



European Network of  
Transmission System Operators  
for Electricity

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# ASSESSED ELEMENT PROFILE SPECIFICATION

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2025-09-11

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ICTC APPROVED  
VERSION 2.4.0

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## Revision History

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## 113 1 Introduction

114 The assessed element profile is a profile to exchange a list of assessed elements.

115 An assessed element is a network element for which the electrical state is evaluated in a  
116 regional or cross-regional process and which value is expected to fulfil regional rules function  
117 of the operational security limits.<sup>1</sup>

118 The assessed elements are input data describing the elements that shall be assessed during  
119 the security analysis.

120 These are the elements on which limit violations are potentially detected (scanned assessed  
121 elements) and resolved (secured assessed elements) by applying defined and agreed remedial  
122 actions. Assessed elements can be a conducting equipment e.g. a line, transformer, breaker,  
123 etc or just a terminal i.e. the end of the equipment. In cases where an assessed element is  
124 associated with a conducting equipment the whole equipment is scanned meaning limits defined  
125 at all sides of the equipment are scanned. In cases where an assessed element is associated  
126 with a terminal only the limits defined for this terminal are scanned. In addition, it shall be noted  
127 that only elements from an IGM that are designated as assessed elements are scanned. This  
128 means that the party performing the analysis will normally not report, optimise or resolve any  
129 limit violations for elements that are not designated as assessed elements. This is designed in  
130 this way in order to provide more flexibility to the remedial action optimisation engines  
131 eventually helping to minimise computational effort and increase performance.

## 132 2 Application profile specification

### 133 2.1 Version information

134 The content is generated from UML model file CIM17-2\_CGMES31v01\_PROF-  
135 20v02\_NC24v18\_MS10v03\_DES10v01.eap.

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

- 137 - Title: Assessed Element Vocabulary
- 138 - Keyword: AE
- 139 - Description: This vocabulary is describing the assessed element profile.
- 140 - Version IRI: <https://ap-voc.cim4.eu/AssessedElement/2.4>
- 141 - Version info: 2.4.0
- 142 - Prior version: <https://ap-voc.cim4.eu/AssessedElement/2.3>
- 143 - Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-  
144 7:amd1|file:///iec61970cim17v40\_iec61968cim13v13a\_iec62325cim03v17a.eap|urn:iso:  
145 std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-2|file:///CIM17-  
146 2\_CGMES31v01\_PROF-20v02\_NC24v18\_MS10v03\_DES10v01.eap
- 147 - Identifier: urn:uuid:a2de1738-214d-4552-b894-5b33cbc34218

148

### 149 2.2 Constraints naming convention

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

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

<sup>1</sup> [SOURCE: 2019 Inter-RSC report, BRS CAS consistency function, 4.1]

153 where

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

155 rule.Standard: the number of the standard e.g. 301 for 61970-301, 456 for 61970-456, 13 for  
156 61968-13. 61970-600 specific constraints refer to 600 although they are related to one or  
157 combination of the 61970-450 series profiles. For NC profiles, NC is used.

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

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

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

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

### 165 **2.3 Profile constraints**

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

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

#### 171 • C:452:ALL:NA:datatypes

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

#### 174 • R:452:ALL:NA:exchange

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

#### 177 • R:452:ALL:NA:exchange1

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

#### 183 • R:452:ALL:NA:exchange2

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

#### 192 • R:452:ALL:NA:exchange3

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

196 • R:452:ALL:NA:exchange4

197 From the standpoint of the model import used by a data recipient, the document  
198 describes a subset of the CIM that importing software shall be able to interpret in order  
199 to import exported models. Data providers are free to exceed the minimum requirements  
200 described herein as long as their resulting data files are compliant with the CIM Schema  
201 and the conventions established in Clause 5. The document, therefore, describes  
202 additional classes and class data that, although not required, exporters will, in all  
203 likelihood, choose to include in their data files. The additional classes and data are  
204 labelled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them  
205 from their required counterparts. Please note, however, that data importers could  
206 potentially receive data containing instances of any and all classes described by the  
207 CIM Schema.

