which reference metadata  
546 is used and where it is located.

### 547 3 Detailed Profile Specification

#### 548 3.1 General

549 This package contains remedial action profile.

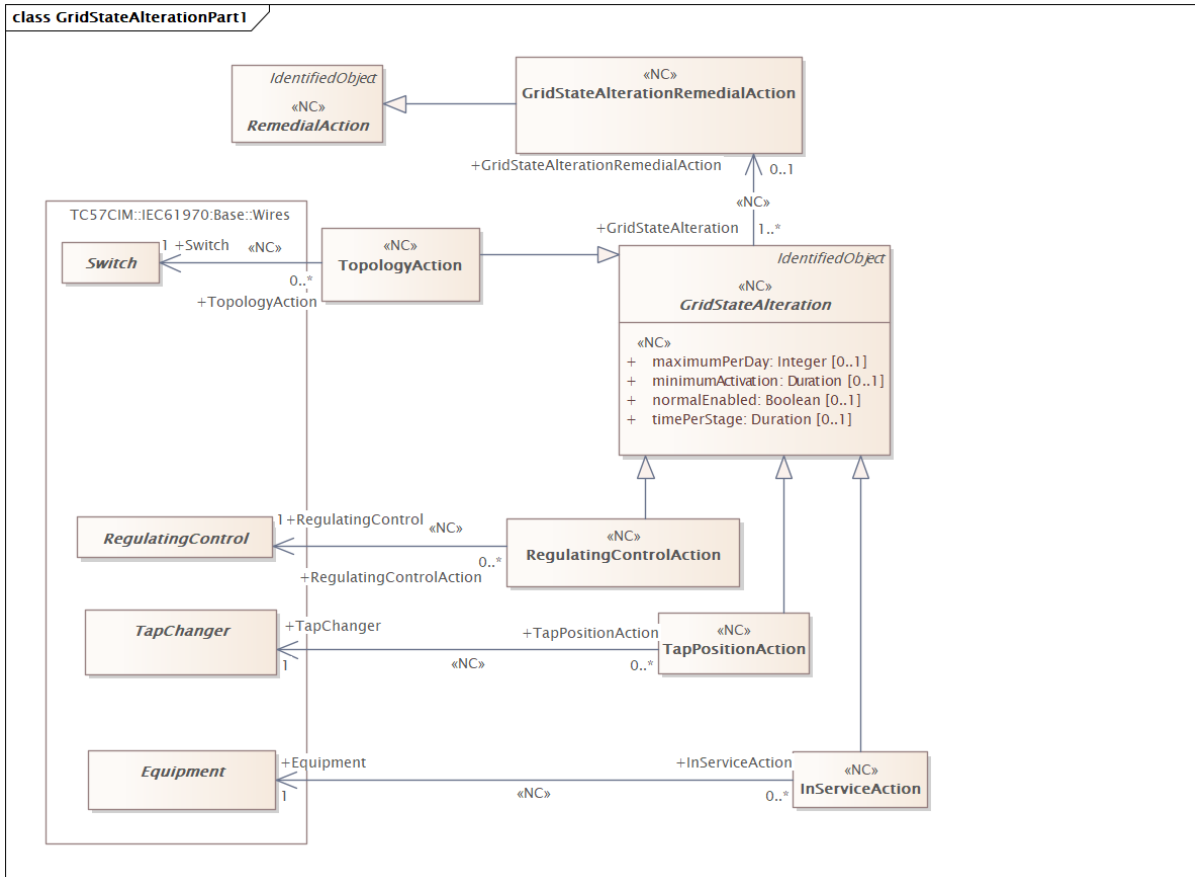


550

551 **Figure 1 – Class diagram RemedialActionProfile::Core**

552 Figure 1: The diagram shows classes from Base CIM used in the profile.

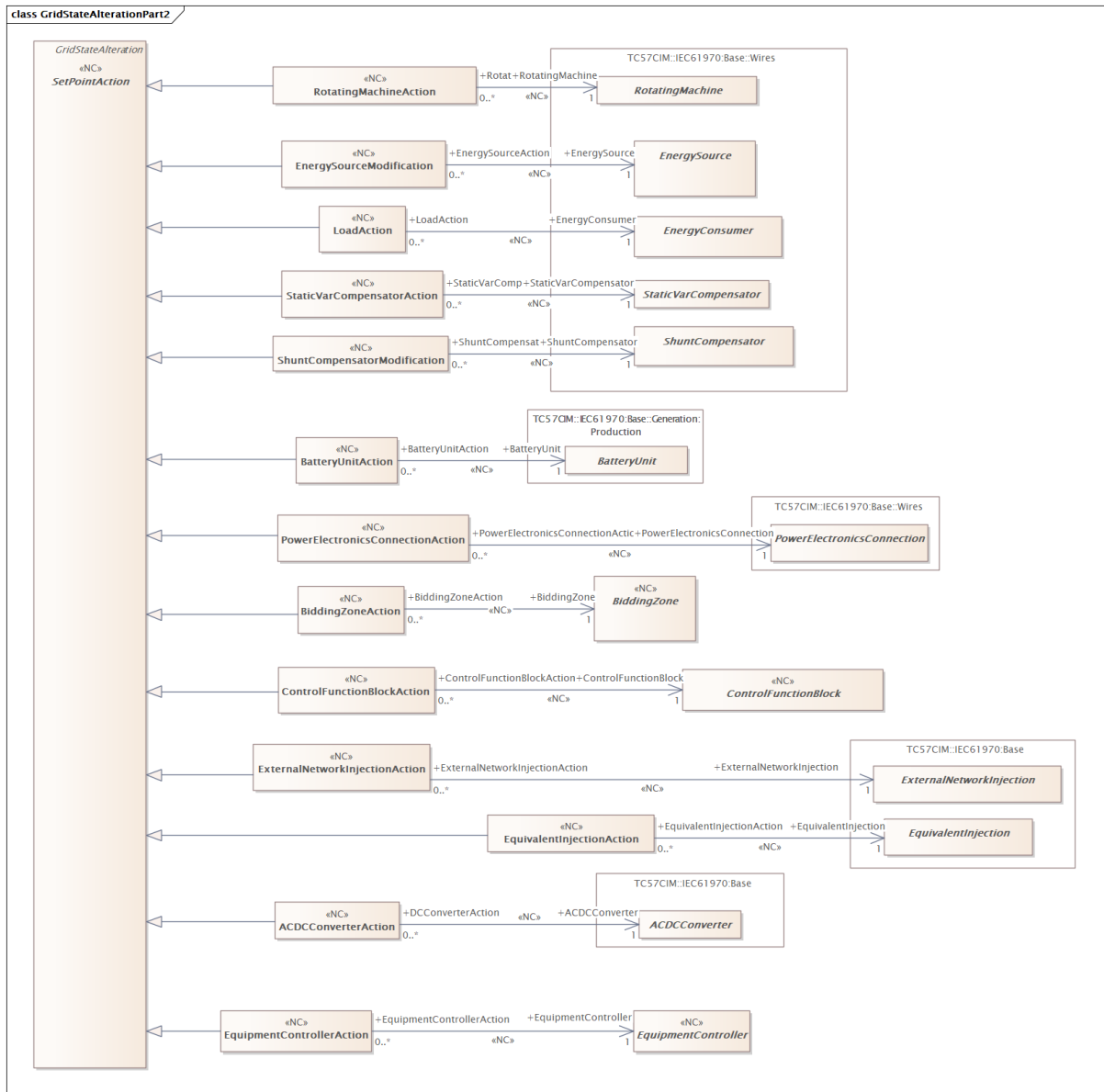




553

554 **Figure 2 – Class diagram RemedialActionProfile::GridStateAlterationPart1**

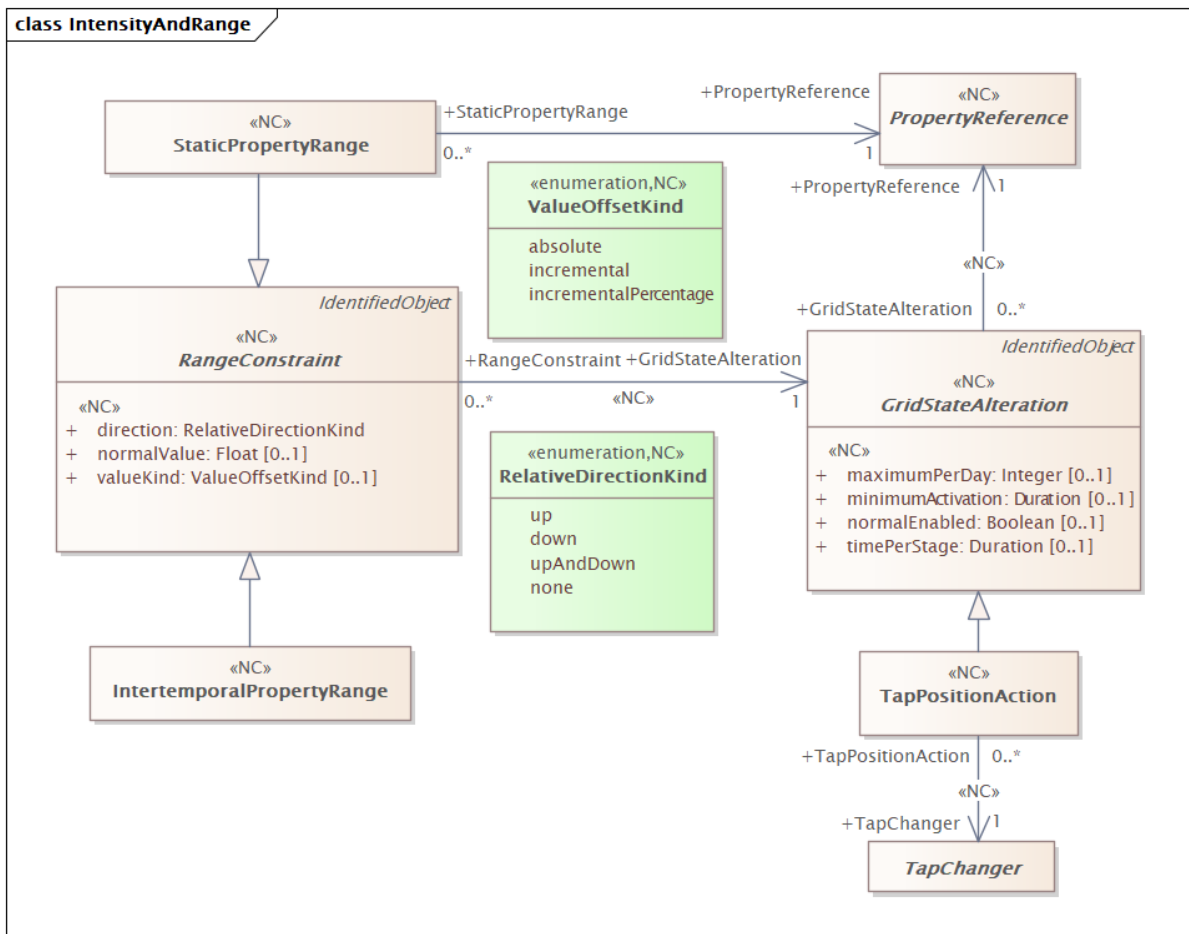
555 Figure 2: This diagram contains extended classes for the purpose of the remedial action data  
 556 exchange.



