



European Network of  
Transmission System Operators  
for Electricity

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# STEADY STATE INSTRUCTION PROFILE SPECIFICATION

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2024-10-16

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ICTC APPROVED  
VERSION 2.3.1

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30 before implementing any behaviour described with this label.
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32

## Revision History

Version	Date	Paragraph	Comments
0.1.0	2021-10-12		For CIM EG review
1.0.0	2022-02-16		SOC approved.
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2.3.0-beta	2024-03-20		For CIM WG review.
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## 260 1 Introduction

261 The steady state instruction profile enables an exchange of additional information related to  
262 MTU.

## 263 2 Application profile specification

### 264 2.1 Version information

265 The content is generated from UML model file CIM17-2\_CGMES31v01\_PROF-  
266 20v02\_NC23v65\_MS10v01\_DES10v01.eap.

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

- 268 - Title: Steady state instruction Vocabulary
- 269 - Keyword: SSI
- 270 - Description: This vocabulary is describing the steady state instruction profile.
- 271 - Version IRI: <https://ap-voc.cim4.eu/SteadyStateInstruction/2.3>
- 272 - Version info: 2.3.1
- 273 - Prior version: <http://entsoe.eu/ns/CIM/SteadyStateInstruction-EU/2.2>
- 274 - Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-  
275 7:amd1|file://iec61970cim17v40\_iec61968cim13v13a\_iec62325cim03v17a.eap|urn:iso:  
276 std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-  
277 2|file://CIM100\_CGMES31v01\_501-20v02\_NC23v62\_MM10v01.eap
- 278 - Identifier: urn:uuid:6d01969f-38fd-460d-b260-b839a8123319

279

### 280 2.2 Constraints naming convention

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

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

284 where

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

286 rule.Standard: the number of the standard e.g. 301 for 61970-301, 456 for 61970-456, 13 for  
287 61968-13. 61970-600 specific constraints refer to 600 although they are related to one or  
288 combination of the 61970-450 series profiles. For NC profiles, NC is used.

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

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

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

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

## 296 2.3 Profile constraints

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

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

- 302 • C:452:ALL:NA:datatypes

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

- 305 • R:452:ALL:NA:exchange

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

- 308 • R:452:ALL:NA:exchange1

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

- 314 • R:452:ALL:NA:exchange2

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

- 323 • R:452:ALL:NA:exchange3

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

- 327 • R:452:ALL:NA:exchange4

328 From the standpoint of the model import used by a data recipient, the document  
329 describes a subset of the CIM that importing software shall be able to interpret in order  
330 to import exported models. Data providers are free to exceed the minimum requirements  
331 described herein as long as their resulting data files are compliant with the CIM Schema  
332 and the conventions established in Clause 5. The document, therefore, describes  
333 additional classes and class data that, although not required, exporters will, in all  
334 likelihood, choose to include in their data files. The additional classes and data are  
335 labelled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them  
336 from their required counterparts. Please note, however, that data importers could  
337 potentially receive data containing instances of any and all classes described by the  
338 CIM Schema.

- 339 • R:452:ALL:NA:cardinality

340 The cardinality defined in the CIM model shall be followed, unless a more restrictive  
341 cardinality is explicitly defined in this document. For instance, the cardinality on the  
342 association between VoltageLevel and BaseVoltage indicates that a VoltageLevel shall  
343 be associated with one and only one BaseVoltage, but a BaseVoltage can be associated  
344 with zero to many VoltageLevels.

- 345 • R:452:ALL:NA:associations

346 Associations between classes referenced in this document and classes not referenced  
347 here are not required regardless of cardinality.

- 348 • R:452:ALL:IdentifiedObject.name:rule

349 The attribute “name” inherited by many classes from the abstract class IdentifiedObject  
350 is not required to be unique. It must be a human readable identifier without additional  
351 embedded information that would need to be parsed. The attribute is used for purposes  
352 such as User Interface and data exchange debugging. The MRID defined in the data  
353 exchange format is the only unique and persistent identifier used for this data exchange.  
354 The attribute IdentifiedObject.name is, however, always required for CoreEquipment  
355 profile and Short Circuit profile.

- 356 • R:452:ALL:IdentifiedObject.description:rule

357 The attribute “description” inherited by many classes from the abstract class  
358 IdentifiedObject must contain human readable text without additional embedded  
359 information that would need to be parsed.

- 360 • R:452:ALL:NA:uniqueIdentifier

361 All IdentifiedObject-s shall have a persistent and globally unique identifier (Master  
362 Resource Identifier - mRID).

- 363 • R:452:ALL:NA:unitMultiplier

364 For exchange of attributes defined using CIM Data Types (ActivePower, Susceptance,  
365 etc.) a unit multiplier of 1 is used if the UnitMultiplier specified in this document is “none”.

- 366 • C:452:ALL:IdentifiedObject.name:stringLength

367 The string IdentifiedObject.name has a maximum of 128 characters.

- 368 • C:452:ALL:IdentifiedObject.description:stringLength

369 The string IdentifiedObject.description is maximum 256 characters.

- 370 • C:452:ALL:NA:float

371 An attribute that is defined as float (e.g. has a type Float or a type which is a Datatype  
372 with .value attribute of type Float) shall support ISO/IEC 60559:2020 for floating-point  
373 arithmetic using single precision floating point. A single precision float supports 7  
374 significant digits where the significant digits are described as an integer, or a decimal  
375 number with 6 decimal digits. Two float values are equal when the significant with 7  
376 digits are identical, e.g. 1234567 is equal 1.234567E6 and so are 1.2345678 and  
377 1.234567E0.

- 378 • R:NC:ALL:NA:serialization

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

- 381 1) the EAP file (EnterpriseArchitect project file),  
382 2) the profiles' specification document and  
383 3) the application profiles (RDFS and SHACL).

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

- 389 ○ Case 1: An association end refers to an abstract class
- 390 ○ Case 2: An abstract class (stereotyped with "Description") has an association  
391 (direction to another class)
- 392 ○ Case 3: An abstract class (not stereotyped with "Description") has an  
393 association (direction to another class)
- 394 ○ Case 4: An abstract class has attributes and subclasses are not in the profile

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

402 It should be taken into account that this approach deviates from MVAL5 (IEC 61970-  
403 600-1:2021), which creates multiple inheritance at serialization. For instance, with this  
404 more explicit exchange the serialization of the association between abstract class  
405 Equipment and abstract class Circuit for a PowerTransformer will be serialized as  
406 follows:

- 407 ○ for association
- ```
408 <cim:PowerTransformer rdf:about="_c328f787-bc17-47ad-a59f-6ba7133340d0">
409   <nc:Equipment.Circuit rdf:resource="#_9ced16ac-d076-4ef9-a241-a998a579e77b"/>
410 </cim:PowerTransformer>
```
- 411 ○ for attribute
- ```
412 <cim:ACLineSegment rdf:about="_04f681aa-6999-4fb3-9775-aca5eb7ceff">
413   <cim:Equipment.inService>true</cim:Equipment.inService>
414 </cim:ACLineSegment>
```