208 • R:452:ALL:NA:cardinality

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

214 • R:452:ALL:NA:associations

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

217 • R:452:ALL:IdentifiedObject.name:rule

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

225 • R:452:ALL:IdentifiedObject.description:rule

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

229 • R:452:ALL:NA:uniqueIdentifier

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

232 • R:452:ALL:NA:unitMultiplier

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

235 • C:452:ALL:IdentifiedObject.name:stringLength



- 236 The string IdentifiedObject.name has a maximum of 128 characters.
- 237 • C:452:ALL:IdentifiedObject.description:stringLength
- 238 The string IdentifiedObject.description is maximum 256 characters.
- 239 • C:452:ALL:NA:float
- 240 An attribute that is defined as float (e.g. has a type Float or a type which is a Datatype  
241 with .value attribute of type Float) shall support ISO/IEC 60559:2020 for floating-point  
242 arithmetic using single precision floating point. A single precision float supports 7  
243 significant digits where the significant digits are described as an integer, or a decimal  
244 number with 6 decimal digits. Two float values are equal when the significant with 7  
245 digits are identical, e.g. 1234567 is equal 1.234567E6 and so are 1.2345678 and  
246 1.234567E0.
- 247 • R:NC:ALL:Region:reference
- 248 The reference to the Region is normally a reference to the capacity calculation region,  
249 which is identified by “Y” EIC code of the capacity calculation region.
- 250 • R:NC:ALL:SystemOperator:reference
- 251 The reference to the System Operator is normally identified by “X” EIC code of TSO.
- 252 • R:NC:AE:AssessedElement:usage
- 253 All elements that need to be scanned for a base case or contingencies shall be explicitly  
254 defined. If not specified otherwise in another document, an application that performs  
255 contingency analysis will only report violations that occur on an assessed element and  
256 will not report any other violations on elements that have operational limits defined, but  
257 the object in the equipment is not designated as an AssessedElement. Therefore, the  
258 choice which equipment is scanned shall be made considering multiple factors among  
259 which the probability of missing potential violations and the performance of the  
260 contingency analysis.
- 261 • C:NC:AE:AssessedElement:associations
- 262 An AssessedElement shall have at least one of the following association ends  
263 instantiated: AssessedElement.ConductingEquipment,  
264 AssessedElement.OperationalLimit, AssessedElement.DCTieCorridor,  
265 AssessedElement.AssessedPowerTransferCorridor, AssessedElement.Line.
- 266 • R:NC:AE: AssessedElement:danglingAssociations
- 267 Due to the nature of the exchange and requirements it is allowed that the associations  
268 AssessedElement.ConductingEquipment, AssessedElement.OperationalLimit,  
269 AssessedElement.DCTieCorridor, AssessedElement.AssessedPowerTransferCorridor,  
270 AssessedElement.Line provide a dangling reference. This occurs when the referenced  
271 element is in another MAS. Validation of these associations is only performed when all  
272 dangling references are completed.
- 273 • R:NC:ALL:NA:serialization
- 274 The profiles are defined in the EnterpriseArchitect application and have multiple artifacts  
275 that describe them. The main artifacts are:
- 276 1) the EAP file (EnterpriseArchitect project file),  
277 2) the profiles' specification document and

### 3) the application profiles (RDFS and SHACL).

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

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

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

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

- for association

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

- for attribute

```
<cim:ACLineSegment rdf:about="_04f681aa-6999-4fb3-9775-acaa5eb7ceff">
  <cim:Equipment.inService>true</cim:Equipment.inService>
</cim:ACLineSegment>
```

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

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

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

- C:NC:AE:AssessedElementWithContingency.combinationConstraintKind:allowedValues

ElementCombinationConstraintKind.considered is not allowed value for the attribute AssessedElementWithContingency.combinationConstraintKind.

- C:NC:AE:OperationalLimit.AssessedElement:required

A BaseCaseCurrentLimit shall be associated with an AssessedElement via the association end OperationalLimit.AssessedElement. The AssessedElement.inBaseCase shall be set to true.