557

558 **Figure 3 – Class diagram RemedialActionProfile::GridStateAlterationPart2**

559 Figure 3: This diagram contains extended classes for the purpose of the remedial action data  
560 exchange.



561

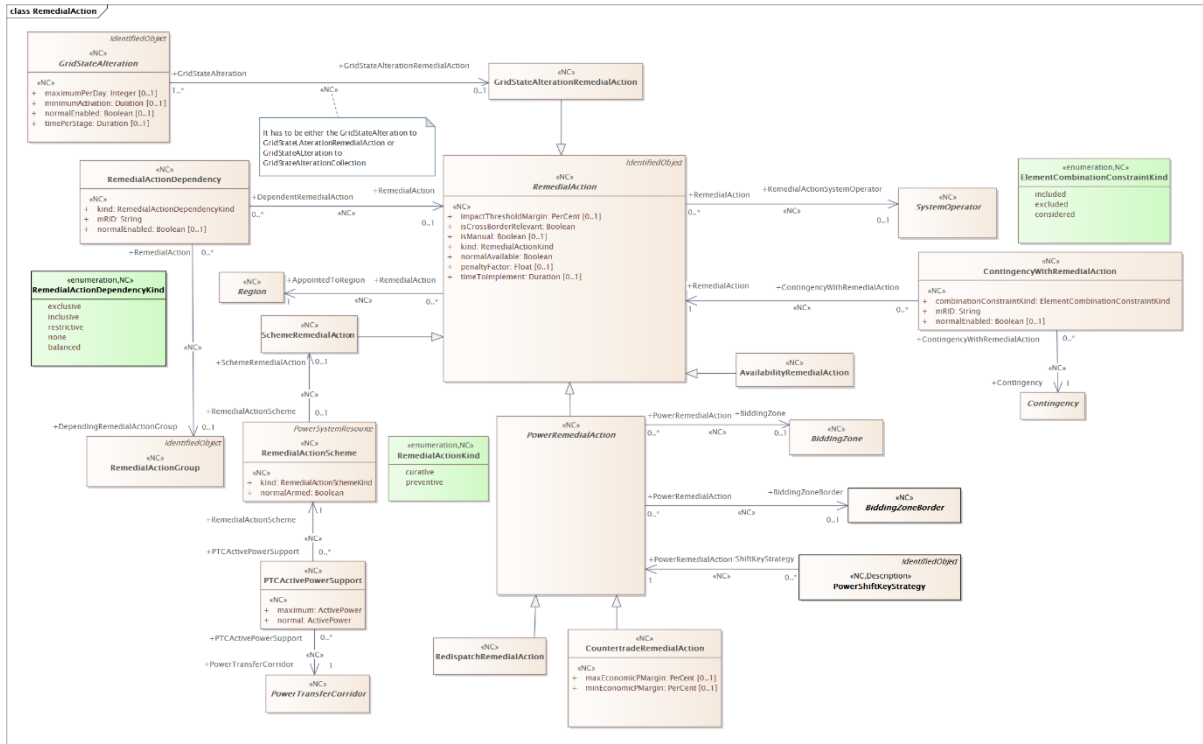
562

**Figure 4 – Class diagram RemedialActionProfile::IntensityAndRange**

563

Figure 4: This diagram contains extended classes related to the modelling of static, dynamic ranges and intensity.

564

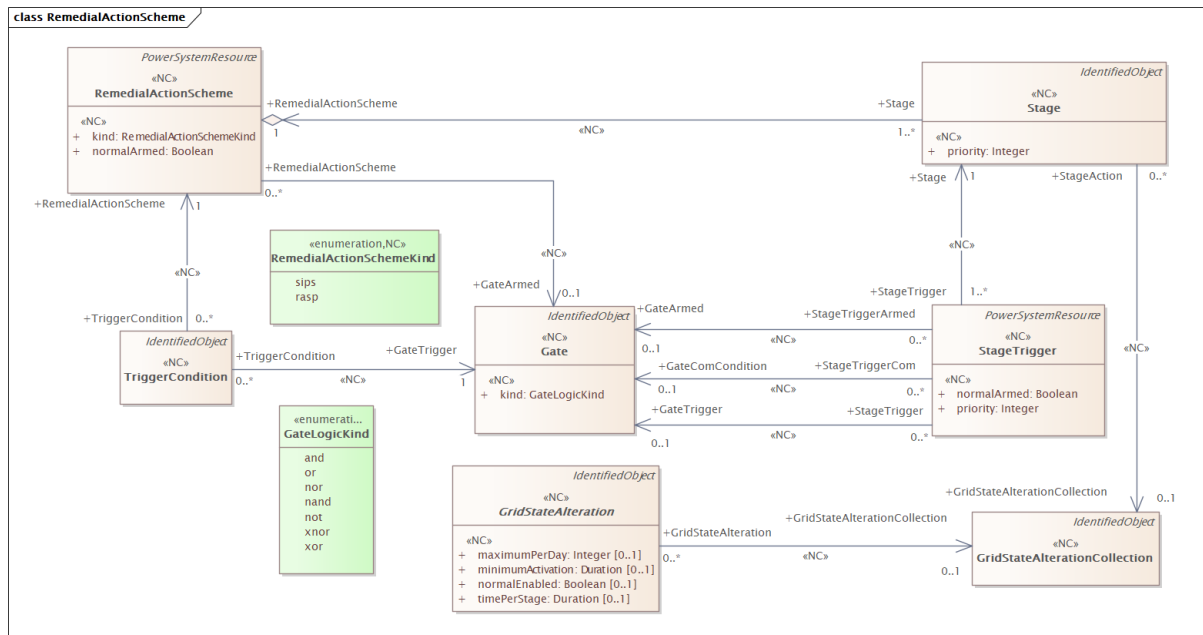


565

Figure 5 – Class diagram RemedialActionProfile::RemedialAction

566

567 Figure 5: The diagram contains main classes related to the remedial action.

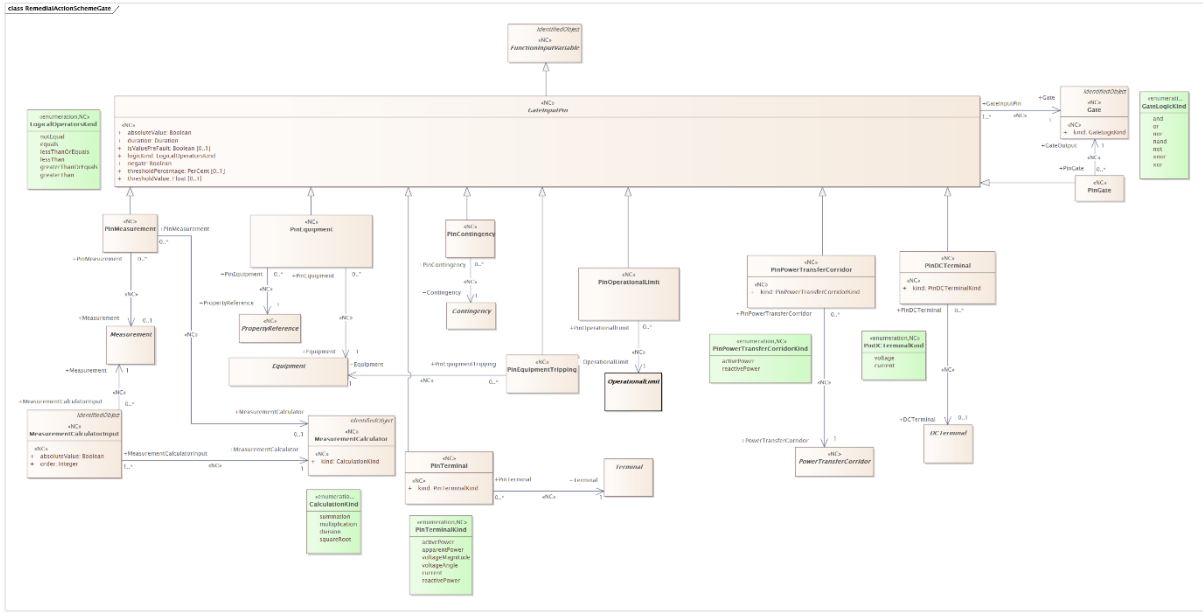


568

Figure 6 – Class diagram RemedialActionProfile::RemedialActionScheme

569

570 Figure 6: The diagram shows remedial action scheme related classes.



571  
572 **Figure 7 – Class diagram RemedialActionProfile::RemedialActionSchemeGate**

573 Figure 7: The diagram shows remedial action scheme gate related classes.

574 **3.2 (NC) ShuntCompensatorModification**

575 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

576 Shunt compensator action.

577 Table 1 shows all attributes of ShuntCompensatorModification.

578 **Table 1 – Attributes of RemedialActionProfile::ShuntCompensatorModification**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

579  
580 Table 2 shows all association ends of ShuntCompensatorModification with other classes.

581 **Table 2 – Association ends of RemedialActionProfile::ShuntCompensatorModification**  
582 **with other classes**

mult from	name	mult to	type	description
0..*	ShuntCompensator	1..1	<a href="#">ShuntCompensator</a>	(NC) The ShuntCompensator that is associated with an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

583

584 **3.3 (NC) Stage**585 Inheritance path = [IdentifiedObject](#)

586 Stage of a remedial action scheme.

587 Table 3 shows all attributes of Stage.

588

**Table 3 – Attributes of RemedialActionProfile::Stage**

name	mult	type	description
priority	1..1	<a href="#">Integer</a>	(NC) The priority of the stage. 0 = do not care (default) 1 = highest priority. 2 is less than 1 and so on. A stage with higher priority needs be activated before a lower stage can be activated.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

589

590 Table 4 shows all association ends of Stage with other classes.

591

**Table 4 – Association ends of RemedialActionProfile::Stage with other classes**

mult from	name	mult to	type	description
1..*	RemedialActionScheme	1..1	<a href="#">RemedialActionScheme</a>	(NC) The remedial action scheme that has a stage.
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) The GridStateAlterationCollection which belongs to the Stage.

592

593 **3.4 (NC) StageTrigger**594 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

595 Stage that is triggered either by TriggerCondition or by gate condition within a stage.

596 Table 5 shows all attributes of StageTrigger.

597

**Table 5 – Attributes of RemedialActionProfile::StageTrigger**

name	mult	type	description
normalArmed	1..1	<a href="#">Boolean</a>	(NC) The default/normal value used when other active signal/values are missing.
priority	1..1	<a href="#">Integer</a>	(NC) Priority of trigger. 0 = don t care (default) 1 = highest priority. 2 is less than 1 and so on. A trigger with the highest priority will trigger first.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

598

599 Table 6 shows all association ends of StageTrigger with other classes.

600

**Table 6 – Association ends of RemedialActionProfile::StageTrigger with other classes**

mult from	name	mult to	type	description
1..*	Stage	1..1	<a href="#">Stage</a>	(NC) The stage that has this stage trigger.

mult from	name	mult to	type	description
0..*	GateComCondition	0..1	<a href="#">Gate</a>	(NC) The gate that is the input pin which defines a communication condition.
0..*	GateArmed	0..1	<a href="#">Gate</a>	(NC) The gate that is the input pin which defines arming of the StageTrigger.
0..*	GateTrigger	0..1	<a href="#">Gate</a>	(NC) The gate that is the input pin which triggers the protective reactions.