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

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

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

421

422

## 423 2.4 Metadata

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

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

### 434 2.4.1 Constraints

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

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

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

440

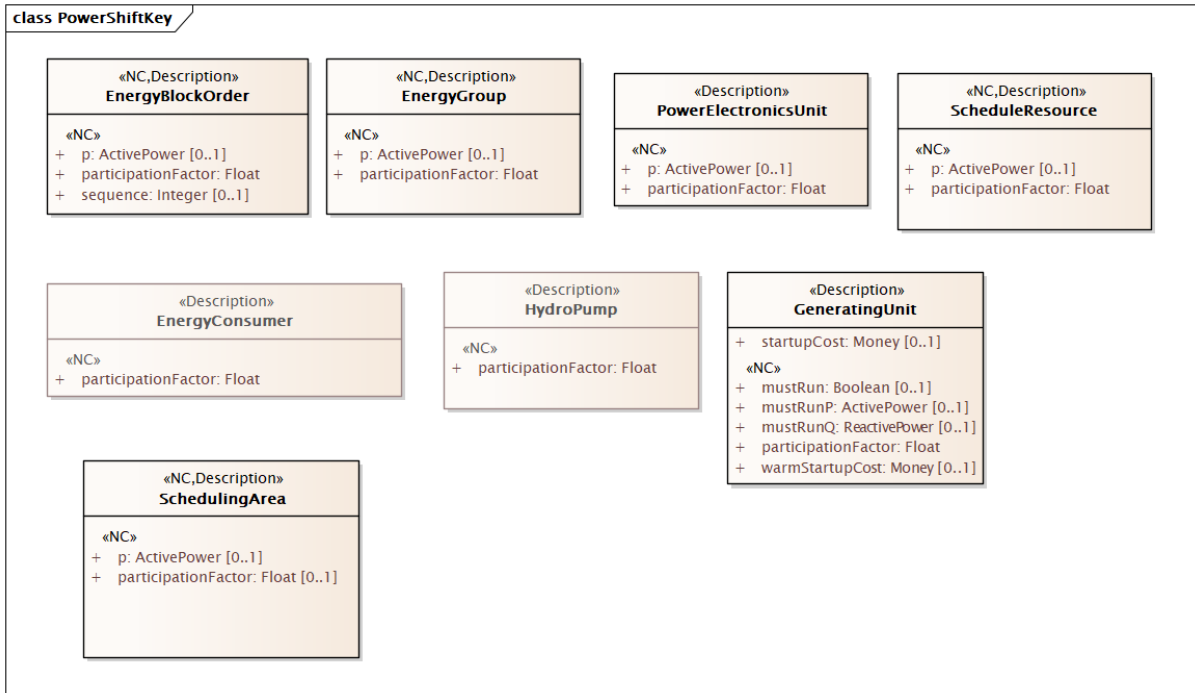
### 441 2.4.2 Reference metadata

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

## 450 3 Detailed Profile Specification

### 451 3.1 General

452 This package contains steady state instruction profile.



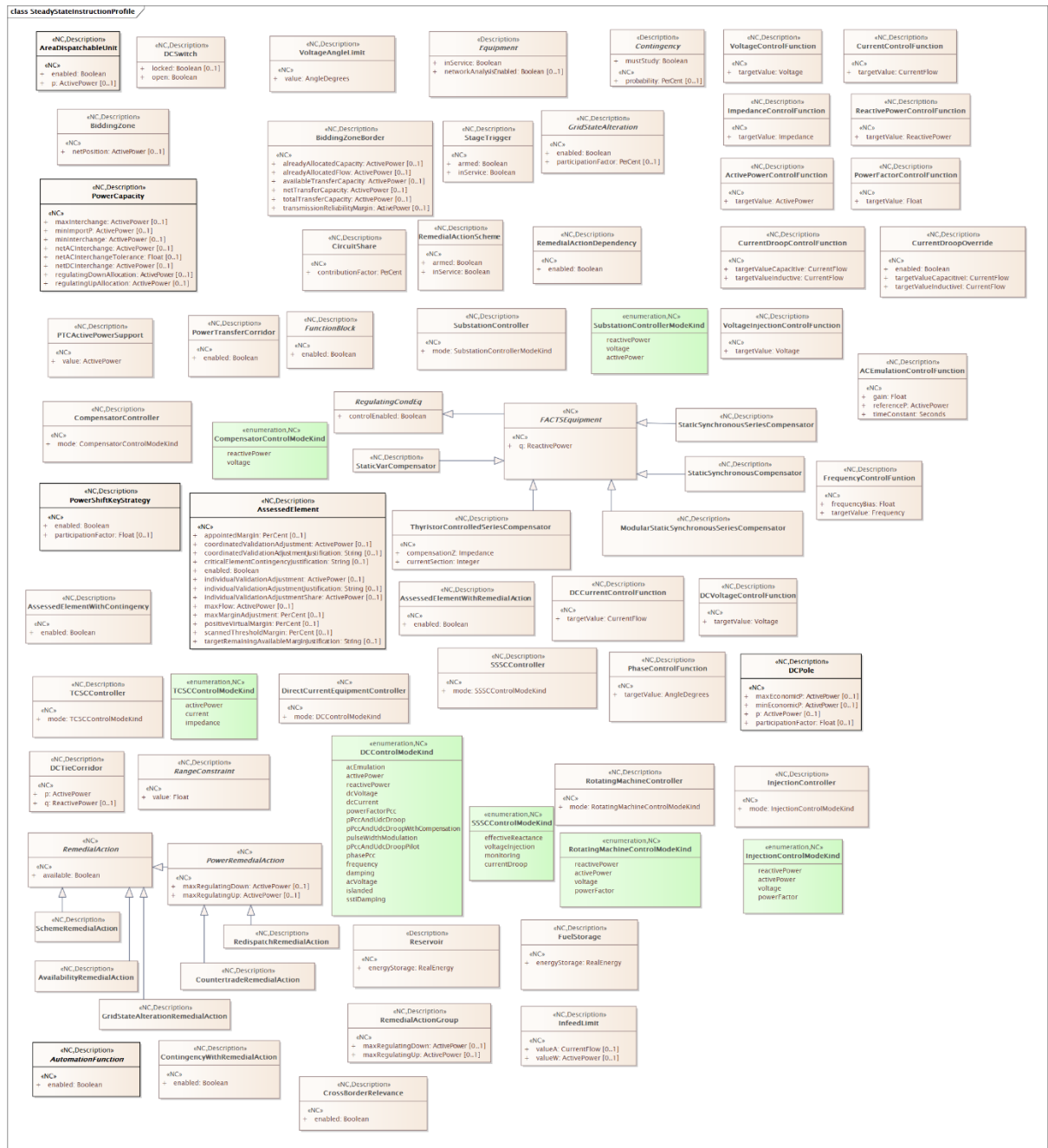
453

454

**Figure 1 – Class diagram SteadyStateInstructionProfile::PowerShiftKey**

455

Figure 1: The diagram shows generation and load shift keys related classes.



456

457 **Figure 2 – Class diagram SteadyStateInstructionProfile::SteadyStateInstructionProfile**

458 Figure 2: The diagram shows steady state instruction related classes.

459 **3.2 (NC,Description) CrossBorderRelevance root class**

460 Combination of an assessed element and one or more bidding zone border that are affected by  
461 the assessment.

462 Table 1 shows all attributes of CrossBorderRelevance.

463 **Table 1 – Attributes of SteadyStateInstructionProfile::CrossBorderRelevance**

name	mult	type	description
enabled	1..1	Boolean	(NC) If true, the cross border relevance is enabled, otherwise it is disabled.



464

465 **3.3 (NC,Description) ACEmulationControlFunction root class**

466 The AC emulation control function is used when AC emulation model is activated for a DC  
467 system. It consists in computing the active power set point of the DC system as a function of  
468 the voltage angle difference between both points of common coupling with the AC network in  
469 order to mimic the behavior of an AC transmission line. This control mode enables the automatic  
470 adjustment of the active power reference following variations of the AC system operational  
471 point.

472 The setpoint of the DC system is calculated by  $P_{setpoint} = Pref + K_{dc} * (angle1 - angle2)$ , where

473 - Pref is the existing active power setpoint;

474 - Kdc is the control system gain and

475 - angle1 and angle2 are the phase angle measurement (measured at points of common coupling  
476 with the AC network) respectively at the side 1 and 2 of the DC system.

477 Table 2 shows all attributes of ACEmulationControlFunction.

478 **Table 2 – Attributes of SteadyStateInstructionProfile::ACEmulationControlFunction**

name	mult	type	description
referenceP	1..1	<a href="#">ActivePower</a>	(NC) Existing active power setpoint used to calculate the active power setpoint of the AC emulation control.
gain	1..1	<a href="#">Float</a>	(NC) Control system gain in AC transmission emulation control measured in MW/deg. It plays the role of an admittance of the equivalent AC transmission line that the control is emulating the higher is the gain the higher is the active power transfer at steady state.
timeConstant	1..1	<a href="#">Seconds</a>	(NC) Control system time constant in AC transmission emulation control. It affects the time needed to reach a new steady state equilibrium point after a network perturbation extremely important to guarantee N-1 relief related to an interconnection. The higher is time constant the slower is the DC system dynamic.

479

480 **3.4 (abstract) RegulatingCondEq root class**

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

483 Table 3 shows all attributes of RegulatingCondEq.

484 **Table 3 – Attributes of SteadyStateInstructionProfile::RegulatingCondEq**

name	mult	type	description
controlEnabled	1..1	<a href="#">Boolean</a>	Specifies the regulation status of the equipment. True is regulating, false is not regulating.

485

486 **3.5 (NC) CompensatorControlModeKind enumeration**

487 Kind of compensator controller mode.

488 Table 4 shows all literals of CompensatorControlModeKind.

489 **Table 4 – Literals of SteadyStateInstructionProfile::CompensatorControlModeKind**

literal	value	description
reactivePower		Reactive power control.
voltage		Voltage control.

490

491 **3.6 Currency enumeration**

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

493 Table 5 shows all literals of Currency.

494

**Table 5 – Literals of SteadyStateInstructionProfile::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.

literal	value	description
CUC	931	Cuban convertible peso.
CUP	192	Cuban peso.
CVE	132	Cape Verde escudo.
CZK	203	Czech koruna.
DJF	262	Djiboutian franc.
DKK	208	Danish krone.
DOP	214	Dominican peso.
DZD	012	Algerian dinar.
EEK	233	Estonian kroon.
EGP	818	Egyptian pound.
ERN	232	Eritrean nakfa.
ETB	230	Ethiopian birr.
EUR	978	Euro.
FJD	242	Fiji dollar.
FKP	238	Falkland Islands pound.
GBP	826	Pound sterling.
GEL	981	Georgian lari.
GHS	936	Ghanaian cedi.
GIP	929	Gibraltar pound.
GMD	270	Gambian dalasi.
GNF	324	Guinean franc.
GTQ	320	Guatemalan quetzal.
GYD	328	Guyanese dollar.
HKD	344	Hong Kong dollar.
HNL	340	Honduran lempira.
HRK	191	Croatian kuna.
HTG	332	Haitian gourde.
HUF	348	Hungarian forint.
IDR	360	Indonesian rupiah.
ILS	376	Israeli new sheqel.
INR	356	Indian rupee.
IQD	368	Iraqi dinar.
IRR	364	Iranian rial.
ISK	352	Icelandic króna.
JMD	388	Jamaican dollar.
JOD	400	Jordanian dinar.
JPY	392	Japanese yen.
KES	404	Kenyan shilling.
KGS	417	Kyrgyzstani som.
KHR	116	Cambodian riel.
KMF	174	Comoro franc.

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

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

literal	value	description
ZAR	710	South African rand.
ZMK	894	Zambian kwacha.
ZWL	932	Zimbabwe dollar.