324

## 325 2.4 Metadata

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

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

### 336 2.4.1 Constraints

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

- R:NC:ALL:wasAttributedTo:usage

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

342

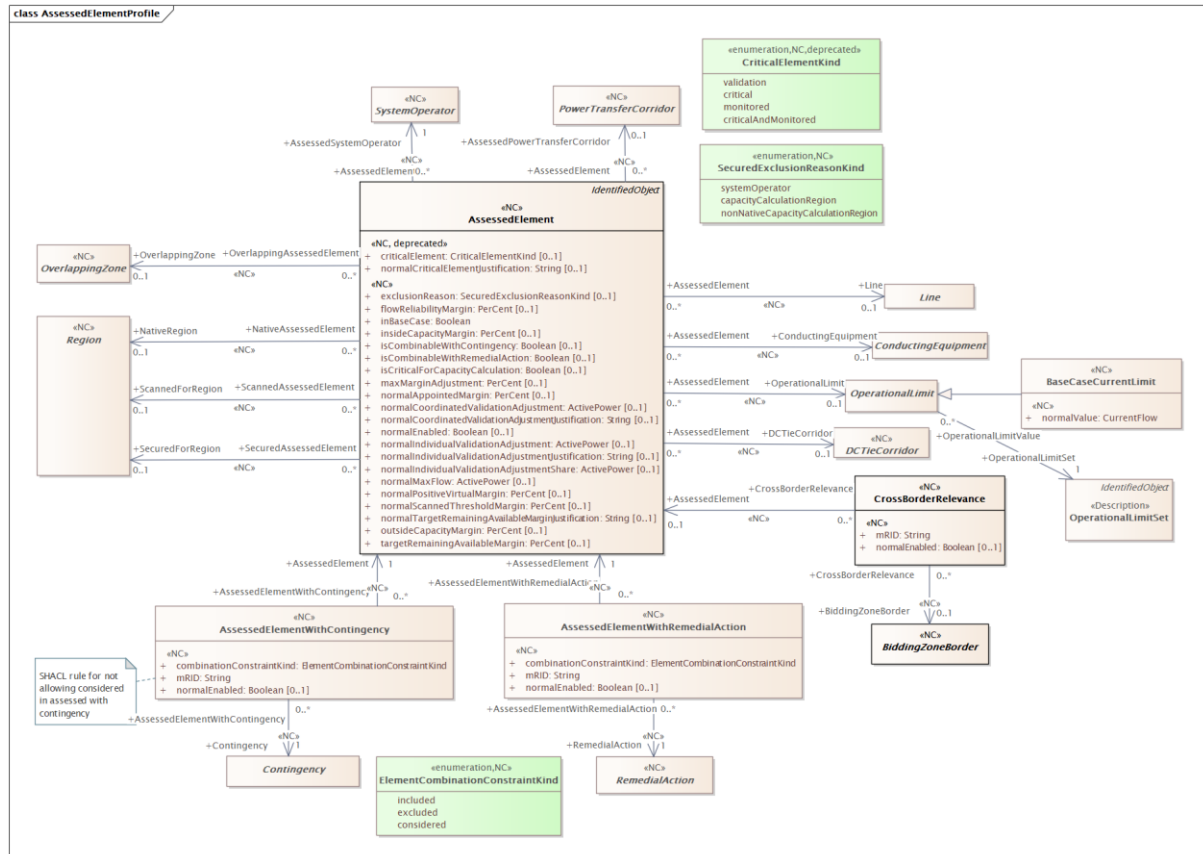
### 343 2.4.2 Reference metadata

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

## 352 3 Detailed Profile Specification

### 353 3.1 General

This package contains assessed element profile.



**Figure 1 – Class diagram AssessedElementProfile::AssessedElementProfile**

Figure 1: The diagram contains the main classes used in the profile.

### 3.2 (NC) AssessedElement

Inheritance path = [IdentifiedObject](#)

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

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

Table 1 shows all attributes of AssessedElement.

**Table 1 – Attributes of AssessedElementProfile::AssessedElement**

| name                  | mult | type                    | description                                                                                                                                                                                                                                                                                                          |
|-----------------------|------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| inBaseCase            | 1..1 | <a href="#">Boolean</a> | (NC) Indicates if the assessed element is scanned in the base case. In case of a base case overload, the assessed element is considered as a limiting element for the optimization process.<br><br>True means that the assessed element is scanned in the base case. False means it is not scanned in the base case. |
| maxMarginAdjustment   | 0..1 | <a href="#">PerCent</a> | (NC) Maximum adjustment, relative to maximum flow allowed for exceeding the maximum flow of this assessed element.<br><br>The allowed value range is [0,100].                                                                                                                                                        |
| flowReliabilityMargin | 0..1 | <a href="#">PerCent</a> | (NC) Percentage of the maximum flow (margin) reserved to anticipate forecasting errors.                                                                                                                                                                                                                              |