601

### 602 3.5 (NC) StaticPropertyRange

603 Inheritance path = [RangeConstraint](#) : [IdentifiedObject](#)

604 Defines the static range, which means that this is the minimum and/or maximum of an attribute  
605 value. The value provided by the schedule replaces the value of the attribute to which the  
606 schedule refers to.

607 In case that the PropertyReference refers to Boolean type attributes, RangeConstraint.direction  
608 shall be none or upAndDown and the RangeConstraint.valueKind shall be absolute. If the  
609 direction is none then optimization of the attribute referenced by the PropertyReference is not  
610 possible if the current status is already as the value in the range. Otherwise if the direction is  
611 upAndDown, the optimization can change from true to false or vice versa independently of the  
612 initial value in the operational scenario.

613 For instance for a tap changer related grid state alteration for a particular point in time, if the  
614 range of TapChanger.step is to be restricted, the value of the schedule will represent that new  
615 TapChanger.step range.

616 Table 7 shows all attributes of StaticPropertyRange.

617

**Table 7 – Attributes of RemedialActionProfile::StaticPropertyRange**

name	mult	type	description
direction	1..1	<a href="#">RelativeDirectionKind</a>	(NC) inherited from: <a href="#">RangeConstraint</a>
valueKind	0..1	<a href="#">ValueOffsetKind</a>	(NC) inherited from: <a href="#">RangeConstraint</a>
normalValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RangeConstraint</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

618

619 Table 8 shows all association ends of StaticPropertyRange with other classes.

**Table 8 – Association ends of RemedialActionProfile::StaticPropertyRange with other classes**

621

mult from	name	mult to	type	description
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	Property reference for this static property range.
0..*	GridStateAlteration	1..1	<a href="#">GridStateAlteration</a>	(NC) inherited from: <a href="#">RangeConstraint</a>

622

### 623 3.6 (abstract) StaticVarCompensator root class

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

627 The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage  
628 control mode, the output of the SVC will be proportional to the deviation of voltage at the

629 controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion.  
630 If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.

### 631 3.7 (NC) StaticVarCompensatorAction

632 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

633 Static Var compensator action.

634 Table 9 shows all attributes of StaticVarCompensatorAction.

635 **Table 9 – Attributes of RemedialActionProfile::StaticVarCompensatorAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

636

637 Table 10 shows all association ends of StaticVarCompensatorAction with other classes.

638 **Table 10 – Association ends of RemedialActionProfile::StaticVarCompensatorAction**  
639 **with other classes**

mult from	name	mult to	type	description
0..*	StaticVarCompensator	1..1	<a href="#">StaticVarCompensator</a>	(NC) The StaticVarCompensator which is associated with an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

640

### 641 3.8 (Description) Substation root class

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

### 644 3.9 (abstract) Switch root class

645 A generic device designed to close, or open, or both, one or more electric circuits. All switches  
646 are two terminal devices including grounding switches. The ACDCTerminal.connected at the  
647 two sides of the switch shall not be considered for assessing switch connectivity, i.e. only  
648 Switch.open, .normalOpen and .locked are relevant.

### 649 3.10 (abstract) ACDCCConverter root class

650 A unit with valves for three phases, together with unit control equipment, essential protective  
651 and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for  
652 conversion.

### 653 3.11 (NC) ACDCCConverterAction

654 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

655 Alternate current Direct current (ACDC) converter action.

656 Table 11 shows all attributes of ACDCCConverterAction.



657 **Table 11 – Attributes of RemedialActionProfile::ACDCConverterAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

658

659 Table 12 shows all association ends of ACDCConverterAction with other classes.

660 **Table 12 – Association ends of RemedialActionProfile::ACDCConverterAction with**  
661 **other classes**

mult from	name	mult to	type	description
0..*	ACDCConverter	1..1	<a href="#">ACDCConverter</a>	(NC) The ACDCConverter that is associated with an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

662

663 **3.12 (abstract) ACDCTerminal**664 Inheritance path = [IdentifiedObject](#)665 An electrical connection point (AC or DC) to a piece of conducting equipment. Terminals are  
666 connected at physical connection points called connectivity nodes.

667 Table 13 shows all attributes of ACDCTerminal.

668 **Table 13 – Attributes of RemedialActionProfile::ACDCTerminal**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

669

670 **3.13 (NC) AvailabilityRemedialAction**671 Inheritance path = [RemedialAction](#) : [IdentifiedObject](#)672 Availability remedial action is a remedial action that cancels or reschedules an availability  
673 schedule.

674 Table 14 shows all attributes of AvailabilityRemedialAction.

675 **Table 14 – Attributes of RemedialActionProfile::AvailabilityRemedialAction**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) inherited from: <a href="#">RemedialAction</a>
penaltyFactor	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>

name	mult	type	description
isManual	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
timeToImplement	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">RemedialAction</a>
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">RemedialAction</a>
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

676

677

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

678

**Table 15 – Association ends of RemedialActionProfile::AvailabilityRemedialAction with other classes**

679

mult from	name	mult to	type	description
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) inherited from: <a href="#">RemedialAction</a>
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) inherited from: <a href="#">RemedialAction</a>

680

### 681 3.14 (abstract) BatteryUnit root class

682 An electrochemical energy storage device.

### 683 3.15 (NC) BatteryUnitAction

684 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

685 Battery unit setpoint action.

686 Table 16 shows all attributes of BatteryUnitAction.

687

**Table 16 – Attributes of RemedialActionProfile::BatteryUnitAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

688

689

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

690

**Table 17 – Association ends of RemedialActionProfile::BatteryUnitAction with other classes**

691

mult from	name	mult to	type	description
0..*	BatteryUnit	1..1	<a href="#">BatteryUnit</a>	(NC) The BatteryUnit that is associated with an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

mult from	name	mult to	type	description
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlterationCollection</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlterationCollection</a>

692

693 **3.16 (abstract,NC) BiddingZone root class**

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

697 **3.17 (NC) CountertradeRemedialAction**

698 Inheritance path = [PowerRemedialAction](#) : [RemedialAction](#) : [IdentifiedObject](#)

699 Countertrade is a remedial action to relieve physical congestions where the location of activated  
700 resources within the bidding zone is not known.

701 Table 18 shows all attributes of CountertradeRemedialAction.

702

**Table 18 – Attributes of RemedialActionProfile::CountertradeRemedialAction**

name	mult	type	description
maxEconomicPMargin	0..1	<a href="#">PerCent</a>	(NC) High economic active power limit given by the percentage of the relevant units operating p. e.g. If a generating unit (G1) with maximum operating active power of 100 MW and a conform load with active maximum load of 50 MW (L1). Max economic p margin of 90% will give the limit of the shift key to be 90 MW for the G1 and 45 MW for the L1. The allowed value range is [0,100].
minEconomicPMargin	0..1	<a href="#">PerCent</a>	(NC) Low economic active power limit given by the percentage of the relevant units operating p. e.g. If a generating unit (G1) with minimum operating active power of 10 MW and a conform load with active maximum load of 5 MW (L1). Min economic p margin of 90% will give the limit of the shift key to be 11 MW for the G1 and 5.5 MW for the L1. The allowed value range is [0,100].
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) inherited from: <a href="#">RemedialAction</a>
penaltyFactor	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isManual	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
timeToImplement	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">RemedialAction</a>
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">RemedialAction</a>
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

703

704

Table 19 shows all association ends of CountertradeRemedialAction with other classes.

705 **Table 19 – Association ends of RemedialActionProfile::CountertradeRemedialAction**  
706 **with other classes**

mult from	name	mult to	type	description
0..*	BiddingZone	0..1	<a href="#">BiddingZone</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
0..*	BiddingZoneBorder	0..1	<a href="#">BiddingZoneBorder</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) inherited from: <a href="#">RemedialAction</a>
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) inherited from: <a href="#">RemedialAction</a>

707

### 708 3.18 (abstract) Contingency root class

709 An event threatening system reliability, consisting of one or more contingency elements.

### 710 3.19 (NC) ContingencyWithRemedialAction root class

711 Combination of a contingency and a remedial action. ContingencyWithRemedialAction shall not  
712 be instantiated for preventive RemedialAction (RemedialAction.kind equals  
713 RemedialActionKind.preventive).

714 Table 20 shows all attributes of ContingencyWithRemedialAction.

715 **Table 20 – Attributes of RemedialActionProfile::ContingencyWithRemedialAction**

name	mult	type	description
mRID	1..1	<a href="#">String</a>	(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.
combinationConstraintKind	1..1	<a href="#">ElementCombinationConstraintKind</a>	(NC) Defines the combination constraint of the Contingency and Remedial Action. If included, this remedial action can only be applied for this contingency. Else if excluded, this remedial action should not be used for this contingency. Else if considered, this remedial action can be considered for this contingency.
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) If true, the contingency with remedial action is enabled, otherwise it is disabled under normal operating conditions.

716

717 Table 21 shows all association ends of ContingencyWithRemedialAction with other classes.

718 **Table 21 – Association ends of RemedialActionProfile::ContingencyWithRemedialAction**  
719 **with other classes**

mult from	name	mult to	type	description
0..*	Contingency	1..1	<a href="#">Contingency</a>	(NC) The contingency that is associated with a remedial action, i.e. the contingency that is the cause for the creation of a remedial action and justifies it or would usually be resolved with a remedial action.

mult from	name	mult to	type	description
0..*	RemedialAction	1..1	<a href="#">RemedialAction</a>	(NC) The remedial action defined for this contingency and remedial action combination.

720

721 **3.20 (NC) ControlFunctionBlockAction**722 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

723 Action for setting the control function block target values.

724 Table 22 shows all attributes of ControlFunctionBlockAction.

725 **Table 22 – Attributes of RemedialActionProfile::ControlFunctionBlockAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

726

727 Table 23 shows all association ends of ControlFunctionBlockAction with other classes.

728 **Table 23 – Association ends of RemedialActionProfile::ControlFunctionBlockAction with other classes**

mult from	name	mult to	type	description
0..*	ControlFunctionBlock	1..1	<a href="#">ControlFunctionBlock</a>	(NC) The control function block that is associated with a ControlFunctionBlockAction.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

730

731 **3.21 (abstract) DCTerminal root class**

732 An electrical connection point to generic DC conducting equipment.

733 **3.22 (abstract) EnergyConsumer root class**

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

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

736 LoadResponseCharacteristic associated with EnergyConsumer or if

737 LoadResponseCharacteristic.exponentModel is set to False.

738 **3.23 (abstract) EnergySource root class**

739 A generic equivalent for an energy supplier on a transmission or distribution voltage level.

740 **3.24 (NC) EnergySourceModification**741 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

742 Energy source action.

743 Table 24 shows all attributes of EnergySourceModification.

744 **Table 24 – Attributes of RemedialActionProfile::EnergySourceModification**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

745

746 Table 25 shows all association ends of EnergySourceModification with other classes.

747 **Table 25 – Association ends of RemedialActionProfile::EnergySourceModification with**  
748 **other classes**

mult from	name	mult to	type	description
0..*	EnergySource	1..1	<a href="#">EnergySource</a>	(NC) The EnergySource which is associated with an EnergySourceAction.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

749

### 750 3.25 (abstract) EquivalentInjection root class

751 This class represents equivalent injections (generation or load). Voltage regulation is allowed  
752 only at the point of connection.