495

496 **3.7 (NC) DCControlModeKind enumeration**

497 Kind of DC control mode.

498 Table 6 shows all literals of DCControlModeKind.

499

**Table 6 – Literals of SteadyStateInstructionProfile::DCControlModeKind**

literal	value	description
acEmulation		<p>An AC emulation control aims to reproduce the behaviour of an AC line by means of a function of the difference between angles in both converter stations in DC links embedded within a single synchronous AC grid. For changes in the phase angle on either station, the response of this control is to 'emulate the behaviour of an AC line' in both steady and transient states.</p> <p>The AC emulation control needs measurement signals for the angles at both ends of the DC system (at the AC points of common coupling of the DC system). In practice, the angle difference is measured by built-in devices in the converters and the synchronization of angle measurements on both stations is done by means of GPS.</p> <p>ACEmulationControlFunction is used by this control. The control can only be applied by a controller that have access to the two AC points of common coupling of the DC system. Therefore it cannot be applied for a ACDCConverterController.</p>
activePower		Control is active power control at AC side, at point of common coupling. According to IEC 60633 the active power control mode is control of the active power flow exchanged between a DC substation and the connected AC network.
reactivePower		Control is reactive power control at AC side, at point of common coupling. According to IEC 60633 reactive power control mode is a control of the reactive power exchanged between a converter unit, or DC substation and the connected AC network.
dcVoltage		Control is DC voltage in a DC substation (IEC 60633).
dcCurrent		Control is DC current in a DC system (IEC 60633).
powerFactorPcc		Control is power factor at point of common coupling.
pPccAndUdcDroop		Control is active power at point of common coupling and local DC voltage, with the droop.
pPccAndUdcDroopWithCompensation		Control is active power at point of common coupling and compensated DC voltage, with the droop. Compensation factor is the resistance, as an approximation of the DC voltage of a common (real or virtual) node in the DC network.
pulseWidthModulation		No explicit control. Pulse-modulation factor is directly set in magnitude and phase.

literal	value	description
pPccAndUdcDroopPilot		Control is active power at point of common coupling and the pilot DC voltage, with the droop. The mode is used for Multi Terminal High Voltage DC (MTDC) systems where multiple DC Substations are connected to the DC transmission lines. The pilot voltage is then used to coordinate the control the DC voltage across the DC substations.
phasePcc		Control is phase at point of common coupling.
frequency		Frequency control mode (IEC 60633) is a control of the frequency of the connected AC network by varying the active power exchanged between a DC substation and the connected AC network.
damping		Damping control mode (IEC 60633) is supplementary control mode providing the damping of power oscillations in one or more connected AC networks.
acVoltage		AC voltage control mode (IEC 60633) is a control of the AC voltage of the AC network connected to a DC substation.
islanded		Islanded network operation mode (IEC 60633) is a control mode in which the DC substation is connected to an islanded AC network.
sstiDamping		Sub-synchronous torsional interaction (SSTI) damping control mode (IEC 60633) is a supplementary control mode providing the damping of critical frequencies of an (electrical) nearby generator.

500

### 501 3.8 (NC) InjectionControlModeKind enumeration

502 Kind of injection controller mode.

503 Table 7 shows all literals of InjectionControlModeKind.

504 **Table 7 – Literals of SteadyStateInstructionProfile::InjectionControlModeKind**

literal	value	description
reactivePower		Reactive power control.
activePower		Active power is specified.
voltage		Voltage control.
powerFactor		Power factor is specified.

505

### 506 3.9 (NC) RotatingMachineControlModeKind enumeration

507 Kind of rotating machine controller mode.

508 Table 8 shows all literals of RotatingMachineControlModeKind.

509 **Table 8 – Literals of SteadyStateInstructionProfile::RotatingMachineControlModeKind**

literal	value	description
reactivePower		Reactive power control.
activePower		Active power is specified.
voltage		Voltage control.
powerFactor		Power factor is specified.

510

511 **3.10 (NC) SSSCControlModeKind enumeration**

512 Control modes of the Static Synchronous Series Compensator (SSSC).

513 Table 9 shows all literals of SSSCControlModeKind.

514 **Table 9 – Literals of SteadyStateInstructionProfile::SSSCControlModeKind**

literal	value	description
effectiveReactance		The device injects a voltage proportional to the line current to achieve the specified target value defined by the ImpedanceControlFunction. The voltage will vary according to the line current level.
voltageInjection		The device injects a fixed voltage that is either inductive or capacitive according to the specified target value of the VoltageInjectionControlFunction. The effective reactance varies according to the flow of the line current.
monitoring		The device bypasses and a voltage injection is close to zero. In monitoring mode current is monitored.
currentDroop		The device injects a voltage proportional to the difference between the line current and the target value of the CurrentDroopControlFunction. There are capacitive and inductive operational regions.

515

516 **3.11 (NC) SubstationControllerModeKind enumeration**

517 Kind of substation controller mode.

518 Table 10 shows all literals of SubstationControllerModeKind.

519 **Table 10 – Literals of SteadyStateInstructionProfile::SubstationControllerModeKind**

literal	value	description
reactivePower		Reactive power control is the primary control of the substation.
voltage		Voltage control is the primary control of the substation.
activePower		Active power control is the primary control of the substation..

520

521 **3.12 (NC) TCSCControlModeKind enumeration**

522 Kind of TCSC control mode.

523 Table 11 shows all literals of TCSCControlModeKind.

524 **Table 11 – Literals of SteadyStateInstructionProfile::TCSCControlModeKind**

literal	value	description
activePower		Control is active power.
current		Control is current.
impedance		Control is impedance.

525

526 **3.13 UnitMultiplier enumeration**527 The unit multipliers defined for the CIM. When applied to unit symbols, the unit symbol is  
528 treated as a derived unit. Regardless of the contents of the unit symbol text, the unit symbol



529 shall be treated as if it were a single-character unit symbol. Unit symbols should not contain  
530 multipliers, and it should be left to the multiplier to define the multiple for an entire data type.  
531 For example, if a unit symbol is "m2Pers" and the multiplier is "k", then the value is  $k(m^{**2}/s)$ ,  
532 and the multiplier applies to the entire final value, not to any individual part of the value. This  
533 can be conceptualized by substituting a derived unit symbol for the unit type. If one imagines  
534 that the symbol "P" represents the derived unit "m2Pers", then applying the multiplier "k" can  
535 be conceptualized simply as "kP".  
536 For example, the SI unit for mass is "kg" and not "g". If the unit symbol is defined as "kg", then  
537 the multiplier is applied to "kg" as a whole and does not replace the "k" in front of the "g". In  
538 this case, the multiplier of "m" would be used with the unit symbol of "kg" to represent one gram.  
539 As a text string, this violates the instructions in IEC 80000-1. However, because the unit symbol  
540 in CIM is treated as a derived unit instead of as an SI unit, it makes more sense to conceptualize  
541 the "kg" as if it were replaced by one of the proposed replacements for the SI mass symbol. If  
542 one imagines that the "kg" were replaced by a symbol "P", then it is easier to conceptualize the  
543 multiplier "m" as creating the proper unit "mP", and not the forbidden unit "mkg".  
544 Table 12 shows all literals of UnitMultiplier.

545 **Table 12 – Literals of SteadyStateInstructionProfile::UnitMultiplier**

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

546

### 547 3.14 UnitSymbol enumeration

548 The derived units defined for usage in the CIM. In some cases, the derived unit is equal to an  
549 SI unit. Whenever possible, the standard derived symbol is used instead of the formula for the  
550 derived unit. For example, the unit symbol Farad is defined as "F" instead of "CPerV". In cases  
551 where a standard symbol does not exist for a derived unit, the formula for the unit is used as  
552 the unit symbol. For example, density does not have a standard symbol and so it is represented  
553 as "kgPerm3". With the exception of the "kg", which is an SI unit, the unit symbols do not contain  
554 multipliers and therefore represent the base derived unit to which a multiplier can be applied as  
555 a whole.

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

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

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

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

570 Table 13 shows all literals of UnitSymbol.

571 **Table 13 – Literals of SteadyStateInstructionProfile::UnitSymbol**

literal	value	description
none	0	Dimension less quantity, e.g. count, per unit, etc.
A	5	Current in amperes.
deg	9	Plane angle in degrees.

literal	value	description
V	29	Electric potential in volts (W/A).
ohm	30	Electric resistance in ohms (V/A).
W	38	Real power in watts (J/s). Electrical power may have real and reactive components. The real portion of electrical power ( $I^2R$ or $VI\cos(\phi)$ ), is expressed in Watts. See also apparent power and reactive power.
VAr	63	Reactive power in volt amperes reactive. The "reactive" or "imaginary" component of electrical power ( $VI\sin(\phi)$ ). (See also real power and apparent power).  Note: Different meter designs use different methods to arrive at their results. Some meters may compute reactive power as an arithmetic value, while others compute the value vectorially. The data consumer should determine the method in use and the suitability of the measurement for the intended purpose.
Wh	72	Real energy in watt hours.

572

573 **3.15 Seconds datatype**

574 Time, in seconds.

575 Table 14 shows all attributes of Seconds.

576

**Table 14 – Attributes of SteadyStateInstructionProfile::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)

577

578 **3.16 ActivePower datatype**579 Product of RMS value of the voltage and the RMS value of the in-phase component of the  
580 current.

581 Table 15 shows all attributes of ActivePower.

582

**Table 15 – Attributes of SteadyStateInstructionProfile::ActivePower**

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

583

584 **3.17 AngleDegrees datatype**

585 Measurement of angle in degrees.

586 Table 16 shows all attributes of AngleDegrees.

587

**Table 16 – Attributes of SteadyStateInstructionProfile::AngleDegrees**

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

name	mult	type	description
multiplier	0..1	<a href="#">UnitMultiplier</a>	(const=none)

588

589 **3.18 CurrentFlow datatype**

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

591 Table 17 shows all attributes of CurrentFlow.

592

593 **Table 17 – Attributes of SteadyStateInstructionProfile::CurrentFlow**

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

594

595 **3.19 Frequency datatype**

596 Cycles per second.

597 Table 18 shows all attributes of Frequency.

598

599 **Table 18 – Attributes of SteadyStateInstructionProfile::Frequency**

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

600

601 **3.20 Impedance datatype**

602 Ratio of voltage to current.

603 Table 19 shows all attributes of Impedance.

604

605 **Table 19 – Attributes of SteadyStateInstructionProfile::Impedance**

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

606

607 **3.21 Money datatype**

608 Amount of money.

609 Table 20 shows all attributes of Money.

610

611 **Table 20 – Attributes of SteadyStateInstructionProfile::Money**

name	mult	type	description
multiplier	0..1	<a href="#">UnitMultiplier</a>	
unit	0..1	<a href="#">Currency</a>	
value	0..1	<a href="#">Decimal</a>	

612

610 **3.22 PerCent datatype**

611 Percentage on a defined base. For example, specify as 100 to indicate at the defined base.  
612 Table 21 shows all attributes of PerCent.