| name                           | mult | type                                       | description                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------|------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                |      |                                            | The allowed value range is [0,100].                                                                                                                                                                                                                                                                                                                                                                                                                             |
| targetRemainingAvailableMargin | 0..1 | <a href="#">PerCent</a>                    | (NC) Target for the remaining available margin as a percentage of maximum flow.<br>The allowed value range is [0,100].                                                                                                                                                                                                                                                                                                                                          |
| normalEnabled                  | 0..1 | <a href="#">Boolean</a>                    | (NC) If true, the assessed element shall be considered under normal operating conditions.                                                                                                                                                                                                                                                                                                                                                                       |
| normalMaxFlow                  | 0..1 | <a href="#">ActivePower</a>                | (NC) Maximum flow on a conducting equipment or a collection of conducting equipment forming a power transfer corridor under normal operating conditions. For assessed elements that become critical due to contingency, this value represents the maximum flow with remedial action taken into consideration.                                                                                                                                                   |
| normalAppointedMargin          | 0..1 | <a href="#">PerCent</a>                    | (NC) The normal 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.<br>It is only used when an assessed element is considered conservative for a region.<br>The allowed value range is [0,100].                                                                                         |
| normalPositiveVirtualMargin    | 0..1 | <a href="#">PerCent</a>                    | (NC) A positive margin that defines the overload allowed in a solution for the assessed element for a normal 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.<br>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]. |
| isCombinableWithRemedialAction | 0..1 | <a href="#">Boolean</a>                    | (NC) Defines if the AssessedElement is available to be combined with RemedialAction. If true, this AssessedElement can be included in various combinations not defined in the data exchange in an explicit way. If false, this assessed element is not to be considered in any combination with remedial actions and contingencies except for the exclusive combination. If not provided, the default meaning is true, i.e. the assessed element is combinable. |
| isCombinableWithContingency    | 0..1 | <a href="#">Boolean</a>                    | (NC) Defines if the AssessedElement is available to be combined with Contingency. If true, this AssessedElement can be included in various combinations not defined in the data exchange in an explicit way. If false, this assessed element is not to be considered in any combination with remedial actions and contingencies except for the exclusive combination. If not provided, the default meaning is true, i.e. the assessed element is combinable.    |
| normalScannedThresholdMargin   | 0..1 | <a href="#">PerCent</a>                    | (NC) Normal 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).<br>The allowed value range is [0,100].                                                                                                                 |
| exclusionReason                | 0..1 | <a href="#">SecuredExclusionReasonKind</a> | (NC) Reason for not associating this assessed element with a secured region.                                                                                                                                                                                                                                                                                                                                                                                    |

| name                                               | mult | type                                | description                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------|------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| criticalElement                                    | 0..1 | <a href="#">CriticalElementKind</a> | (deprecated,NC) Indicates the type of the critical element.                                                                                                                                                                                                                                                                                                                                        |
| normalIndividualValidationAdjustment               | 0..1 | <a href="#">ActivePower</a>         | (NC) Normal 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.                                                                                                                                                                                            |
| normalCoordinatedValidationAdjustment              | 0..1 | <a href="#">ActivePower</a>         | (NC) Normal 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.                                                                                                                                                                                                            |
| normalIndividualValidationAdjustmentShare          | 0..1 | <a href="#">ActivePower</a>         | (NC) Normal 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. |
| normalIndividualValidationAdjustmentJustification  | 0..1 | <a href="#">String</a>              | (NC) Normal 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 processing purpose, it should only be used for reporting.                                                                                               |
| normalCoordinatedValidationAdjustmentJustification | 0..1 | <a href="#">String</a>              | (NC) Normal 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.                                                                     |
| normalCriticalElementJustification                 | 0..1 | <a href="#">String</a>              | (deprecated,NC) Normal free text describing the justification of critical element 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.                                                                                                                                                      |
| normalTargetRemainingAvailableMarginJustification  | 0..1 | <a href="#">String</a>              | (NC) Normal 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.                                                                                                                                                                               |
| insideCapacityMargin                               | 0..1 | <a href="#">PerCent</a>             | (NC) Percentage of the maximum flow (margin) from coordinated capacity calculation, i.e. capacity available for cross-zonal trade within the considered coordination area.<br>The allowed value range is [0,100].                                                                                                                                                                                  |
| outsideCapacityMargin                              | 0..1 | <a href="#">PerCent</a>             | (NC) Percentage of the maximum flow (margin) capacity calculation, i.e. the capacity available for cross-zonal trade outside the considered coordination area.<br>The allowed value range is [0,100].                                                                                                                                                                                              |
| isCriticalForCapacityCalculation                   | 0..1 | <a href="#">Boolean</a>             | (NC) Indicates whether the capacity calculation process is using the element or not.                                                                                                                                                                                                                                                                                                               |
| description                                        | 0..1 | <a href="#">String</a>              | inherited from: <a href="#">IdentifiedObject</a>                                                                                                                                                                                                                                                                                                                                                   |
| mRID                                               | 1..1 | <a href="#">String</a>              | inherited from: <a href="#">IdentifiedObject</a>                                                                                                                                                                                                                                                                                                                                                   |
| name                                               | 0..1 | <a href="#">String</a>              | inherited from: <a href="#">IdentifiedObject</a>                                                                                                                                                                                                                                                                                                                                                   |