### 753 3.26 (NC) EquivalentInjectionAction

754 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

755 Equivalent injection action.

756 Table 26 shows all attributes of EquivalentInjectionAction.

757 **Table 26 – Attributes of RemedialActionProfile::EquivalentInjectionAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

758

759 Table 27 shows all association ends of EquivalentInjectionAction with other classes.

760 **Table 27 – Association ends of RemedialActionProfile::EquivalentInjectionAction with**  
761 **other classes**

mult from	name	mult to	type	description
0..*	EquivalentInjection	1..1	<a href="#">EquivalentInjection</a>	(NC) The EquivalentInjection that is associated with an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

762

### 763 3.27 (abstract) ExternalNetworkInjection root class

764 This class represents the external network and it is used for IEC 60909 calculations.

### 765 3.28 (NC) ExternalNetworkInjectionAction

766 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

767 External network injection action.

768 Table 28 shows all attributes of ExternalNetworkInjectionAction.

769 **Table 28 – Attributes of RemedialActionProfile::ExternalNetworkInjectionAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

770

771 Table 29 shows all association ends of ExternalNetworkInjectionAction with other classes.

772 **Table 29 – Association ends of RemedialActionProfile::ExternalNetworkInjectionAction**  
773 **with other classes**

mult from	name	mult to	type	description
0..*	ExternalNetworkInjection	1..1	<a href="#">ExternalNetworkInjection</a>	(NC) The ExternalNetworkInjection that is associated with an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

774

### 775 3.29 (NC) Gate

776 Inheritance path = [IdentifiedObject](#)

777 Logical gate that supports a logical operation based on the input.

778 Table 30 shows all attributes of Gate.

779

**Table 30 – Attributes of RemedialActionProfile::Gate**

name	mult	type	description
kind	1..1	<a href="#">GateLogicKind</a>	(NC) The logical operation of the gate.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

780

**781 3.30 (abstract,NC) GateInputPin**782 Inheritance path = [FunctionInputVariable](#) : [IdentifiedObject](#)

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

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

785 Table 31 shows all attributes of GateInputPin.

786

**Table 31 – Attributes of RemedialActionProfile::GateInputPin**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) Indicates if the absolute value is used for comparison. If true, use the absolute value. If false, use the complex value (vector).
duration	1..1	<a href="#">Duration</a>	(NC) The time duration for which the condition is satisfied before acting. Default is 0 seconds.
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) The logical operator kind used for comparison.
negate	1..1	<a href="#">Boolean</a>	(NC) Invert/negate the result of the comparison.
thresholdPercentage	0..1	<a href="#">PerCent</a>	(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	<a href="#">Float</a>	(NC) The threshold value that should be used for compare with the input value.
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) Indicates if the gate input pin value is referring to the value prior to a fault (e.g. simulated by a contingency or due to a SIPS activation in a N-x-y case). If it is true, it means that the value is referring to pre-fault. If it is false or not populated, then it is post-fault.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

787

788 Table 32 shows all association ends of GateInputPin with other classes.

**789 Table 32 – Association ends of RemedialActionProfile::GateInputPin with other classes**

mult from	name	mult to	type	description
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) The Gate that has this input.

790

**791 3.31 (abstract,NC) GridStateAlteration**792 Inheritance path = [IdentifiedObject](#)

793 Grid state alteration is a change of values describing state (operating point) of one element in the grid model compared to the base case.

794



795 Table 33 shows all attributes of GridStateAlteration.

796 **Table 33 – Attributes of RemedialActionProfile::GridStateAlteration**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) The default/normal value used when other active signal/values are missing.
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) Maximum number of alterations per day.
minimumActivation	0..1	<a href="#">Duration</a>	(NC) Minimum time duration between activating the same grid state alteration.
timePerStage	0..1	<a href="#">Duration</a>	(NC) Time to implement a stage of a grid state alteration. If a grid state alteration consists of multiple stages (e.g. A step on a power transformer), this duration comes in addition to the timeToImplement and need to be multiplied by the number of stages. A stage can also be defined as MW in the case of regulating production.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

797

798 Table 34 shows all association ends of GridStateAlteration with other classes.

799 **Table 34 – Association ends of RemedialActionProfile::GridStateAlteration with other**  
800 **classes**

mult from	name	mult to	type	description
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) The grid state alteration remedial action associated with a given grid state alteration.
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) The collection that has a GridStateAlteration.
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) The property reference for this grid state alteration.

801

### 802 3.32 (NC) GridStateAlterationCollection

803 Inheritance path = [IdentifiedObject](#)

804 A collection of grid state alterations.

805 Table 35 shows all attributes of GridStateAlterationCollection.

806 **Table 35 – Attributes of RemedialActionProfile::GridStateAlterationCollection**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

807

### 808 3.33 (NC) GridStateAlterationRemedialAction

809 Inheritance path = [RemedialAction](#) : [IdentifiedObject](#)

810 Grid state alteration remedial action describes one or many grid state alterations applied to a grid model state or a particular scenario in order to resolve one or more identified constraints.

811 Table 36 shows all attributes of GridStateAlterationRemedialAction.

812

813 **Table 36 – Attributes of RemedialActionProfile::GridStateAlterationRemedialAction**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) inherited from: <a href="#">RemedialAction</a>
penaltyFactor	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isManual	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
timeToImplement	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">RemedialAction</a>
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">RemedialAction</a>
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

814

815 Table 37 shows all association ends of GridStateAlterationRemedialAction with other classes.

816

817

**Table 37 – Association ends of  
RemedialActionProfile::GridStateAlterationRemedialAction with other classes**

mult from	name	mult to	type	description
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) inherited from: <a href="#">RemedialAction</a>
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) inherited from: <a href="#">RemedialAction</a>

818

819 **3.34 (abstract) IdentifiedObject root class**

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

822 Table 38 shows all attributes of IdentifiedObject.

823

**Table 38 – Attributes of RemedialActionProfile::IdentifiedObject**

name	mult	type	description
description	0..1	<a href="#">String</a>	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	<a href="#">String</a>	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	<a href="#">String</a>	The name is any free human readable and possibly non unique text naming the object.

824

825 **3.35 (NC) IntertemporalPropertyRange**826 Inheritance path = [RangeConstraint](#) : [IdentifiedObject](#)

827 It represents the intertemporal range, which means that this is the maximum change of an  
 828 attribute value between two time stamps or per time unit (e.g. hour). Both up and down  
 829 directions are defined by the direction attribute, i.e. There are different schedules per direction.  
 830 The class is not instantiated for PropertyReference which refers to Boolean type attributes.  
 831 For instance the following example illustrates the approach:  
 832 - A tap changer related grid state alteration having two intertemporal range schedules.  
 833 - For a particular point in time, the value from up schedule is 6 and the value from down  
 834 schedule is 3.  
 835 - Then, the GridStateIntensity for the same point in time cannot be more than plus 6 taps from  
 836 the current, or more than minus 3 taps from the current.  
 837 Table 39 shows all attributes of IntertemporalPropertyRange.

838 **Table 39 – Attributes of RemedialActionProfile::IntertemporalPropertyRange**

name	mult	type	description
direction	1..1	<a href="#">RelativeDirectionKind</a>	(NC) inherited from: <a href="#">RangeConstraint</a>
valueKind	0..1	<a href="#">ValueOffsetKind</a>	(NC) inherited from: <a href="#">RangeConstraint</a>
normalValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RangeConstraint</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

839  
 840 Table 40 shows all association ends of IntertemporalPropertyRange with other classes.

841 **Table 40 – Association ends of RemedialActionProfile::IntertemporalPropertyRange**  
 842 **with other classes**

mult from	name	mult to	type	description
0..*	GridStateAlteration	1..1	<a href="#">GridStateAlteration</a>	(NC) inherited from: <a href="#">RangeConstraint</a>

843  
 844 **3.36 (Description) Line root class**

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

846 **3.37 (NC) LoadAction**

847 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

848 Load action.

849 Table 41 shows all attributes of LoadAction.

850 **Table 41 – Attributes of RemedialActionProfile::LoadAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

851  
 852 Table 42 shows all association ends of LoadAction with other classes.

853 **Table 42 – Association ends of RemedialActionProfile::LoadAction with other classes**

mult from	name	mult to	type	description
0..*	EnergyConsumer	1..1	<a href="#">EnergyConsumer</a>	(NC) The EnergyConsumer that is associated with a load action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

854

855 **3.38 (abstract) Measurement root class**

856 A Measurement represents any measured, calculated or non-measured non-calculated  
857 quantity. Any piece of equipment may contain Measurements, e.g. a substation may have  
858 temperature measurements and door open indications, a transformer may have oil temperature  
859 and tank pressure measurements, a bay may contain a number of power flow measurements  
860 and a Breaker may contain a switch status measurement.

861 The PSR - Measurement association is intended to capture this use of Measurement and is  
862 included in the naming hierarchy based on EquipmentContainer. The naming hierarchy typically  
863 has Measurements as leaves, e.g. Substation-VoltageLevel-Bay-Switch-Measurement.

864 Some Measurements represent quantities related to a particular sensor location in the network,  
865 e.g. a voltage transformer (VT) or potential transformer (PT) at a busbar or a current transformer  
866 (CT) at the bar between a breaker and an isolator. The sensing position is not captured in the  
867 PSR - Measurement association. Instead it is captured by the Measurement - Terminal  
868 association that is used to define the sensing location in the network topology. The location is  
869 defined by the connection of the Terminal to ConductingEquipment.

870 If both a Terminal and PSR are associated, and the PSR is of type ConductingEquipment, the  
871 associated Terminal should belong to that ConductingEquipment instance.

872 When the sensor location is needed both Measurement-PSR and Measurement-Terminal are  
873 used. The Measurement-Terminal association is never used alone.

874 **3.39 (NC) MeasurementCalculator**

875 Inheritance path = [IdentifiedObject](#)

876 Result of a calculation of one or more measurement.

877 Table 43 shows all attributes of MeasurementCalculator.

878 **Table 43 – Attributes of RemedialActionProfile::MeasurementCalculator**

name	mult	type	description
kind	1..1	<a href="#">CalculationKind</a>	(NC) Calculation operation executed on the operands.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

879

880 **3.40 (NC) MeasurementCalculatorInput**

881 Inheritance path = [IdentifiedObject](#)

882 Input to measurement calculation. It supports Analog, Discrete and Accumulator  
883 measurements.

884 Table 44 shows all attributes of MeasurementCalculatorInput.

885 **Table 44 – Attributes of RemedialActionProfile::MeasurementCalculatorInput**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) Indicates if the absolute value is used for comparison. If true, use the absolute value. If false, use the complex value (vector).
order	1..1	<a href="#">Integer</a>	(NC) Positive number that defines the order of the operand in the calculation. 0 means default in which case the order is not relevant.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

886

887 Table 45 shows all association ends of MeasurementCalculatorInput with other classes.

888 **Table 45 – Association ends of RemedialActionProfile::MeasurementCalculatorInput**  
889 **with other classes**

mult from	name	mult to	type	description
0..*	Measurement	1..1	<a href="#">Measurement</a>	(NC) Measurement used as input to a calculation.
1..*	MeasurementCalculator	1..1	<a href="#">MeasurementCalculator</a>	(NC) The measurement calculator using this calculator input.