613 **Table 21 – Attributes of SteadyStateInstructionProfile::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)

614

615 **3.23 ReactivePower datatype**

616 Product of RMS value of the voltage and the RMS value of the quadrature component of the  
617 current.  
618 Table 22 shows all attributes of ReactivePower.

619 **Table 22 – Attributes of SteadyStateInstructionProfile::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)

620

621 **3.24 RealEnergy datatype**

622 Real electrical energy.  
623 Table 23 shows all attributes of RealEnergy.

624 **Table 23 – Attributes of SteadyStateInstructionProfile::RealEnergy**

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

625

626 **3.25 Voltage datatype**

627 Electrical voltage, can be both AC and DC.  
628 Table 24 shows all attributes of Voltage.

629 **Table 24 – Attributes of SteadyStateInstructionProfile::Voltage**

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

630

631 **3.26 Boolean primitive**

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

633 **3.27 Decimal primitive**

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

**635 3.28 Duration primitive**

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

**641 3.29 Float primitive**

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

**643 3.30 Integer primitive**

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

**645 3.31 String primitive**

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

**648 3.32 (NC,Description) ActivePowerControlFunction root class**

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

651 Table 25 shows all attributes of ActivePowerControlFunction.

652 **Table 25 – Attributes of SteadyStateInstructionProfile::ActivePowerControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">ActivePower</a>	(NC) Target value for the active power that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

653

**654 3.33 (NC,Description) AreaDispatchableUnit root class**

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

658 Table 26 shows all attributes of AreaDispatchableUnit.

659 **Table 26 – Attributes of SteadyStateInstructionProfile::AreaDispatchableUnit**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) Identifies if the unit is enabled to accept a dispatch instruction. If true, the unit is enabled to accept a dispatch instruction. If false, the unit has the capability, but it is not enabled to receive a dispatch instruction.
p	0..1	<a href="#">ActivePower</a>	(NC) Active power injection. Load sign convention is used, i.e. positive sign means flow out from a node.

660

**661 3.34 (NC,Description) AssessedElement root class**

662 Assessed element is a network element for which the electrical state is evaluated in the regional  
663 or cross-regional process and which value is expected to fulfil regional rules function of the  
664 operational security limits.

665 The measurements and limits are as defined in the steady state hypothesis.

666 Table 27 shows all attributes of AssessedElement.

667

**Table 27 – Attributes of SteadyStateInstructionProfile::AssessedElement**

name	mult	type	description
maxFlow	0..1	<a href="#">ActivePower</a>	(NC) Maximum flow on a conducting equipment or a collection of conducting equipment forming a power transfer corridor. For assessed element that becomes critical due to contingency, this value represents the maximum flow with remedial action taken into consideration.
maxMarginAdjustment	0..1	<a href="#">PerCent</a>	(NC) Maximum adjustment, relative to maximum flow allowed for exceeding the maximum flow of this assessed element. The allowed value range is [0,100].
enabled	1..1	<a href="#">Boolean</a>	(NC) If true, the assessed element is enabled, otherwise it is disabled.
positiveVirtualMargin	0..1	<a href="#">PerCent</a>	(NC) A positive margin that defines the overload allowed in a solution for the assessed element for the current situation. The margin represents influences that can be solved by the System Operators using available remedial action which is not cross-border relevant remedial action. All relevant operational limits (e.g. PATL, TATL, etc) are modified by this margin value. The attribute represents the increase. The allowed value range is [0,100].
scannedThresholdMargin	0..1	<a href="#">PerCent</a>	(NC) Threshold percentage that a scanned element can be overloaded, on a given element, on top of any overload prior to optimisation (default= 5%). e.g. Initial loading of the element is 110%, with a 5% scanned threshold margin, the new maximum is 115% of the limit (e.g. PATL, TATL, etc). The allowed value range is [0,100].
appointedMargin	0..1	<a href="#">PerCent</a>	(NC) The percentage (appointed to a region) of the remaining margin obtained in the grid model to reach its current limit under normal operating conditions. The maximum percentage shall by default be 10% of the remaining margin. It is only used when an assessed element is considered conservative for a region. The allowed value range is [0,100].
individualValidationAdjustment	0..1	<a href="#">ActivePower</a>	(NC) Positive value calculated and provided by System Operators from their individual validation process for the reduction of Remaining Available Margin (RAM) in order to ensure grid security.
coordinatedValidationAdjustment	0..1	<a href="#">ActivePower</a>	(NC) Positive value calculated and provided by the Coordinated Capacity Calculator (CCC) for the reduction of Remaining Available Margin (RAM) in order to ensure grid security.
individualValidationAdjustmentShare	0..1	<a href="#">ActivePower</a>	(NC) Positive value expressed calculated by the Coordinated Capacity Calculator (CCC) based on the provided Individual Validation Adjustment (IVA) by System Operators in order to show the actual reduction of Remaining Available Margin (RAM). Individual Validation Adjustment Share is a positive non-zero value. It is equal or less than the Individual Validation Adjustment value.
individualValidationAdjustmentJustification	0..1	<a href="#">String</a>	(NC) Free text description provided by System Operators for justifying the reduction of Remaining Available Margin (RAM) by means of Individual Validation Adjustment (IVA). This justification is not intended for any application

name	mult	type	description
			processing purpose, it should only be used for reporting.
coordinatedValidationAdjustmentJustification	0..1	<a href="#">String</a>	(NC) Free text description provided by the coordinated capacity calculator (CCC) for justifying the reduction of Remaining Available Margin (RAM) by means of Coordinated Validation Adjustment (CVA). This justification is not intended for any application processing purpose, it should only be used for reporting.
criticalElementContingencyJustification	0..1	<a href="#">String</a>	(NC) Free text describing the justification of critical element contingency categorization (e.g. the use of the kind). This justification is not intended for any application processing purpose, it should only be used for reporting.
targetRemainingAvailableMarginJustification	0..1	<a href="#">String</a>	(NC) Free text describing the justification for the target Remaining Available Margin (RAM). This justification is not intended for any application processing purpose, it should only be used for reporting.

668

669 **3.35 (NC,Description) AssessedElementWithContingency root class**

670 Combination of an assessed element and a contingency.

671 Table 28 shows all attributes of AssessedElementWithContingency.

672

673

**Table 28 – Attributes of  
SteadyStateInstructionProfile::AssessedElementWithContingency**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) If true, the assessed element with contingency is enabled, otherwise it is disabled.

674

675 **3.36 (NC,Description) AssessedElementWithRemedialAction root class**

676 Combination of an assessed element and a remedial action

677 Table 29 shows all attributes of AssessedElementWithRemedialAction.

678

679

**Table 29 – Attributes of  
SteadyStateInstructionProfile::AssessedElementWithRemedialAction**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) If true, the assessed element with remedial action is enabled, otherwise it is disabled.

680

681 **3.37 (abstract,NC,Description) AutomationFunction root class**682 Automation function is a collection of functional block or other automation function that can be  
683 executed as a work cycle program as part of an automated system.

684 Table 30 shows all attributes of AutomationFunction.

685

**Table 30 – Attributes of SteadyStateInstructionProfile::AutomationFunction**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) True, if the automation function is enabled (active). Otherwise false.

686

687 **3.38 (NC,Description) AvailabilityRemedialAction**688 Inheritance path = [RemedialAction](#)



689 Availability remedial action is a remedial action that cancels or reschedules an availability  
690 schedule.

691 Table 31 shows all attributes of AvailabilityRemedialAction.

692 **Table 31 – Attributes of SteadyStateInstructionProfile::AvailabilityRemedialAction**

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

693

### 694 3.39 (NC,Description) BiddingZone root class

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

698 Table 32 shows all attributes of BiddingZone.

699 **Table 32 – Attributes of SteadyStateInstructionProfile::BiddingZone**

name	mult	type	description
netPosition	0..1	<a href="#">ActivePower</a>	(NC) Net position is the netted sum of electricity exports and imports for each market time unit for a bidding zone.

700

### 701 3.40 (NC,Description) BiddingZoneBorder root class

702 Defines the aggregated connection capacity between two Bidding Zones.

703 Table 33 shows all attributes of BiddingZoneBorder.

704 **Table 33 – Attributes of SteadyStateInstructionProfile::BiddingZoneBorder**

name	mult	type	description
totalTransferCapacity	0..1	<a href="#">ActivePower</a>	(NC) Total Transfer Capacity (TTC) is the maximum exchange program between two areas compatible with operational security standards applicable at each system if future network conditions, generation and load patterns were perfectly known in advance.
transmissionReliabilityMargin	0..1	<a href="#">ActivePower</a>	(NC) Transmission Reliability Margin (TRM) is the minimum reserve that system operators must have available at their connections so that they can help other countries to which their system is directly or indirectly connected, if necessary.
netTransferCapacity	0..1	<a href="#">ActivePower</a>	(NC) Net Transfer Capacity (NTC) is defined as $NTC = TTC - TRM$ and corresponds to the maximum exchange between two areas compatible with operational security limits applicable in both areas and taking into account the technical uncertainties on future network conditions.
alreadyAllocatedCapacity	0..1	<a href="#">ActivePower</a>	(NC) Already Allocated Capacity (AAC) means the total amount of allocated transmission rights i.e. transmission capacity reserved by virtue of historical long-term contracts and the previously held transmission capacity reservation auctions.
availableTransferCapacity	0..1	<a href="#">ActivePower</a>	(NC) Available Transfer Capacity (ATC) means the transmission capacity that remains available, after allocation procedure, to be used under the physical conditions of the transmission system. ATC value is defined as: $ATC = NTC - AAC$ .



name	mult	type	description
alreadyAllocatedFlow	0..1	<a href="#">ActivePower</a>	(NC) The maximum allowed flow on the collection of interconnection between two bidding zones.