Table 2 shows all association ends of AssessedElement with other classes.

**Table 2 – Association ends of AssessedElementProfile::AssessedElement with other classes**

| mult from | name                          | mult to | type                                  | description                                                                                                   |
|-----------|-------------------------------|---------|---------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 0..*      | NativeRegion                  | 0..1    | <a href="#">Region</a>                | (NC) The native region for an assessed element.                                                               |
| 0..*      | AssessedSystemOperator        | 1..1    | <a href="#">SystemOperator</a>        | (NC) A system operator that assesses the element.                                                             |
| 0..*      | ScannedForRegion              | 0..1    | <a href="#">Region</a>                | (NC) This is the region in which this assessed element is scanned.                                            |
| 0..*      | ConductingEquipment           | 0..1    | <a href="#">ConductingEquipment</a>   | (NC) The conducting equipment that is designated as an assessed element, i.e. the equipment that is assessed. |
| 0..*      | SecuredForRegion              | 0..1    | <a href="#">Region</a>                | (NC) This is the region where the element is secured.                                                         |
| 0..*      | AssessedPowerTransferCorridor | 0..1    | <a href="#">PowerTransferCorridor</a> | (NC) The power transfer corridor that is designated as an assessed element.                                   |
| 0..*      | OverlappingZone               | 0..1    | <a href="#">OverlappingZone</a>       | (NC) The overlapping zone grouping the overlapping assessed elements.                                         |
| 0..*      | DCTieCorridor                 | 0..1    | <a href="#">DCTieCorridor</a>         | (NC) The DC tie corridor that is assessed.                                                                    |
| 0..*      | OperationalLimit              | 0..1    | <a href="#">OperationalLimit</a>      | (NC) The terminal limit that is being assessed against.                                                       |
| 0..*      | Line                          | 0..1    | <a href="#">Line</a>                  | (NC) The line that is designated as an assessed element, i.e. the equipment that is assessed.                 |

### 3.3 (abstract) ConductingEquipment root class

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

### 3.4 (abstract) Contingency root class

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

### 3.5 (abstract) IdentifiedObject root class

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

Table 3 shows all attributes of IdentifiedObject.

**Table 3 – Attributes of AssessedElementProfile::IdentifiedObject**

| name        | mult | type                   | description                                                                                                                                                                                                                                                                                                                                        |
|-------------|------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| description | 0..1 | <a href="#">String</a> | The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.                                                                                                                                                                                                   |
| mRID        | 1..1 | <a href="#">String</a> | Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.<br><br>For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID |



| name | mult | type                   | description                                                                         |
|------|------|------------------------|-------------------------------------------------------------------------------------|
|      |      |                        | or rdf:about attributes that identify CIM object elements.                          |
| name | 0..1 | <a href="#">String</a> | The name is any free human readable and possibly non unique text naming the object. |

381

382 **3.6 (abstract,NC) PowerTransferCorridor root class**

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

386 **3.7 (abstract,NC) Region root class**

387 A region where the system operator belongs to.

388 **3.8 (abstract,NC) SystemOperator root class**

389 System operator.

390 **3.9 (abstract,NC) OverlappingZone root class**

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

393 **3.10 (abstract,NC) DCTieCorridor root class**

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

395 **3.11 (abstract) OperationalLimit root class**

396 A value and normal value associated with a specific kind of limit.  
 397 The sub class value and normalValue attributes vary inversely to the associated  
 398 OperationalLimitType.acceptableDuration (acceptableDuration for short).  
 399 If a particular piece of equipment has multiple operational limits of the same kind (apparent  
 400 power, current, etc.), the limit with the greatest acceptableDuration shall have the smallest limit  
 401 value and the limit with the smallest acceptableDuration shall have the largest limit value. Note:  
 402 A large current can only be allowed to flow through a piece of equipment for a short duration  
 403 without causing damage, but a lesser current can be allowed to flow for a longer duration.  
 404 Table 4 shows all association ends of OperationalLimit with other classes.