890

891 **3.41 (NC) PinContingency**892 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

893 Input pin associated with a Contingency. It is used for comparison.

894 Table 46 shows all attributes of PinContingency.

895 **Table 46 – Attributes of RemedialActionProfile::PinContingency**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

896

897 Table 47 shows all association ends of PinContingency with other classes.

898 **Table 47 – Association ends of RemedialActionProfile::PinContingency with other**  
899 **classes**

mult from	name	mult to	type	description
0..*	Contingency	1..1	<a href="#">Contingency</a>	(NC) The Contingency that is used in the input pin.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

900

### 901 3.42 (NC) PinDCTerminal

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

903 Input pin associated with a DCTerminal. It is used for comparison.

904 Table 48 shows all attributes of PinDCTerminal.

905 **Table 48 – Attributes of RemedialActionProfile::PinDCTerminal**

name	mult	type	description
kind	1..1	<a href="#">PinDCTerminalKind</a>	(NC) The kind of quantity which is used as an input value.
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

906

907 Table 49 shows all association ends of PinDCTerminal with other classes.

908 **Table 49 – Association ends of RemedialActionProfile::PinDCTerminal with other**  
909 **classes**

mult from	name	mult to	type	description
0..*	DCTerminal	0..1	<a href="#">DCTerminal</a>	(NC) The DC terminal that has this pin DC terminal.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

910

### 911 3.43 (NC) PinEquipment

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

913 Input pin associated with an Equipment. It is used for the comparison.

914 Table 50 shows all attributes of PinEquipment.

915 **Table 50 – Attributes of RemedialActionProfile::PinEquipment**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>

name	mult	type	description
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

916

917 Table 51 shows all association ends of PinEquipment with other classes.

918 **Table 51 – Association ends of RemedialActionProfile::PinEquipment with other classes**

mult from	name	mult to	type	description
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) The property reference for this pin equipment.
0..*	Equipment	1..1	<a href="#">Equipment</a>	(NC) The Equipment that is used in the input pin.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

919

920 **3.44 (NC) PinGate**921 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

922 An output from one gate represents an input to another gate.

923 Table 52 shows all attributes of PinGate.

924

**Table 52 – Attributes of RemedialActionProfile::PinGate**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

925

926 Table 53 shows all association ends of PinGate with other classes.

927 **Table 53 – Association ends of RemedialActionProfile::PinGate with other classes**

mult from	name	mult to	type	description
0..*	GateOutput	1..1	<a href="#">Gate</a>	(NC) The output of the gate.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

928

929 **3.45 (NC) PinMeasurement**930 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

931 Input pin associated with a Measurement. It is used for comparison.

932 Table 54 shows all attributes of PinMeasurement.

933

**Table 54 – Attributes of RemedialActionProfile::PinMeasurement**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

934

935 Table 55 shows all association ends of PinMeasurement with other classes.

936

**Table 55 – Association ends of RemedialActionProfile::PinMeasurement with other classes**

937

mult from	name	mult to	type	description
0..*	Measurement	0..1	<a href="#">Measurement</a>	(NC) The Measurement that is used in the input pin.
0..*	MeasurementCalculator	0..1	<a href="#">MeasurementCalculator</a>	(NC) The result of the calculation used as input to a gate.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

938

939 **3.46 (NC) PinPowerTransferCorridor**940 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

941 Input pin associated with a PowerTransferCorridor. It is used for comparison.

942 Table 56 shows all attributes of PinPowerTransferCorridor.

943

**Table 56 – Attributes of RemedialActionProfile::PinPowerTransferCorridor**

name	mult	type	description
kind	1..1	<a href="#">PinPowerTransferCorridorKind</a>	(NC) The kind of quantity which is used as an input value.
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>



name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

944

945 Table 57 shows all association ends of PinPowerTransferCorridor with other classes.

946 **Table 57 – Association ends of RemedialActionProfile::PinPowerTransferCorridor with**  
947 **other classes**

mult from	name	mult to	type	description
0..*	PowerTransferCorridor	1..1	<a href="#">PowerTransferCorridor</a>	(NC) The PowerTransferCorridor that is used in the input pin.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

948

949 **3.47 (NC) PinTerminal**950 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

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

952 Table 58 shows all attributes of PinTerminal.

953 **Table 58 – Attributes of RemedialActionProfile::PinTerminal**

name	mult	type	description
kind	1..1	<a href="#">PinTerminalKind</a>	(NC) The kind of quantity which is used as an input value.
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

954

955 Table 59 shows all association ends of PinTerminal with other classes.

956 **Table 59 – Association ends of RemedialActionProfile::PinTerminal with other classes**

mult from	name	mult to	type	description
0..*	Terminal	1..1	<a href="#">Terminal</a>	(NC) The Terminal that is used in the input pin.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

957

958 **3.48 (NC) PinOperationalLimit**959 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

960 Input pin associated with the limits of a Terminal. It is used for comparison.

961 Table 60 shows all attributes of PinOperationalLimit.

962

**Table 60 – Attributes of RemedialActionProfile::PinOperationalLimit**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

963

964

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

965

**Table 61 – Association ends of RemedialActionProfile::PinOperationalLimit with other classes**

966

mult from	name	mult to	type	description
0..*	OperationalLimit	1..1	<a href="#">OperationalLimit</a>	(NC) The operational limit that is used in the input pin.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

967

### 968 3.49 (abstract) PowerElectronicsConnection root class

969 A connection to the AC network for energy production or consumption that uses power  
970 electronics rather than rotating machines.

### 971 3.50 (NC) PowerElectronicsConnectionAction

972 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

973 Power electronics setpoint action.

974 Table 62 shows all attributes of PowerElectronicsConnectionAction.

975

**Table 62 – Attributes of RemedialActionProfile::PowerElectronicsConnectionAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

976

977

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

978  
979**Table 63 – Association ends of RemedialActionProfile::PowerElectronicsConnectionAction with other classes**

mult from	name	mult to	type	description
0..*	PowerElectronicsConnection	1..1	<a href="#">PowerElectronicsConnection</a>	(NC) The PowerElectronicsConnection that is applied to an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

980

**981 3.51 (abstract) PowerSystemResource**982 Inheritance path = [IdentifiedObject](#)983 A power system resource (PSR) can be an item of equipment such as a switch, an equipment  
984 container containing many individual items of equipment such as a substation, or an  
985 organisational entity such as sub-control area. Power system resources can have  
986 measurements associated.

987 Table 64 shows all attributes of PowerSystemResource.

**988 Table 64 – Attributes of RemedialActionProfile::PowerSystemResource**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

989

**990 3.52 (abstract,NC) PowerTransferCorridor root class**991 A power transfer corridor is defined as a set of circuits (transmission lines or transformers)  
992 separating two portions of the power system, or a subset of circuits exposed to a substantial  
993 portion of the transmission exchange between two parts of the system.**994 3.53 (abstract,NC) PropertyReference root class**

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

**996 3.54 (NC) PTCActivePowerSupport root class**997 Defines the active power capability (support) of the scheme in relation to a  
998 PowerTransferCorridor.

999 Table 65 shows all attributes of PTCActivePowerSupport.

**1000 Table 65 – Attributes of RemedialActionProfile::PTCActivePowerSupport**

name	mult	type	description
maximum	1..1	<a href="#">ActivePower</a>	(NC) Maximum support that a System Integrity Protection Scheme (SIPS) can provide to a Power Transfer Corridor (PTC). This is normally limited by the maximum power system disconnect allowed.
normal	1..1	<a href="#">ActivePower</a>	(NC) Normal support that a System Integrity Protection Scheme (SIPS) is expected to provide when enabled to a Power Transfer Corridor (PTC).

1001

1002 Table 66 shows all association ends of PTCActivePowerSupport with other classes.

1003 **Table 66 – Association ends of RemedialActionProfile::PTCActivePowerSupport with**  
1004 **other classes**

mult from	name	mult to	type	description
0..*	PowerTransferCorridor	1..1	<a href="#">PowerTransferCorridor</a>	(NC) The PowerTransferCorridor that has a specific active power support.
0..*	RemedialActionScheme	1..1	<a href="#">RemedialActionScheme</a>	(NC) The RemedialActionScheme which has active power support from the PowerTransferCorridor.

1005

### 1006 3.55 (NC) RedispatchRemedialAction

1007 Inheritance path = [PowerRemedialAction](#) : [RemedialAction](#) : [IdentifiedObject](#)

1008 Redispatch remedial action is a remedial action that through rearranging power schedules is  
1009 eliminating breaches of constraints.

1010 Table 67 shows all attributes of RedispatchRemedialAction.

1011 **Table 67 – Attributes of RemedialActionProfile::RedispatchRemedialAction**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) inherited from: <a href="#">RemedialAction</a>
penaltyFactor	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isManual	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
timeToImplement	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">RemedialAction</a>
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">RemedialAction</a>
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1012

1013 Table 68 shows all association ends of RedispatchRemedialAction with other classes.

1014 **Table 68 – Association ends of RemedialActionProfile::RedispatchRemedialAction with**  
1015 **other classes**

mult from	name	mult to	type	description
0..*	BiddingZone	0..1	<a href="#">BiddingZone</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
0..*	BiddingZoneBorder	0..1	<a href="#">BiddingZoneBorder</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) inherited from: <a href="#">RemedialAction</a>
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) inherited from: <a href="#">RemedialAction</a>

1016

### 1017 3.56 (abstract,NC) Region root class

1018 A region where the system operator belongs to.

### 1019 3.57 (abstract) RegulatingControl root class

1020 Specifies a set of equipment that works together to control a power system quantity such as  
1021 voltage or flow.

1022 Remote bus voltage control is possible by specifying the controlled terminal located at some  
1023 place remote from the controlling equipment.  
1024 The specified terminal shall be associated with the connectivity node of the controlled point.  
1025 The most specific subtype of RegulatingControl shall be used in case such equipment  
1026 participate in the control, e.g. TapChangerControl for tap changers.  
1027 For flow control, load sign convention is used, i.e. positive sign means flow out from a  
1028 TopologicalNode (bus) into the conducting equipment.  
1029 The attribute minAllowedTargetValue and maxAllowedTargetValue are required in the following  
1030 cases:  
1031 - For a power generating module operated in power factor control mode to specify maximum  
1032 and minimum power factor values;  
1033 - Whenever it is necessary to have an off center target voltage for the tap changer regulator.  
1034 For instance, due to long cables to off shore wind farms and the need to have a simpler setup  
1035 at the off shore transformer platform, the voltage is controlled from the land at the connection  
1036 point for the off shore wind farm. Since there usually is a voltage rise along the cable, there is  
1037 typical and overvoltage of up 3-4 kV compared to the on shore station. Thus in normal operation  
1038 the tap changer on the on shore station is operated with a target set point, which is in the lower  
1039 parts of the dead band.  
1040 The attributes minAllowedTargetValue and maxAllowedTargetValue are not related to the  
1041 attribute targetDeadband and thus they are not treated as an alternative of the targetDeadband.  
1042 They are needed due to limitations in the local substation controller. The attribute  
1043 targetDeadband is used to prevent the power flow from move the tap position in circles (hunting)  
1044 that is to be used regardless of the attributes minAllowedTargetValue and  
1045 maxAllowedTargetValue.

### 1046 3.58 (NC) RegulatingControlAction

1047 Inheritance path = [GridStateAlteration](#) : [IdentifiedObject](#)

1048 Control action means the set point change of a regulating control power system resource in the  
1049 grid model compared to the base case.