705

### 706 3.41 (NC,Description) CircuitShare root class

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

708 Table 34 shows all attributes of CircuitShare.

709

**Table 34 – Attributes of SteadyStateInstructionProfile::CircuitShare**

name	mult	type	description
contributionFactor	1..1	<a href="#">PerCent</a>	(NC) Contribution factor for the circuit which is part of a power transfer corridor. The allowed value range is [0,100].

710

### 711 3.42 (NC,Description) CompensatorController root class

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

713 Table 35 shows all attributes of CompensatorController.

714

**Table 35 – Attributes of SteadyStateInstructionProfile::CompensatorController**

name	mult	type	description
mode	1..1	<a href="#">CompensatorControlModeKind</a>	(NC) Mode of the compensator controller.

715

### 716 3.43 (abstract,Description) Contingency root class

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

718 Table 36 shows all attributes of Contingency.

719

**Table 36 – Attributes of SteadyStateInstructionProfile::Contingency**

name	mult	type	description
mustStudy	1..1	<a href="#">Boolean</a>	Set true if must study this contingency.
probability	0..1	<a href="#">PerCent</a>	(NC) The forecasted probability of the occurrence of the contingency based on the given operational condition, status of the equipment and the forecasted environment condition. The allowed value range is [0,100].

720

### 721 3.44 (NC,Description) ContingencyWithRemedialAction root class

722 Combination of a contingency and a remedial action. ContingencyWithRemedialAction shall not  
723 be instantiated for preventive RemedialAction (RemedialAction.kind equals  
724 RemedialActionKind.preventive).

725 Table 37 shows all attributes of ContingencyWithRemedialAction.

726

**Table 37 – Attributes of SteadyStateInstructionProfile::ContingencyWithRemedialAction**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) If true, the contingency with remedial action is enabled, otherwise it is disabled.

727

728 **3.45 (NC,Description) CountertradeRemedialAction**729 Inheritance path = [PowerRemedialAction](#) : [RemedialAction](#)730 Countertrade is a remedial action to relieve physical congestions where the location of activated  
731 resources within the bidding zone is not known.

732 Table 38 shows all attributes of CountertradeRemedialAction.

733 **Table 38 – Attributes of SteadyStateInstructionProfile::CountertradeRemedialAction**

name	mult	type	description
maxRegulatingDown	0..1	<a href="#">ActivePower</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
maxRegulatingUp	0..1	<a href="#">ActivePower</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
available	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>

734

735 **3.46 (NC,Description) CurrentControlFunction root class**736 Current control function is a function block that calculates the operating point of the controlled  
737 equipment to achieve the target current.

738 Table 39 shows all attributes of CurrentControlFunction.

739 **Table 39 – Attributes of SteadyStateInstructionProfile::CurrentControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">CurrentFlow</a>	(NC) Target value for the current that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

740

741 **3.47 (NC,Description) CurrentDroopControlFunction root class**742 Current droop control function is a function block that calculates the operating point of the  
743 controlled equipment to achieve the target current.

744 Table 40 shows all attributes of CurrentDroopControlFunction.

745 **Table 40 – Attributes of SteadyStateInstructionProfile::CurrentDroopControlFunction**

name	mult	type	description
targetValueInductive	1..1	<a href="#">CurrentFlow</a>	(NC) Setpoint when control is active in inductive region.
targetValueCapacitive	1..1	<a href="#">CurrentFlow</a>	(NC) Setpoint when control is active in capacitive region.

746

747 **3.48 (NC,Description) CurrentDroopOverride root class**

748 Current droop override uses the following logic:

749 - When the current exceeds a threshold the device executes the following transitions: 1) When  
750 injecting an inductive voltage or in monitoring mode the device tends to inject a voltage  
751 proportional to the difference between the line current and the aforementioned threshold. 2)  
752 When injecting a capacitive voltage the device transitions to monitoring mode.753 - If the aforementioned proportional voltage is lower than the initial one, the voltage injection  
754 remains unchanged.

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

756 Table 41 shows all attributes of CurrentDroopOverride.

757 **Table 41 – Attributes of SteadyStateInstructionProfile::CurrentDropOverride**

name	mult	type	description
targetValueInductivel	1..1	<a href="#">CurrentFlow</a>	(NC) Setpoint when control is active in inductive region.
enabled	1..1	<a href="#">Boolean</a>	(NC) True, if the current droop override is enabled (active). Otherwise false.
targetValueCapacitiveI	1..1	<a href="#">CurrentFlow</a>	(NC) Setpoint when control is active in capacitive region.

758

759 **3.49 (NC,Description) DCCurrentControlFunction root class**760 DC current control function is a function block that calculates the operating point of the  
761 controlled equipment to achieve the target current.

762 Table 42 shows all attributes of DCCurrentControlFunction.

763 **Table 42 – Attributes of SteadyStateInstructionProfile::DCCurrentControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">CurrentFlow</a>	(NC) Target value for the current that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

764

765 **3.50 (NC,Description) DCPole root class**766 The direct current (DC) system pole (IEC 60633) is part of a DC system consisting of all the  
767 equipment in the DC substations and the interconnecting transmission lines, if any, which during  
768 normal operation exhibit a common direct voltage polarity with respect to earth.

769 Table 43 shows all attributes of DCPole.

770 **Table 43 – Attributes of SteadyStateInstructionProfile::DCPole**

name	mult	type	description
p	0..1	<a href="#">ActivePower</a>	(NC) Active power injection. Load sign convention is used, i.e. positive sign means flow out from a node.
participationFactor	0..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ .  In the case of priority strategy, the item with the lowest number gets allocated energy first.
maxEconomicP	0..1	<a href="#">ActivePower</a>	(NC) Maximum high economic active power limit, that should not exceed the maximum operating active power limit.
minEconomicP	0..1	<a href="#">ActivePower</a>	(NC) Low economic active power limit that shall be greater than or equal to the minimum operating active power limit.

771

772 **3.51 (NC,Description) DCSwitch root class**

773 A switch within the DC system.

774 Table 44 shows all attributes of DCSwitch.

775 **Table 44 – Attributes of SteadyStateInstructionProfile::DCSwitch**

name	mult	type	description
open	1..1	<a href="#">Boolean</a>	The attribute tells if the switch is considered open when used as input to topology processing.
locked	0..1	<a href="#">Boolean</a>	If true, the switch is locked. The resulting switch state is a combination of locked and DCSwitch.open attributes as follows: - locked=true and DCSwitch.open=true. The resulting state is open and locked; - locked=false and DCSwitch.open=true. The resulting state is open; - locked=false and DCSwitch.open=false. The resulting state is closed.

776

777 **3.52 (NC,Description) DCTieCorridor root class**

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

779 Table 45 shows all attributes of DCTieCorridor.

780 **Table 45 – Attributes of SteadyStateInstructionProfile::DCTieCorridor**

name	mult	type	description
p	1..1	<a href="#">ActivePower</a>	(NC) Active power at the point of common coupling. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for a steady state solution in the case a simplified power flow model is used.
q	0..1	<a href="#">ReactivePower</a>	(NC) Reactive power at the point of common coupling. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for a steady state solution in the case a simplified power flow model is used.

781

782 **3.53 (NC,Description) DCVoltageControlFunction root class**

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

784 Table 46 shows all attributes of DCVoltageControlFunction.

785 **Table 46 – Attributes of SteadyStateInstructionProfile::DCVoltageControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">Voltage</a>	(NC) Target value for the voltage that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

787

788 **3.54 (NC) DirectCurrentEquipmentController root class**

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

790 Table 47 shows all attributes of DirectCurrentEquipmentController.

791

792  
793**Table 47 – Attributes of  
SteadyStateInstructionProfile::DirectCurrentEquipmentController**

name	mult	type	description
mode	1..1	<a href="#">DCControlModeKind</a>	(NC) Mode of the dc controller.

794

**3.55 (NC,Description) EnergyBlockOrder root class**

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

798 Table 48 shows all attributes of EnergyBlockOrder.

799

**Table 48 – Attributes of SteadyStateInstructionProfile::EnergyBlockOrder**

name	mult	type	description
sequence	0..1	<a href="#">Integer</a>	(NC) Sequence needs to be ordered by the scheduling area. It has to be unique by the scheduling area.
p	0..1	<a href="#">ActivePower</a>	(NC) The maximum active power that can be applied as part of this block order.
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor.

800

**3.56 (Description) EnergyConsumer root class**

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

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

804 LoadResponseCharacteristic associated with EnergyConsumer or if

805 LoadResponseCharacteristic.exponentModel is set to False.

806 Table 49 shows all attributes of EnergyConsumer.

807

**Table 49 – Attributes of SteadyStateInstructionProfile::EnergyConsumer**

name	mult	type	description
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ .  In the case of priority strategy, the item with the lowest number gets allocated energy first.