405 **Table 4 – Association ends of AssessedElementProfile::OperationalLimit with other**  
 406 **classes**

| mult from | name                | mult to | type                                | description                                     |
|-----------|---------------------|---------|-------------------------------------|-------------------------------------------------|
| 0..*      | OperationalLimitSet | 1..1    | <a href="#">OperationalLimitSet</a> | The limit set to which the limit values belong. |

407

408 **3.12 (NC) AssessedElementWithContingency root class**

409 Combination of an assessed element and a contingency.

410 Table 5 shows all attributes of AssessedElementWithContingency.

411 **Table 5 – Attributes of AssessedElementProfile::AssessedElementWithContingency**

| name | mult | type                   | description                                                                                                                                                                                                                                        |
|------|------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mRID | 1..1 | <a href="#">String</a> | (NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. |



| name                      | mult | type                                             | description                                                                                                                                                                                                                                                                                       |
|---------------------------|------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           |      |                                                  | For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.                                                                                                                                          |
| combinationConstraintKind | 1..1 | <a href="#">ElementCombinationConstraintKind</a> | (NC) Defines the combination constraint of the AssessedElement and Contingency. If included, this assessed element is only assessed for this contingency. Else if excluded, this assessed element should not be assessed for this contingency. Considered shall not be used for this combination. |
| normalEnabled             | 0..1 | <a href="#">Boolean</a>                          | (NC) If true, the assessed element with contingency is enabled, otherwise it is disabled under normal operating conditions.                                                                                                                                                                       |

Table 6 shows all association ends of AssessedElementWithContingency with other classes.

**Table 6 – Association ends of AssessedElementProfile::AssessedElementWithContingency with other classes**

| mult from | name            | mult to | type                            | description                                                                              |
|-----------|-----------------|---------|---------------------------------|------------------------------------------------------------------------------------------|
| 0..*      | AssessedElement | 1..1    | <a href="#">AssessedElement</a> | (NC) The assessed element defined for this contingency and assessed element combination. |
| 0..*      | Contingency     | 1..1    | <a href="#">Contingency</a>     | (NC) The contingency defined for this contingency and assessed element combination.      |

### 3.13 (NC) AssessedElementWithRemedialAction root class

Combination of an assessed element and a remedial action

Table 7 shows all attributes of AssessedElementWithRemedialAction.

**Table 7 – Attributes of AssessedElementProfile::AssessedElementWithRemedialAction**

| name                      | mult | type                                             | description                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------|------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mRID                      | 1..1 | <a href="#">String</a>                           | (NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.<br><br>For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements. |
| combinationConstraintKind | 1..1 | <a href="#">ElementCombinationConstraintKind</a> | (NC) Defines the combination constraint of the AssessedElement and Remedial Action. If included, this remedial action is only assessed for this assessed element. Else if excluded, this remedial action should not be used for this assessed element. Else if considered, this remedial action can be considered for this assessed element.                                                                       |
| normalEnabled             | 0..1 | <a href="#">Boolean</a>                          | (NC) If true, the assessed element with remedial action is enabled, otherwise it is disabled under normal operating conditions.                                                                                                                                                                                                                                                                                    |

Table 8 shows all association ends of AssessedElementWithRemedialAction with other classes.

**Table 8 – Association ends of AssessedElementProfile::AssessedElementWithRemedialAction with other classes**

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

### 3.14 (abstract,NC) RemedialAction root class

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

### 3.15 (NC) CrossBorderRelevance root class

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

Table 9 shows all attributes of CrossBorderRelevance.

**Table 9 – Attributes of AssessedElementProfile::CrossBorderRelevance**

| name          | mult | type                    | description                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mRID          | 1..1 | <a href="#">String</a>  | (NC) Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.<br><br>For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements. |
| normalEnabled | 0..1 | <a href="#">Boolean</a> | (NC) If true, the cross border relevance shall be considered under normal operating conditions.                                                                                                                                                                                                                                                                                                                    |

Table 10 shows all association ends of CrossBorderRelevance with other classes.