1050 Table 69 shows all attributes of RegulatingControlAction.

1051 **Table 69 – Attributes of RemedialActionProfile::RegulatingControlAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1052

1053 Table 70 shows all association ends of RegulatingControlAction with other classes.

1054 **Table 70 – Association ends of RemedialActionProfile::RegulatingControlAction with**  
1055 **other classes**

mult from	name	mult to	type	description
0..*	RegulatingControl	1..1	<a href="#">RegulatingControl</a>	(NC) The regulating control which has an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

mult from	name	mult to	type	description
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1056

1057 **3.59 (abstract,NC) RemedialAction**1058 Inheritance path = [IdentifiedObject](#)1059 Remedial action describes one or more actions that can be performed on a given power system  
1060 model situation to eliminate one or more identified breaches of constraints. The remedial action  
1061 can be costly, and have a cost characteristic, or non costly.

1062 Table 71 shows all attributes of RemedialAction.

1063

**Table 71 – Attributes of RemedialActionProfile::RemedialAction**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) The kind of the remedial action. If curative remedial action, it is required to have an association with ContingencyWithRemedialAction. If preventive remedial action, RemedialAction class shall not have association with ContingencyWithRemedialAction.
penaltyFactor	0..1	<a href="#">Float</a>	(NC) Defines the relative penalty for a given remedial action. This is a positive number greater than zero and default is one, meaning the remedial action does not have negative nor positive effect on the quality of the solution. A remedial action that provide changes in the transmission loss can have negative (Between zero and one) or positive effect (Bigger than one) given by $1 / (1 - \text{Incremental Transmission Loss})$ . In a similar way remedial action using generating units or compensation units can have negative or positive effect. Typical value would be between 0.8 and 1.1.
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) Indicates if the remedial action is cross border relevant. True, means that the remedial action is cross border relevant.
isManual	0..1	<a href="#">Boolean</a>	(NC) Indicates if the remedial action is manually executed which involves one or many actions performed by human. A SIPS remedial action cannot be manual. True, means that the remedial action is manual. False, means that the remedial action is automatically executed without human communication.
timeToImplement	0..1	<a href="#">Duration</a>	(NC) Time to implement a remedial action.
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) Impact threshold margin for the use of the remedial action. Meaning that the remedial action should not be used if it cannot resolve violation with more than the given impact threshold margin. The allowed value range is [0,100].
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) It identifies if the remedial action is available under normal condition. True means available, False means unavailable.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1064

1065 Table 72 shows all association ends of RemedialAction with other classes.

1066 **Table 72 – Association ends of RemedialActionProfile::RemedialAction with other**  
1067 **classes**

mult from	name	mult to	type	description
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) The region in which the remedial action is appointed.
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) System operator operating remedial actions.

1068

### 1069 3.60 (NC) RemedialActionScheme

1070 Inheritance path = [PowerSystemResource](#) : [IdentifiedObject](#)

1071 Remedial Action Scheme (RAS), Special Protection Schemes (SPS), System Protection

1072 Schemes (SPS) or System Integrity Protection Schemes (SIPS).

1073 A Remedial Action Scheme consists of one or more stages that can trigger and execute a

1074 protection action.

1075 Table 73 shows all attributes of RemedialActionScheme.

1076 **Table 73 – Attributes of RemedialActionProfile::RemedialActionScheme**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionSchemeKind</a>	(NC) Kind of Remedial Action Scheme.
normalArmed	1..1	<a href="#">Boolean</a>	(NC) Defines the normal arming status of the remedial action scheme.
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1077

1078 Table 74 shows all association ends of RemedialActionScheme with other classes.

1079 **Table 74 – Association ends of RemedialActionProfile::RemedialActionScheme with**  
1080 **other classes**

mult from	name	mult to	type	description
0..*	GateArmed	0..1	<a href="#">Gate</a>	(NC) Gate that through a gate logic and input pin defines arming of a Remedial Action Scheme.
0..1	SchemeRemedialAction	0..1	<a href="#">SchemeRemedialAction</a>	(NC) Scheme remedial action that belongs to the remedial action scheme.

1081

### 1082 3.61 (abstract) RotatingMachine root class

1083 A rotating machine which may be used as a generator or motor.

### 1084 3.62 (NC) RotatingMachineAction

1085 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

1086 Rotating machine action.

1087 Table 75 shows all attributes of RotatingMachineAction.

1088 **Table 75 – Attributes of RemedialActionProfile::RotatingMachineAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

name	mult	type	description
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1089

1090

Table 76 shows all association ends of RotatingMachineAction with other classes.

1091

1092

**Table 76 – Association ends of RemedialActionProfile::RotatingMachineAction with other classes**

mult from	name	mult to	type	description
0..*	RotatingMachine	1..1	<a href="#">RotatingMachine</a>	(NC) The rotating machine that has an action.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1093

1094

### 3.63 (NC) SchemeRemedialAction

1095

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

1096

1097

1098

1099

1100

Scheme remedial action is remedial action that involves a scheme that can include conditional logic and stages of grid alteration. The primary remedial action is the arming of these schemes, that will then perform curative remedial action when the condition is met. System Integrity Protection Scheme (SIPS) and Special Protection Scheme (SPS) are example of this.

Table 77 shows all attributes of SchemeRemedialAction.

1101

**Table 77 – Attributes of RemedialActionProfile::SchemeRemedialAction**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) inherited from: <a href="#">RemedialAction</a>
penaltyFactor	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isManual	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
timeToImplement	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">RemedialAction</a>
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">RemedialAction</a>
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1102

1103

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



1104 **Table 78 – Association ends of RemedialActionProfile::SchemeRemedialAction with**  
1105 **other classes**

mult from	name	mult to	type	description
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) inherited from: <a href="#">RemedialAction</a>
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) inherited from: <a href="#">RemedialAction</a>

1106

### 1107 3.64 (abstract,NC) SetPointAction

1108 Inheritance path = [GridStateAlteration](#) : [IdentifiedObject](#)

1109 Setpoint action.

1110 Table 79 shows all attributes of SetPointAction.

1111 **Table 79 – Attributes of RemedialActionProfile::SetPointAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1112

1113 Table 80 shows all association ends of SetPointAction with other classes.

1114 **Table 80 – Association ends of RemedialActionProfile::SetPointAction with other**  
1115 **classes**

mult from	name	mult to	type	description
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1116

### 1117 3.65 (abstract) ShuntCompensator root class

1118 A shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a  
1119 shunt compensator is an individual capacitor or reactor. A negative value for bPerSection  
1120 indicates that the compensator is a reactor. ShuntCompensator is a single terminal device.  
1121 Ground is implied.

### 1122 3.66 (abstract,NC) SystemOperator root class

1123 System operator.

### 1124 3.67 (abstract) TapChanger root class

1125 Mechanism for changing transformer winding tap positions.

### 1126 3.68 (NC) TapPositionAction

1127 Inheritance path = [GridStateAlteration](#) : [IdentifiedObject](#)

1128 Tap position action represents a change of a tap changer position in the grid model compared  
1129 to the base case.

1130 Table 81 shows all attributes of TapPositionAction.

1131 **Table 81 – Attributes of RemedialActionProfile::TapPositionAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1132

1133 Table 82 shows all association ends of TapPositionAction with other classes.

1134 **Table 82 – Association ends of RemedialActionProfile::TapPositionAction with other**  
1135 **classes**

mult from	name	mult to	type	description
0..*	TapChanger	1..1	<a href="#">TapChanger</a>	(NC) The tap changer that has a tap position action associated.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1136

### 1137 3.69 (abstract) Terminal root class

1138 An AC electrical connection point to a piece of conducting equipment. Terminals are connected  
1139 at physical connection points called connectivity nodes.

### 1140 3.70 (NC) TopologyAction

1141 Inheritance path = [GridStateAlteration](#) : [IdentifiedObject](#)

1142 Topology action means the connection or disconnection of a switch in the grid model compared  
1143 to the base case.

1144 Table 83 shows all attributes of TopologyAction.

1145 **Table 83 – Attributes of RemedialActionProfile::TopologyAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1146

1147 Table 84 shows all association ends of TopologyAction with other classes.

1148 **Table 84 – Association ends of RemedialActionProfile::TopologyAction with other**  
1149 **classes**

mult from	name	mult to	type	description
0..*	Switch	1..1	<a href="#">Switch</a>	(NC) The switch that has a topology action associated.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1150

### 1151 3.71 (NC) TriggerCondition

1152 Inheritance path = [IdentifiedObject](#)

1153 The condition that triggers a remedial action scheme.

1154 Table 85 shows all attributes of TriggerCondition.

1155 **Table 85 – Attributes of RemedialActionProfile::TriggerCondition**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1156

1157 Table 86 shows all association ends of TriggerCondition with other classes.

1158 **Table 86 – Association ends of RemedialActionProfile::TriggerCondition with other**  
1159 **classes**

mult from	name	mult to	type	description
0..*	GateTrigger	1..1	<a href="#">Gate</a>	(NC) The gate that is the condition for the trigger.
0..*	RemedialActionScheme	1..1	<a href="#">RemedialActionScheme</a>	(NC) The remedial action scheme that has the trigger condition.

1160

### 1161 3.72 (NC) CalculationKind enumeration

1162 Kind of calculation operation that can be done to Measurement.

1163 Table 87 shows all literals of CalculationKind.

1164 **Table 87 – Literals of RemedialActionProfile::CalculationKind**

literal	value	description
summation		Summation operation on the input values (operands).
multiplication		Multiplication operation on the input values (operands).
division		Division operation on the input values (operands).
squareRoot		Square root operator - only one input value (operands).

1165

1166 **3.73 Currency enumeration**

1167 Monetary currencies. ISO 4217 standard including 3-character currency code.

1168 Table 88 shows all literals of Currency.

1169

**Table 88 – Literals of RemedialActionProfile::Currency**

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

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

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

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

literal	value	description
ZMK	894	Zambian kwacha.
ZWL	932	Zimbabwe dollar.

1170

1171 **3.74 (NC) GateLogicKind enumeration**

1172 Define the different logical operations.

1173 Table 89 shows all literals of GateLogicKind.

1174

**Table 89 – Literals of RemedialActionProfile::GateLogicKind**

literal	value	description
and		A logical AND operation. True when all inputs are true.
or		A logical OR operation. True when one or more inputs are true.
nor		A logical NOR operation. False when one or more inputs are true.
nand		A logical NAND operation. False when all inputs are true.
not		A logical NOT operation. Only one input and true input will give false out and false in will give true out. An inverter.
xnor		A logical XNOR operation. The function is the inverse of the exclusive OR (XOR) gate. All input false or true will give true. Otherwise false.
xor		A logical XOR operation. All input false or true will give false. Otherwise true.

1175

1176 **3.75 (NC) LogicalOperatorsKind enumeration**

1177 Kinds of logical operators for comparison.

1178 Table 90 shows all literals of LogicalOperatorsKind.

1179

**Table 90 – Literals of RemedialActionProfile::LogicalOperatorsKind**

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

1180

1181 **3.76 (NC) PinDCTerminalKind enumeration**

1182 The kind of quantities that can serve as an input value for the DCTerminal pin.

1183 Table 91 shows all literals of PinDCTerminalKind.

1184

**Table 91 – Literals of RemedialActionProfile::PinDCTerminalKind**

literal	value	description
voltage		Direct current voltage in the DCTerminal.
current		Direct current in the DCTerminal.