808

**3.57 (NC,Description) EnergyGroup root class**

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

812 Table 50 shows all attributes of EnergyGroup.

813

**Table 50 – Attributes of SteadyStateInstructionProfile::EnergyGroup**

name	mult	type	description
p	0..1	<a href="#">ActivePower</a>	(NC) Active power for the energy group representing a particular energy type. e.g. WInd Power

name	mult	type	description
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor for the power group in relation to scheduling area. Must be a positive value.

814

815 **3.58 (abstract,Description) Equipment root class**

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

817 Table 51 shows all attributes of Equipment.

818

**Table 51 – Attributes of SteadyStateInstructionProfile::Equipment**

name	mult	type	description
inService	1..1	<a href="#">Boolean</a>	Specifies the availability of the equipment. True means the equipment is available for topology processing, which determines if the equipment is energized or not. False means that the equipment is treated by network applications as if it is not in the model.
networkAnalysisEnabled	0..1	<a href="#">Boolean</a>	The equipment is enabled to participate in network analysis. If unspecified, the value is assumed to be true.

819

820 **3.59 (abstract,NC) FACTSEquipment**821 Inheritance path = [RegulatingCondEq](#)

822 Flexible Alternating Current Transmission System regulating equipment.

823 Table 52 shows all attributes of FACTSEquipment.

824

**Table 52 – Attributes of SteadyStateInstructionProfile::FACTSEquipment**

name	mult	type	description
q	1..1	<a href="#">ReactivePower</a>	(NC) Reactive power injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for a steady state solution.
controlEnabled	1..1	<a href="#">Boolean</a>	inherited from: <a href="#">RegulatingCondEq</a>

825

826 **3.60 (NC,Description) FrequencyControlFuntion root class**

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

829 Table 53 shows all attributes of FrequencyControlFuntion.

830

**Table 53 – Attributes of SteadyStateInstructionProfile::FrequencyControlFuntion**

name	mult	type	description
frequencyBias	1..1	<a href="#">Float</a>	(NC) Target value for the active power that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.
targetValue	1..1	<a href="#">Frequency</a>	(NC) Target value for the frequency that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

831

832 **3.61 (NC,Description) FuelStorage root class**

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

834 Table 54 shows all attributes of FuelStorage.

835 **Table 54 – Attributes of SteadyStateInstructionProfile::FuelStorage**

name	mult	type	description
energyStorage	1..1	<a href="#">RealEnergy</a>	(NC) Amount of energy available in the storage.

836

### 837 3.62 (abstract,NC,Description) FunctionBlock root class

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

840 Table 55 shows all attributes of FunctionBlock.

841 **Table 55 – Attributes of SteadyStateInstructionProfile::FunctionBlock**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) True, if the function block is enabled (active). Otherwise false.

842

### 843 3.63 (Description) GeneratingUnit root class

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

849 Table 56 shows all attributes of GeneratingUnit.

850 **Table 56 – Attributes of SteadyStateInstructionProfile::GeneratingUnit**

name	mult	type	description
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ .  In the case of priority strategy, the item with the lowest number gets allocated energy first.
mustRunP	0..1	<a href="#">ActivePower</a>	(NC) Minimum active power injection that is needed to meet must-run requirement. This value can be higher or equal to minimum operational limit. Load sign convention is used, i.e. positive sign means flow out from a node.
startupCost	0..1	<a href="#">Money</a>	The initial startup cost incurred for each start of the GeneratingUnit.
warmStartupCost	0..1	<a href="#">Money</a>	(NC) The warm startup cost incurred for each start of the GeneratingUnit.
mustRunQ	0..1	<a href="#">ReactivePower</a>	(NC) Minimum reactive power injection that is needed to meet must-run requirement. This value can be higher or equal to minimum operational limit. Load sign convention is used, i.e. positive sign means flow out from a node.
mustRun	0..1	<a href="#">Boolean</a>	(NC) Identifies if the generating unit is a must-run unit. This means that it cannot be instructed to shutdown due to other obligation. e.g.



name	mult	type	description
			Providing heat. If true, the generating unit is must-run. If false, it is not.

851

852 **3.64 (abstract,NC,Description) GridStateAlteration root class**853 Grid state alteration is a change of values describing state (operating point) of one element in  
854 the grid model compared to the base case.

855 Table 57 shows all attributes of GridStateAlteration.

856 **Table 57 – Attributes of SteadyStateInstructionProfile::GridStateAlteration**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) The status of the GridStateAlteration set by an operation or by a signal resulting from a control action.
participationFactor	0..1	<a href="#">PerCent</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ .  In the case of priority strategy, the item with the lowest number gets allocated energy first.  e.g. If 0 this grid alteration does not participate. The sum of all participation factors for all grid state alterations associated with same remedial action shall be equal to 100%.

857

858 **3.65 (NC,Description) GridStateAlterationRemedialAction**859 Inheritance path = [RemedialAction](#)860 Grid state alteration remedial action describes one or many grid state alterations applied to a  
861 grid model state or a particular scenario in order to resolve one or more identified constraints.

862 Table 58 shows all attributes of GridStateAlterationRemedialAction.

863

864 **Table 58 – Attributes of SteadyStateInstructionProfile::GridStateAlterationRemedialAction**

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

865

866 **3.66 (Description) HydroPump root class**

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

868 Table 59 shows all attributes of HydroPump.

869

**Table 59 – Attributes of SteadyStateInstructionProfile::HydroPump**

name	mult	type	description
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.



name	mult	type	description
			In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ . In the case of priority strategy, the item with the lowest number gets allocated energy first.

870

871 **3.67 (NC,Description) ImpedanceControlFunction root class**872 Impedance control function is a function block that calculates the operating point of the  
873 controlled equipment to achieve the target impedance.

874 Table 60 shows all attributes of ImpedanceControlFunction.

875 **Table 60 – Attributes of SteadyStateInstructionProfile::ImpedanceControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">Impedance</a>	(NC) Target value for the impedance that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

876

877 **3.68 (NC,Description) InfeedLimit root class**

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

879 Table 61 shows all attributes of InfeedLimit.

880

**Table 61 – Attributes of SteadyStateInstructionProfile::InfeedLimit**

name	mult	type	description
valueW	0..1	<a href="#">ActivePower</a>	(NC) Value of active power limit. The attribute shall be a positive value or zero.
valueA	0..1	<a href="#">CurrentFlow</a>	(NC) Value of current limit. The attribute shall be a positive value or zero.

881

882 **3.69 (NC,Description) InjectionController root class**883 Injection controller is controlling the equipment which represents an injection or an external  
884 network.

885 Table 62 shows all attributes of InjectionController.

886 **Table 62 – Attributes of SteadyStateInstructionProfile::InjectionController**

name	mult	type	description
mode	1..1	<a href="#">InjectionControlModeKin</a> <a href="#">d</a>	(NC) Mode of the injection controller.

887

888 **3.70 (NC,Description) ModularStaticSynchronousSeriesCompensator**889 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#)890 Modular static synchronous series compensator (MSSSC) is a type of flexible AC transmission  
891 system regulating equipment which consists of solid-state voltage source inverter connected in  
892 series with a transmission line. This is similar to static synchronous series compensator  
893 (SSSC), but without injection transformer. This enables the MSSSC to be truly modular with the  
894 ability to simply install a number of equipment in series to provide a desired maximum level of  
895 impedance. MSSSC can be dispersed into multiple location in a circuit working collectively  
896 under the same controller scheme.

897 Table 63 shows all attributes of ModularStaticSynchronousSeriesCompensator.

898  
899**Table 63 – Attributes of SteadyStateInstructionProfile::ModularStaticSynchronousSeriesCompensator**

name	mult	type	description
q	1..1	<a href="#">ReactivePower</a>	(NC) inherited from: <a href="#">FACTSEquipment</a>
controlEnabled	1..1	<a href="#">Boolean</a>	inherited from: <a href="#">RegulatingCondEq</a>

900

**3.71 (NC,Description) PhaseControlFunction root class**

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

904 Table 64 shows all attributes of PhaseControlFunction.

905

**Table 64 – Attributes of SteadyStateInstructionProfile::PhaseControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">AngleDegrees</a>	(NC) Target value for the phase that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

906

**3.72 (NC,Description) PowerCapacity root class**

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

911 Table 65 shows all attributes of PowerCapacity.

912

**Table 65 – Attributes of SteadyStateInstructionProfile::PowerCapacity**

name	mult	type	description
netACInterchange	0..1	<a href="#">ActivePower</a>	(NC) The netted aggregation of all AC external schedules of an area. Positive sign means flow into the area (Import).
netACInterchangeTolerance	0..1	<a href="#">Float</a>	(NC) The area AC Net Position tolerance.
netDCInterchange	0..1	<a href="#">ActivePower</a>	(NC) The netted aggregation of all DC external schedules of an area. Positive sign means flow into the area.
regulatingUpAllocation	0..1	<a href="#">ActivePower</a>	(NC) The balancing capacity allocated for regulating up, by increasing the production, decreasing the direct current export, increasing direct current import or reducing the consumption of energy in the bidding zone. This must be a positive number.
maxInterchange	0..1	<a href="#">ActivePower</a>	(NC) Maximum total active power (AC and DC) that the net position for the bidding zone can have to maintain operational security. Positive sign means flow into the bidding zone.
minImportP	0..1	<a href="#">ActivePower</a>	(NC) Minimum imported active power requirement.
minInterchange	0..1	<a href="#">ActivePower</a>	(NC) Minimum total active power (AC and DC) that the net position for the bidding zone can have to maintain operational security. Negative sign means flow out of the bidding zone.
regulatingDownAllocation	0..1	<a href="#">ActivePower</a>	(NC) The balancing capacity allocated for regulating down, by decreasing the production, increasing the direct current export, decreasing direct current import or increasing the

name	mult	type	description
			consumption of energy in the bidding zone. This must be a positive number.