1185

1186 **3.77 (NC) PinPowerTransferCorridorKind enumeration**

1187 The kind of quantities that can serve as an input value for the PowerTransferCorridor pin.

1188 Table 92 shows all literals of PinPowerTransferCorridorKind.

1189 **Table 92 – Literals of RemedialActionProfile::PinPowerTransferCorridorKind**

literal	value	description
activePower		Active power in the branch group.
reactivePower		Reactive power in the branch group.

1190

1191 **3.78 (NC) RelativeDirectionKind enumeration**

1192 Kind of direction for the changes.

1193 Table 93 shows all literals of RelativeDirectionKind.

1194 **Table 93 – Literals of RemedialActionProfile::RelativeDirectionKind**

literal	value	description
up		Up signifies that the changes are increasing from the current status.
down		Down signifies that the changes are decreasing from the current status.
upAndDown		Up and down signifies that both up and down values are equal.
none		There is no direction on the changes.

1195

1196 **3.79 (NC) RemedialActionKind enumeration**

1197 The different kinds for a remedial action.

1198 Table 94 shows all literals of RemedialActionKind.

1199 **Table 94 – Literals of RemedialActionProfile::RemedialActionKind**

literal	value	description
curative		Curative remedial action means a remedial action that is the result of an operational planning process and is activated straight subsequent to the occurrence of the respective contingency for compliance with the (N-1) criterion, taking into account transitory admissible overloads and their accepted duration.
preventive		Preventive remedial action means a remedial action that is the result of an operational planning process and needs to be activated prior to the investigated timeframe for compliance with the (N-1) criterion.

1200

1201 **3.80 (NC) RemedialActionSchemeKind enumeration**

1202 Classification of Remedial Action Scheme.

1203 Table 95 shows all literals of RemedialActionSchemeKind.

1204

**Table 95 – Literals of RemedialActionProfile::RemedialActionSchemeKind**

literal	value	description
sips		System Integrity Protection Scheme (SIPS). The triggering conditions are met through field measurements.
rasp		Remedial Action Schema Plan (RASP). The triggering conditions are met through calculation or manual intervention.

1205

**1206 3.81 UnitSymbol enumeration**

1207 The derived units defined for usage in the CIM. In some cases, the derived unit is equal to an  
1208 SI unit. Whenever possible, the standard derived symbol is used instead of the formula for the  
1209 derived unit. For example, the unit symbol Farad is defined as "F" instead of "CPerV". In cases  
1210 where a standard symbol does not exist for a derived unit, the formula for the unit is used as  
1211 the unit symbol. For example, density does not have a standard symbol and so it is represented  
1212 as "kgPerm3". With the exception of the "kg", which is an SI unit, the unit symbols do not contain  
1213 multipliers and therefore represent the base derived unit to which a multiplier can be applied as  
1214 a whole.

1215 Every unit symbol is treated as an unparseable text as if it were a single-letter symbol. The  
1216 meaning of each unit symbol is defined by the accompanying descriptive text and not by the  
1217 text contents of the unit symbol.

1218 To allow the widest possible range of serializations without requiring special character handling,  
1219 several substitutions are made which deviate from the format described in IEC 80000-1. The  
1220 division symbol "/" is replaced by the letters "Per". Exponents are written in plain text after the  
1221 unit as "m3" instead of being formatted as "m" with a superscript of 3 or introducing a symbol  
1222 as in "m^3". The degree symbol "°" is replaced with the letters "deg". Any clarification of the  
1223 meaning for a substitution is included in the description for the unit symbol.

1224 Non-SI units are included in list of unit symbols to allow sources of data to be correctly labelled  
1225 with their non-SI units (for example, a GPS sensor that is reporting numbers that represent feet  
1226 instead of meters). This allows software to use the unit symbol information correctly convert  
1227 and scale the raw data of those sources into SI-based units.

1228 The integer values are used for harmonization with IEC 61850.

1229 Table 96 shows all literals of UnitSymbol.

1230

**Table 96 – Literals of RemedialActionProfile::UnitSymbol**

literal	value	description
none	0	Dimension less quantity, e.g. count, per unit, etc.
s	4	Time in seconds.
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 $V\cos(\phi)$ ), is expressed in Watts. See also apparent power and reactive power.
VAr	63	Reactive power in volt amperes reactive. The "reactive" or "imaginary" component of electrical power ( $V\sin(\phi)$ ). (See also real power and apparent power).  Note: Different meter designs use different methods to arrive at their results. Some meters may compute reactive power as an arithmetic value, while others compute the value vectorially. The data consumer should determine the method in use and the suitability of the measurement for the intended purpose.

1231

1232 **3.82 UnitMultiplier enumeration**

1233 The unit multipliers defined for the CIM. When applied to unit symbols, the unit symbol is  
1234 treated as a derived unit. Regardless of the contents of the unit symbol text, the unit symbol  
1235 shall be treated as if it were a single-character unit symbol. Unit symbols should not contain  
1236 multipliers, and it should be left to the multiplier to define the multiple for an entire data type.

1237 For example, if a unit symbol is "m2Pers" and the multiplier is "k", then the value is  $k(m^{**2}/s)$ ,  
1238 and the multiplier applies to the entire final value, not to any individual part of the value. This  
1239 can be conceptualized by substituting a derived unit symbol for the unit type. If one imagines  
1240 that the symbol "P" represents the derived unit "m2Pers", then applying the multiplier "k" can  
1241 be conceptualized simply as "kP".

1242 For example, the SI unit for mass is "kg" and not "g". If the unit symbol is defined as "kg", then  
1243 the multiplier is applied to "kg" as a whole and does not replace the "k" in front of the "g". In  
1244 this case, the multiplier of "m" would be used with the unit symbol of "kg" to represent one gram.

1245 As a text string, this violates the instructions in IEC 80000-1. However, because the unit symbol  
1246 in CIM is treated as a derived unit instead of as an SI unit, it makes more sense to conceptualize  
1247 the "kg" as if it were replaced by one of the proposed replacements for the SI mass symbol. If  
1248 one imagines that the "kg" were replaced by a symbol "P", then it is easier to conceptualize the  
1249 multiplier "m" as creating the proper unit "mP", and not the forbidden unit "mkg".

1250 Table 97 shows all literals of UnitMultiplier.

1251 **Table 97 – Literals of RemedialActionProfile::UnitMultiplier**

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

1252

1253 **3.83 (NC) ValueOffsetKind enumeration**

1254 The kind of the value offset.

1255 Table 98 shows all literals of ValueOffsetKind.

1256 **Table 98 – Literals of RemedialActionProfile::ValueOffsetKind**

literal	value	description
absolute		Value of the range constraint is replacing the attribute value referenced by the PropertyReference in a determined operational scenario.
incremental		Value of the range constraint is incrementing the attribute value referenced by the PropertyReference in a determined operational scenario.
incrementalPercentage		Value of the range constraint is incrementing in percentage the attribute value referenced by the PropertyReference in a determined operational scenario.

1257

1258 **3.84 ActivePower datatype**

1259 Product of RMS value of the voltage and the RMS value of the in-phase component of the  
1260 current.

1261 Table 99 shows all attributes of ActivePower.

1262 **Table 99 – Attributes of RemedialActionProfile::ActivePower**

name	mult	type	description
multiplier	0..1	<a href="#">UnitMultiplier</a>	(const=M)

name	mult	type	description
unit	0..1	<a href="#">UnitSymbol</a>	(const=W)
value	0..1	<a href="#">Float</a>	

1263

1264 **3.85 PerCent datatype**

1265 Percentage on a defined base. For example, specify as 100 to indicate at the defined base.  
1266 Table 100 shows all attributes of PerCent.

1267

**Table 100 – Attributes of RemedialActionProfile::PerCent**

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

1268

1269 **3.86 ReactivePower datatype**

1270 Product of RMS value of the voltage and the RMS value of the quadrature component of the  
1271 current.

1272 Table 101 shows all attributes of ReactivePower.

1273

**Table 101 – Attributes of RemedialActionProfile::ReactivePower**

name	mult	type	description
value	0..1	<a href="#">Float</a>	
unit	0..1	<a href="#">UnitSymbol</a>	(const=VAr)
multiplier	0..1	<a href="#">UnitMultiplier</a>	(const=M)

1274

1275 **3.87 Seconds datatype**

1276 Time, in seconds.

1277 Table 102 shows all attributes of Seconds.

1278

**Table 102 – Attributes of RemedialActionProfile::Seconds**

name	mult	type	description
value	0..1	<a href="#">Float</a>	Time, in seconds
unit	0..1	<a href="#">UnitSymbol</a>	(const=s)
multiplier	0..1	<a href="#">UnitMultiplier</a>	(const=none)

1279

1280 **3.88 Boolean primitive**

1281 A type with the value space "true" and "false".

1282 **3.89 Duration primitive**

1283 Duration as "PnYnMnDTnHnMnS" which conforms to ISO 8601, where nY expresses a number  
1284 of years, nM a number of months, nD a number of days. The letter T separates the date  
1285 expression from the time expression and, after it, nH identifies a number of hours, nM a number  
1286 of minutes and nS a number of seconds. The number of seconds could be expressed as a  
1287 decimal number, but all other numbers are integers.

1288 **3.90 Float primitive**

1289 A floating point number. The range is unspecified and not limited.

1290 **3.91 Integer primitive**

1291 An integer number. The range is unspecified and not limited.

1292 **3.92 String primitive**1293 A string consisting of a sequence of characters. The character encoding is UTF-8. The string  
1294 length is unspecified and unlimited.1295 **3.93 (NC) ElementCombinationConstraintKind enumeration**

1296 Kind of constraint for an element combination.

1297 Table 103 shows all literals of ElementCombinationConstraintKind.

1298 **Table 103 – Literals of RemedialActionProfile::ElementCombinationConstraintKind**

literal	value	description
included		Element combination is included.
excluded		Element combination is excluded.
considered		Element combination can be considered.

1299

1300 **3.94 (abstract) OperationalLimit root class**

1301 A value and normal value associated with a specific kind of limit.

1302 The sub class value and normalValue attributes vary inversely to the associated  
1303 OperationalLimitType.acceptableDuration (acceptableDuration for short).1304 If a particular piece of equipment has multiple operational limits of the same kind (apparent  
1305 power, current, etc.), the limit with the greatest acceptableDuration shall have the smallest limit  
1306 value and the limit with the smallest acceptableDuration shall have the largest limit value. Note:  
1307 A large current can only be allowed to flow through a piece of equipment for a short duration  
1308 without causing damage, but a lesser current can be allowed to flow for a longer duration.1309 **3.95 (NC) BiddingZoneAction**1310 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

1311 Bidding zone set point action.

1312 Table 104 shows all attributes of BiddingZoneAction.

1313 **Table 104 – Attributes of RemedialActionProfile::BiddingZoneAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1314

1315 Table 105 shows all association ends of BiddingZoneAction with other classes.

1316 **Table 105 – Association ends of RemedialActionProfile::BiddingZoneAction with other**  
1317 **classes**

mult from	name	mult to	type	description
0..*	BiddingZone	1..1	<a href="#">BiddingZone</a>	(NC) The bidding zone that has this bidding zone action.

mult from	name	mult to	type	description
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1318

### 1319 3.96 (abstract,NC) ControlFunctionBlock root class

1320 Control function block is a function block that contains an algorithm for controlling the  
1321 equipment.

### 1322 3.97 (abstract,NC) RangeConstraint

1323 Inheritance path = [IdentifiedObject](#)

1324 Defines the range constraint.

1325 Table 106 shows all attributes of RangeConstraint.

1326

**Table 106 – Attributes of RemedialActionProfile::RangeConstraint**

name	mult	type	description
direction	1..1	<a href="#">RelativeDirectionKind</a>	(NC) Defines the direction of the attribute value referenced by the PropertyReference.
valueKind	0..1	<a href="#">ValueOffsetKind</a>	(NC) Kind of value offset for the range that applies to the attribute referenced by the PropertyReference.
normalValue	0..1	<a href="#">Float</a>	(NC) The normal (initial) value. The meaning of the value is defined by the attribute referenced by the PropertyReference. The value can be integer, float or boolean. In case of boolean 1 equals true and 0 equals false. If the valueKind is incremental or incrementalPercentage, then the value shall be positive (greater than zero). If the valueKind is incrementalPercentage, then the value shall be in the range [0, 100].
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1327

1328 Table 107 shows all association ends of RangeConstraint with other classes.

**Table 107 – Association ends of RemedialActionProfile::RangeConstraint with other classes**

1329

mult from	name	mult to	type	description
0..*	GridStateAlteration	1..1	<a href="#">GridStateAlteration</a>	(NC) The grid state alteration which has static range.

1331

### 1332 3.98 (NC) PinEquipmentTripping

1333 Inheritance path = [GateInputPin](#) : [FunctionInputVariable](#) : [IdentifiedObject](#)

1334 Input pin associated with an Equipment. It is used to determine if the equipment is tripped  
1335 between two consecutive stages, i.e. the equipment is in service at pre-fault stage and it is out  
1336 of service at post-fault stage.

1337 Table 108 shows all attributes of PinEquipmentTripping.

1338

**Table 108 – Attributes of RemedialActionProfile::PinEquipmentTripping**

name	mult	type	description
absoluteValue	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
duration	1..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GateInputPin</a>
logicKind	1..1	<a href="#">LogicalOperatorsKind</a>	(NC) inherited from: <a href="#">GateInputPin</a>
negate	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdPercentage	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">GateInputPin</a>
thresholdValue	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">GateInputPin</a>
isValuePreFault	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GateInputPin</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1339

1340

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

1341

**Table 109 – Association ends of RemedialActionProfile::PinEquipmentTripping with other classes**

1342

mult from	name	mult to	type	description
0..*	Equipment	1..1	<a href="#">Equipment</a>	(NC) Equipment that is tripped.
1..*	Gate	1..1	<a href="#">Gate</a>	(NC) inherited from: <a href="#">GateInputPin</a>

1343

### 1344 3.99 (abstract) Equipment root class

1345 The parts of a power system that are physical devices, electronic or mechanical.

### 1346 3.100 (NC) RemedialActionDependency root class

1347 Remedial action dependency is making two remedial actions depending on each other. Multiple  
1348 dependency is done by multiple instances of this class. The dependency can arrive by having  
1349 one of the following examples.

1350 - The dependent remedial action is controlled by different system operator (Modeling Authority)  
1351 (e.g. SIPS that goes across control area).

1352 - The dependent remedial action is representing two or more remedial action that represent  
1353 the same grid state alteration but with different modeling resolution (e.g. detail direct current  
1354 model versus a simplified model).

1355 - The remedial action can be combined with other remedial action without the need to create  
1356 multiple remedial action with the same grid alteration for enabling dependency.

1357 Table 110 shows all attributes of RemedialActionDependency.

1358

**Table 110 – Attributes of RemedialActionProfile::RemedialActionDependency**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionDepende ncyKind</a>	(NC) Type of dependency between two remedial actions.
mRID	1..1	<a href="#">String</a>	(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

name	mult	type	description
			or rdf:about attributes that identify CIM object elements.
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) If true, the remedial action dependency with contingency shall be considered under normal operating conditions.

1359

1360 Table 111 shows all association ends of RemedialActionDependency with other classes.

1361 **Table 111 – Association ends of RemedialActionProfile::RemedialActionDependency**  
1362 **with other classes**

mult from	name	mult to	type	description
0..*	RemedialAction	0..1	<a href="#">RemedialAction</a>	(NC) Remedial action which has dependent remedial actions.
0..*	DependingRemedialActionGroup	0..1	<a href="#">RemedialActionGroup</a>	(NC) Remedial action group which the remedial action is depending on.

1363

1364 **3.101 (abstract,NC) FunctionInputVariable**1365 Inheritance path = [IdentifiedObject](#)

1366 Functional input variable defines the domain of the function.

1367 Table 112 shows all attributes of FunctionInputVariable.

1368 **Table 112 – Attributes of RemedialActionProfile::FunctionInputVariable**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1369

1370 **3.102 (NC) RemedialActionDependencyKind enumeration**

1371 Kind of dependency between remedial actions.

1372 Table 113 shows all literals of RemedialActionDependencyKind.

1373 **Table 113 – Literals of RemedialActionProfile::RemedialActionDependencyKind**

literal	value	description
exclusive		Remedial actions are exclusive depending on each other. e.g. Only one of the remedial actions can be selected at the same time.
inclusive		Remedial actions are inclusive depending on each other. e.g. Both remedial action need to be picked if one of them is needed.
restrictive		Remedial actions are restrictive depending on each other. The need to include or to exclude might depend on the model. e.g. In the case of simplified DC model and detailed DC model. In the case where the simplified remedial action is used but not the remedial action for the detail model and opposite for the DC model.
none		Remedial actions are not depending on each other. However, the two remedial actions should be evaluated together.
balanced		This applies only to a set of power remedial actions and means that the remedial action



literal	value	description
		needs to be balanced between the area (directly or indirectly to the bidding zone) that it is applied to.

1374

1375 **3.103 (abstract,NC) PowerRemedialAction**1376 Inheritance path = [RemedialAction](#) : [IdentifiedObject](#)

1377 Energy remedial action describes actions to rearrange power schedules.

1378 Table 114 shows all attributes of PowerRemedialAction.

1379

**Table 114 – Attributes of RemedialActionProfile::PowerRemedialAction**

name	mult	type	description
kind	1..1	<a href="#">RemedialActionKind</a>	(NC) inherited from: <a href="#">RemedialAction</a>
penaltyFactor	0..1	<a href="#">Float</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isCrossBorderRelevant	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
isManual	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
timeToImplement	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">RemedialAction</a>
impactThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) inherited from: <a href="#">RemedialAction</a>
normalAvailable	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1380

1381

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

1382

1383

**Table 115 – Association ends of RemedialActionProfile::PowerRemedialAction with other classes**

mult from	name	mult to	type	description
0..*	BiddingZone	0..1	<a href="#">BiddingZone</a>	(NC) The Bidding Zone where the power remedial action is done.
0..*	BiddingZoneBorder	0..1	<a href="#">BiddingZoneBorder</a>	(NC) Bidding zone border where the power remedial action is done.
0..*	AppointedToRegion	1..1	<a href="#">Region</a>	(NC) inherited from: <a href="#">RemedialAction</a>
0..*	RemedialActionSystemOperator	0..1	<a href="#">SystemOperator</a>	(NC) inherited from: <a href="#">RemedialAction</a>

1384

1385 **3.104 (NC) EquipmentControllerAction**1386 Inheritance path = [SetPointAction](#) : [GridStateAlteration](#) : [IdentifiedObject](#)

1387 Action for setting the equipment controller action.

1388 Table 116 shows all attributes of EquipmentControllerAction.

1389

**Table 116 – Attributes of RemedialActionProfile::EquipmentControllerAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1390

1391 Table 117 shows all association ends of EquipmentControllerAction with other classes.

1392 **Table 117 – Association ends of RemedialActionProfile::EquipmentControllerAction**  
1393 **with other classes**

mult from	name	mult to	type	description
0..*	EquipmentController	1..1	<a href="#">EquipmentController</a>	(NC) Equipment controller that has associated equipment controller actions.
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1394

1395 **3.105 (abstract,NC) EquipmentController root class**

1396 Equipment controller is an automation function that can control one or multiple equipment  
1397 function to achieve all the targets inside the given tolerance.

1398 **3.106 (NC) RemedialActionGroup**1399 Inheritance path = [IdentifiedObject](#)

1400 Grouping of remedial actions that can be operated together.

1401 Table 118 shows all attributes of RemedialActionGroup.

1402 **Table 118 – Attributes of RemedialActionProfile::RemedialActionGroup**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1403

1404 **3.107 (NC,Description) PowerShiftKeyStrategy**1405 Inheritance path = [IdentifiedObject](#)

1406 Strategy of the power shift key.

1407 Table 119 shows all attributes of PowerShiftKeyStrategy.

1408 **Table 119 – Attributes of RemedialActionProfile::PowerShiftKeyStrategy**

name	mult	type	description
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1409

1410 Table 120 shows all association ends of PowerShiftKeyStrategy with other classes.

1411 **Table 120 – Association ends of RemedialActionProfile::PowerShiftKeyStrategy with**  
1412 **other classes**

mult from	name	mult to	type	description
0..*	PowerRemedialAction	1..1	<a href="#">PowerRemedialAction</a>	(NC) Power remedial action which has power shift key strategy.

1413

1414 **3.108 (abstract,NC) BiddingZoneBorder root class**

1415 Defines the aggregated connection capacity between two Bidding Zones.

1416 **3.109 (NC) PinTerminalKind enumeration**

1417 The kind of quantities that can serve as an input value for the pin.

1418 Table 121 shows all literals of PinTerminalKind.

1419 **Table 121 – Literals of RemedialActionProfile::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.

1420

1421 **3.110 (NC) InServiceAction**

1422 Inheritance path = [GridStateAlteration](#) : [IdentifiedObject](#)

1423 In service action represents a change of the status of the equipment in the grid model compared to the base case.

1425 Table 122 shows all attributes of InServiceAction.

1426 **Table 122 – Attributes of RemedialActionProfile::InServiceAction**

name	mult	type	description
normalEnabled	0..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
maximumPerDay	0..1	<a href="#">Integer</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
minimumActivation	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
timePerStage	0..1	<a href="#">Duration</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
description	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
mRID	1..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>
name	0..1	<a href="#">String</a>	inherited from: <a href="#">IdentifiedObject</a>

1427

1428 Table 123 shows all association ends of InServiceAction with other classes.

1429 **Table 123 – Association ends of RemedialActionProfile::InServiceAction with other**  
1430 **classes**

mult from	name	mult to	type	description
0..*	Equipment	1..1	<a href="#">Equipment</a>	(NC) Equipment that has a in service action associated.

mult from	name	mult to	type	description
1..*	GridStateAlterationRemedialAction	0..1	<a href="#">GridStateAlterationRemedialAction</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	GridStateAlterationCollection	0..1	<a href="#">GridStateAlterationCollection</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>
0..*	PropertyReference	1..1	<a href="#">PropertyReference</a>	(NC) inherited from: <a href="#">GridStateAlteration</a>

1431

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1434

## **Annex A (informative): Sample data**

### **A.1 General**

1436 This Annex is designed to illustrate the profile by using fragments of sample data. It is not meant  
1437 to be a complete set of examples covering all possibilities of using the profile. Defining a  
1438 complete set of test data is considered a separate activity to be performed for the purpose of  
1439 setting up interoperability testing and conformity related to this profile.

### **A.2 Sample instance data**

1441 Test data files are available in the CIM EG SharePoint.

1442

1443