913

914 **3.73 (Description) PowerElectronicsUnit root class**915 A generating unit or battery or aggregation that connects to the AC network using power  
916 electronics rather than rotating machines.

917 Table 66 shows all attributes of PowerElectronicsUnit.

918 **Table 66 – Attributes of SteadyStateInstructionProfile::PowerElectronicsUnit**

name	mult	type	description
p	0..1	<a href="#">ActivePower</a>	(NC) Active power injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for a steady state solution.
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ .  In the case of priority strategy, the item with the lowest number gets allocated energy first.

919

920 **3.74 (NC,Description) PowerFactorControlFunction root class**921 Power factor control function is a function block that calculates the operating point of the  
922 controlled equipment to achieve the target power factor.

923 Table 67 shows all attributes of PowerFactorControlFunction.

924 **Table 67 – Attributes of SteadyStateInstructionProfile::PowerFactorControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">Float</a>	(NC) Target value for the power factor that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

925

926 **3.75 (abstract,NC) PowerRemedialAction**927 Inheritance path = [RemedialAction](#)

928 Energy remedial action describes actions to rearrange power schedules.

929 Table 68 shows all attributes of PowerRemedialAction.

930 **Table 68 – Attributes of SteadyStateInstructionProfile::PowerRemedialAction**

name	mult	type	description
maxRegulatingDown	0..1	<a href="#">ActivePower</a>	(NC) Maximum net amount of active power that the remedial action can regulate down.
maxRegulatingUp	0..1	<a href="#">ActivePower</a>	(NC) Maximum net amount of active power that the remedial action can regulate up.
available	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>

931

932 **3.76 (NC,Description) PowerShiftKeyStrategy root class**

933 Strategy of the power shift key.

934 Table 69 shows all attributes of PowerShiftKeyStrategy.

935 **Table 69 – Attributes of SteadyStateInstructionProfile::PowerShiftKeyStrategy**

name	mult	type	description
participationFactor	0..1	<a href="#">Float</a>	(NC) Participation factor describing the entities part of the power shift strategy. Must be a positive value.
enabled	1..1	<a href="#">Boolean</a>	(NC) If true, the assessed element is enabled, otherwise it is disabled.

936

937 **3.77 (NC,Description) PowerTransferCorridor root class**

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

941 Table 70 shows all attributes of PowerTransferCorridor.

942 **Table 70 – Attributes of SteadyStateInstructionProfile::PowerTransferCorridor**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) It enables/disables the monitoring/assessment of a power transfer corridor. True means that the monitoring of the power transfer corridor is assessed. False means the power transfer corridor is not assessed.

943

944 **3.78 (NC,Description) PTCActivePowerSupport root class**

945 Defines the active power capability (support) of the scheme in relation to a  
946 PowerTransferCorridor.

947 Table 71 shows all attributes of PTCActivePowerSupport.

948 **Table 71 – Attributes of SteadyStateInstructionProfile::PTCActivePowerSupport**

name	mult	type	description
value	1..1	<a href="#">ActivePower</a>	(NC) The support that a System Integrity Protection Scheme (SIPS) gives to a Power Transfer Corridor (PTC).

949

950 **3.79 (abstract,NC,Description) RangeConstraint root class**

951 Defines the range constraint.

952 Table 72 shows all attributes of RangeConstraint.

953 **Table 72 – Attributes of SteadyStateInstructionProfile::RangeConstraint**

name	mult	type	description
value	1..1	<a href="#">Float</a>	(NC) The value at the time. 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).

name	mult	type	description
			If the valueKind is incrementalPercentage, then the value shall be in the range [0, 100].

954

### 955 3.80 (NC,Description) ReactivePowerControlFunction root class

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

958 Table 73 shows all attributes of ReactivePowerControlFunction.

#### 959 Table 73 – Attributes of SteadyStateInstructionProfile::ReactivePowerControlFunction

name	mult	type	description
targetValue	1..1	<a href="#">ReactivePower</a>	(NC) Target value for the reactive power that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

960

### 961 3.81 (NC,Description) RedispatchRemedialAction

962 Inheritance path = [PowerRemedialAction](#) : [RemedialAction](#)

963 Redispatch remedial action is a remedial action that through rearranging power schedules is  
964 eliminating breaches of constraints.

965 Table 74 shows all attributes of RedispatchRemedialAction.

#### 966 Table 74 – Attributes of SteadyStateInstructionProfile::RedispatchRemedialAction

name	mult	type	description
maxRegulatingDown	0..1	<a href="#">ActivePower</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
maxRegulatingUp	0..1	<a href="#">ActivePower</a>	(NC) inherited from: <a href="#">PowerRemedialAction</a>
available	1..1	<a href="#">Boolean</a>	(NC) inherited from: <a href="#">RemedialAction</a>

967

### 968 3.82 (abstract,NC) RemedialAction root class

969 Remedial action describes one or more actions that can be performed on a given power system  
970 model situation to eliminate one or more identified breaches of constraints. The remedial action  
971 can be costly, and have a cost characteristic, or non costly.

972 Table 75 shows all attributes of RemedialAction.

#### 973 Table 75 – Attributes of SteadyStateInstructionProfile::RemedialAction

name	mult	type	description
available	1..1	<a href="#">Boolean</a>	(NC) Identifies if the remedial action is available to be proposed. True means available, False means unavailable.

974

### 975 3.83 (NC,Description) RemedialActionDependency root class

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

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

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

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

986 Table 76 shows all attributes of RemedialActionDependency.

987 **Table 76 – Attributes of SteadyStateInstructionProfile::RemedialActionDependency**

name	mult	type	description
enabled	1..1	<a href="#">Boolean</a>	(NC) If true, the remedial action dependency is enabled, otherwise it is disabled.

988

### 989 **3.84 (NC,Description) RemedialActionGroup root class**

990 Grouping of remedial actions that can be operated together.

991 Table 77 shows all attributes of RemedialActionGroup.

992 **Table 77 – Attributes of SteadyStateInstructionProfile::RemedialActionGroup**

name	mult	type	description
maxRegulatingDown	0..1	<a href="#">ActivePower</a>	(NC) Maximum net amount of active power that the group of remedial actions can regulate down.
maxRegulatingUp	0..1	<a href="#">ActivePower</a>	(NC) Maximum net amount of active power that the group of remedial actions can regulate up.

993

### 994 **3.85 (NC,Description) RemedialActionScheme root class**

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

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

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

998 protection action.

999 Table 78 shows all attributes of RemedialActionScheme.

1000 **Table 78 – Attributes of SteadyStateInstructionProfile::RemedialActionScheme**

name	mult	type	description
armed	1..1	<a href="#">Boolean</a>	(NC) Defines the arming status of the remedial action scheme. It is set by operation or by signal.
inService	1..1	<a href="#">Boolean</a>	(NC) Specifies the availability of the Remedial Action Scheme (RAS). If true, the RAS is available for contingency processing. If false, the RAS is treated by contingency processing as if it is not in the model.

1001

### 1002 **3.86 (Description) Reservoir root class**

1003 A water storage facility within a hydro system, including: ponds, lakes, lagoons, and rivers. The

1004 storage is usually behind some type of dam.

1005 Table 79 shows all attributes of Reservoir.

1006 **Table 79 – Attributes of SteadyStateInstructionProfile::Reservoir**

name	mult	type	description
energyStorage	1..1	<a href="#">RealEnergy</a>	(NC) Amount of energy available in the storage.

1007

### 1008 **3.87 (NC,Description) RotatingMachineController root class**

1009 Rotating machine controller is controlling the equipment which may be used as a generator or

1010 motor.

1011 Table 80 shows all attributes of RotatingMachineController.

1012 **Table 80 – Attributes of SteadyStateInstructionProfile::RotatingMachineController**

name	mult	type	description
mode	1..1	<a href="#">RotatingMachineControlModeKind</a>	(NC) Mode of the rotating machine controller.

1013

1014 **3.88 (NC,Description) ScheduleResource root class**

1015 A schedule resource is a market-based method for handling participation of small units,  
1016 particularly located on the lower voltage level that is controlled by a Distributed System  
1017 Operator (DSO). It is a collection of units that can operate in the market by providing bids, offers  
1018 and a resulting committed operational schedule for the collection.

1019 Table 81 shows all attributes of ScheduleResource.

1020 **Table 81 – Attributes of SteadyStateInstructionProfile::ScheduleResource**

name	mult	type	description
participationFactor	1..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ .  In the case of priority strategy, the item with the lowest number gets allocated energy first.
p	0..1	<a href="#">ActivePower</a>	(NC) Active power injection. Load sign convention is used, i.e. positive sign means flow out from a node.

1021

1022 **3.89 (NC,Description) SchedulingArea root class**

1023 An area where production and/or consumption of energy can be forecasted, scheduled and  
1024 measured. The area is operated by only one system operator, typically a Transmission System  
1025 Operator (TSO). The area can consist of a sub area, which has the same definition as the main  
1026 area, but it can be operated by another system operator (typically Distributed System Operator  
1027 (DSO) or a Closed Distributed System Operator (CDSO)). This includes microgrid concept. A  
1028 substation is the smallest grouping that can be included in the area. The area size should be  
1029 considered in terms of the possibility of accumulated reading (settlement metering) and the  
1030 capability of operating as an island.

1031 Table 82 shows all attributes of SchedulingArea.

1032 **Table 82 – Attributes of SteadyStateInstructionProfile::SchedulingArea**

name	mult	type	description
p	0..1	<a href="#">ActivePower</a>	(NC) Netted active power representing production, consumption and import/export for the scheduling area.
participationFactor	0..1	<a href="#">Float</a>	(NC) Participation factor describing the entity part of the active power provided by a collection of entities (e.g. an active power forecast to a collection of entities is divided to each of the member entity according to the participation factor). Must be a positive value.  In the case of a sharing strategy, the distribution is following entities value (V) equals aggregated



name	mult	type	description
			value (T) divided by sum of participation factors (PF), i.e. $V=T/\text{sum}(PF)$ . In the case of priority strategy, the item with the lowest number gets allocated energy first.

1033

1034 **3.90 (NC,Description) SchemeRemedialAction**1035 Inheritance path = [RemedialAction](#)

1036 Scheme remedial action is remedial action that involves a scheme that can include conditional  
1037 logic and stages of grid alteration. The primary remedial action is the arming of these schemes,  
1038 that will then perform curative remedial action when the condition is met. System Integrity  
1039 Protection Scheme (SIPS) and Special Protection Scheme (SPS) are example of this.

1040 Table 83 shows all attributes of SchemeRemedialAction.

1041 **Table 83 – Attributes of SteadyStateInstructionProfile::SchemeRemedialAction**

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

1042

1043 **3.91 (NC,Description) SSSCController root class**

1044 The controller of a Static synchronous series compensator (SSSC).

1045 Table 84 shows all attributes of SSSCController.

1046 **Table 84 – Attributes of SteadyStateInstructionProfile::SSSCController**

name	mult	type	description
mode	1..1	<a href="#">SSSCControlModeKind</a>	(NC) Mode of the Static Synchronous Series compensator controller.

1047

1048 **3.92 (NC,Description) StageTrigger root class**

1049 Stage that is triggered either by TriggerCondition or by gate condition within a stage.

1050 Table 85 shows all attributes of StageTrigger.

1051 **Table 85 – Attributes of SteadyStateInstructionProfile::StageTrigger**

name	mult	type	description
armed	1..1	<a href="#">Boolean</a>	(NC) The status of the class set by operation or by signal. Optional field that will override other status fields.
inService	1..1	<a href="#">Boolean</a>	(NC) Indicates if the stage trigger is in service.

1052

1053 **3.93 (NC,Description) StaticSynchronousCompensator**1054 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#)

1055 Static synchronous compensator (STATCOM), also known as a static synchronous condenser  
1056 (STATCON), is a type of flexible AC transmission system regulating equipment used on  
1057 alternating current electricity transmission networks. It is based on a power electronics voltage-  
1058 source converter and can act as either a source or sink of reactive AC power to an electricity  
1059 network. If connected to a source of power it can also provide active AC power.

1060 Table 86 shows all attributes of StaticSynchronousCompensator.

1061 **Table 86 – Attributes of SteadyStateInstructionProfile::StaticSynchronousCompensator**

name	mult	type	description
q	1..1	<a href="#">ReactivePower</a>	(NC) inherited from: <a href="#">FACTSEquipment</a>



name	mult	type	description
controlEnabled	1..1	<a href="#">Boolean</a>	inherited from: <a href="#">RegulatingCondEq</a>

1062

### 1063 3.94 (NC,Description) StaticSynchronousSeriesCompensator

1064 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#)

1065 Static synchronous series compensator (SSSC) is a type of flexible AC transmission system  
1066 which consists of a solid-state voltage source inverter coupled with a transformer that is  
1067 connected in series with a transmission line. This device can inject an almost sinusoidal voltage  
1068 in series with the line. This injected voltage could be considered as an inductive or capacitive  
1069 reactance, which is connected in series with the transmission line. This feature can provide  
1070 controllable voltage compensation. In addition, SSSC is able to reverse the power flow by  
1071 injecting a sufficiently large series reactive compensating voltage. Moreover it can inject a  
1072 voltage proportional to the difference between the line current and the pre-configured current  
1073 threshold. It shall have two Terminal-s associated with it.

1074 Table 87 shows all attributes of StaticSynchronousSeriesCompensator.

1075

1076 **Table 87 – Attributes of  
SteadyStateInstructionProfile::StaticSynchronousSeriesCompensator**

name	mult	type	description
q	1..1	<a href="#">ReactivePower</a>	(NC) inherited from: <a href="#">FACTSEquipment</a>
controlEnabled	1..1	<a href="#">Boolean</a>	inherited from: <a href="#">RegulatingCondEq</a>

1077

### 1078 3.95 (NC,Description) StaticVarCompensator

1079 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#)

1080 A facility for providing variable and controllable shunt reactive power. The SVC typically  
1081 consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched  
1082 capacitor arms.

1083 The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage  
1084 control mode, the output of the SVC will be proportional to the deviation of voltage at the  
1085 controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion.  
1086 If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.  
1087 Table 88 shows all attributes of StaticVarCompensator.

1088

**Table 88 – Attributes of SteadyStateInstructionProfile::StaticVarCompensator**

name	mult	type	description
q	1..1	<a href="#">ReactivePower</a>	(NC) inherited from: <a href="#">FACTSEquipment</a>
controlEnabled	1..1	<a href="#">Boolean</a>	inherited from: <a href="#">RegulatingCondEq</a>

1089

### 1090 3.96 (NC,Description) SubstationController root class

1091 Substation controller is controlling the equipment to optimize the use of the controlling  
1092 equipment within a substation.

1093 Table 89 shows all attributes of SubstationController.

1094

**Table 89 – Attributes of SteadyStateInstructionProfile::SubstationController**

name	mult	type	description
mode	1..1	<a href="#">SubstationControllerModeKind</a>	(NC) Mode of the substation controller.

1095

1096 **3.97 (NC,Description) TCSCController root class**

1097 TCSC controller is controlling the equipment to optimize the performance of the TCSC.  
1098 Table 90 shows all attributes of TCSCController.

1099 **Table 90 – Attributes of SteadyStateInstructionProfile::TCSCController**

name	mult	type	description
mode	1..1	<a href="#">TCSCControlModeKind</a>	(NC) Mode of the TCSC controller.

1100

1101 **3.98 (NC,Description) ThyristorControlledSeriesCompensator**

1102 Inheritance path = [FACTSEquipment](#) : [RegulatingCondEq](#)

1103 Thyristor-controlled series capacitors (TCSC) is a type of flexible AC transmission system  
1104 regulating equipment that is configured with controlled reactors in parallel with sections of a  
1105 capacitor bank. This combination allows smooth control of the fundamental frequency  
1106 capacitive reactance over a wide range. The thyristor valve contains a string of series connected  
1107 high power thyristors. TCSC can control power flows in order to achieve eliminating of line  
1108 overloads, reducing loop flows and minimising system losses.

1109 Table 91 shows all attributes of ThyristorControlledSeriesCompensator.

1110

1110 **Table 91 – Attributes of**1111 **SteadyStateInstructionProfile::ThyristorControlledSeriesCompensator**

name	mult	type	description
compensationZ	1..1	<a href="#">Impedance</a>	(NC) The actual compensation impedance provided by the compensator. The attribute value shall be positive if compensation is in the capacitive range. The attribute value shall be negative if compensation is in the inductive rating.
currentSection	1..1	<a href="#">Integer</a>	(NC) The current section on which the TCSC is operating.
q	1..1	<a href="#">ReactivePower</a>	(NC) inherited from: <a href="#">FACTSEquipment</a>
controlEnabled	1..1	<a href="#">Boolean</a>	inherited from: <a href="#">RegulatingCondEq</a>

1112

1113 **3.99 (NC,Description) VoltageAngleLimit root class**

1114 Voltage angle limit between two terminals. The association end OperationalLimitSet.Terminal  
1115 defines one end and the host of the limit. The association end  
1116 VoltageAngleLimit.AngleReferenceTerminal defines the reference terminal.

1117 Table 92 shows all attributes of VoltageAngleLimit.

1118 **Table 92 – Attributes of SteadyStateInstructionProfile::VoltageAngleLimit**

name	mult	type	description
value	1..1	<a href="#">AngleDegrees</a>	(NC) The difference in angle degrees between referenced by the association end OperationalLimitSet.Terminal and the Terminal referenced by the association end VoltageAngleLimit.AngleReferenceTerminal. The value shall be positive (greater than zero).

1119

1120 **3.100 (NC,Description) VoltageControlFunction root class**

1121 Voltage control function is a function block that calculate the operating point of the controlled  
1122 equipment to achieve the target voltage.

1123 Table 93 shows all attributes of VoltageControlFunction.

1124 **Table 93 – Attributes of SteadyStateInstructionProfile::VoltageControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">Voltage</a>	(NC) Target value for the voltage that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

1125

1126 **3.101 (NC,Description) VoltageInjectionControlFunction root class**

1127 Voltage injection control function is a function block that calculates the operating point of the  
 1128 controlled equipment to achieve the target voltage injection. The controlled point is the Terminal  
 1129 with sequenceNumber =1.

1130 Table 94 shows all attributes of VoltageInjectionControlFunction.

1131 **Table 94 – Attributes of SteadyStateInstructionProfile::VoltageInjectionControlFunction**

name	mult	type	description
targetValue	1..1	<a href="#">Voltage</a>	(NC) Target value for the voltage that the control function is calculating to achieve by adjusting the operational setting to the controlled equipment.

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

### **A.1 General**

1137 This Annex is designed to illustrate the profile by using fragments of sample data. It is not meant  
1138 to be a complete set of examples covering all possibilities of using the profile. Defining a  
1139 complete set of test data is considered a separate activity to be performed for the purpose of  
1140 setting up interoperability testing and conformity related to this profile.

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

1142 Test data files are available in the CIM EG SharePoint.

1143

1144