**Table 10 – Association ends of AssessedElementProfile::CrossBorderRelevance with other classes**

| mult from | name              | mult to | type                              | description                                             |
|-----------|-------------------|---------|-----------------------------------|---------------------------------------------------------|
| 0..*      | AssessedElement   | 0..1    | <a href="#">AssessedElement</a>   | (NC) Assessed element which is cross border relevant.   |
| 0..*      | BiddingZoneBorder | 0..1    | <a href="#">BiddingZoneBorder</a> | (NC) Bidding zone border relevant for this combination. |

### 3.16 (abstract,NC) BiddingZoneBorder root class

A unidirectional interface between two adjacent Bidding Zones, representing the available transmission capacity from the Bidding Zone defined by the association FromBiddingZone (source) to the Bidding Zone defined by the association ToBiddingZone (sink). It defines the capacity constraints and market-based allocation mechanisms for cross-zonal electricity exchange in the specified direction, considering potential transmission congestion and market price differences.

**3.17 String primitive**

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

**3.18 Boolean primitive**

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

**3.19 PerCent datatype**

Percentage on a defined base. For example, specify as 100 to indicate at the defined base. Table 11 shows all attributes of PerCent.

**Table 11 – Attributes of AssessedElementProfile::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)                         |

**3.20 Float primitive**

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

**3.21 UnitSymbol enumeration**

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

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

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

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

The integer values are used for harmonization with IEC 61850.

Table 12 shows all literals of UnitSymbol.

**Table 12 – Literals of AssessedElementProfile::UnitSymbol**

| literal | value | description                                                                                                                                                                                                             |
|---------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| none    | 0     | Dimension less quantity, e.g. count, per unit, etc.                                                                                                                                                                     |
| W       | 38    | Real power in watts (J/s). Electrical power may have real and reactive components. The real portion of electrical power ( $I^2R$ or $V\cos(\phi)$ ), is expressed in Watts. See also apparent power and reactive power. |

**3.22 UnitMultiplier enumeration**

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

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

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

Table 13 shows all literals of UnitMultiplier.

**Table 13 – Literals of AssessedElementProfile::UnitMultiplier**

| literal | value | description                                  |
|---------|-------|----------------------------------------------|
| none    | 0     | No multiplier or equivalently multiply by 1. |
| M       | 6     | Mega $10^6$ .                                |

**3.23 (deprecated,NC) CriticalElementKind enumeration**

The kind of critical element.

Table 14 shows all literals of CriticalElementKind.

**Table 14 – Literals of AssessedElementProfile::CriticalElementKind**

| literal              | value | description                                                                                      |
|----------------------|-------|--------------------------------------------------------------------------------------------------|
| validation           |       | Network element should be assessed according to the methodology.                                 |
| critical             |       | Network element is considered to be critical according to the methodology.                       |
| monitored            |       | Network element is considered to be monitored under contingency.                                 |
| criticalAndMonitored |       | Network element is considered to be Critical Network Element monitored under Contingency (CNEC). |

**3.24 ActivePower datatype**

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

Table 15 shows all attributes of ActivePower.

**Table 15 – Attributes of AssessedElementProfile::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>          |             |

**3.25 (NC) SecuredExclusionReasonKind enumeration**

The kind of secured exclusion reason.

Table 16 shows all literals of SecuredExclusionReasonKind.

**Table 16 – Literals of AssessedElementProfile::SecuredExclusionReasonKind**

| literal                            | value | description                                                                                                                                                                                       |
|------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| systemOperator                     |       | The network element that is going to be assessed is excluded for being secured by the system operator.                                                                                            |
| capacityCalculationRegion          |       | The network element that is going to be assessed is excluded for being secured by the capacity calculation region.                                                                                |
| nonNativeCapacityCalculationRegion |       | The network element that is going to be assessed is excluded for being secured for the native capacity calculation region since it would be secured for a non native capacity calculation region. |

**3.26 (NC) ElementCombinationConstraintKind enumeration**

Kind of constraint for an element combination.

Table 17 shows all literals of ElementCombinationConstraintKind.

**Table 17 – Literals of AssessedElementProfile::ElementCombinationConstraintKind**

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

**3.27 (abstract) Line root class**

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

**3.28 (NC) BaseCaseCurrentLimit**

Inheritance path = [OperationalLimit](#)

Operational limit on current applicable for base case.

Table 18 shows all attributes of BaseCaseCurrentLimit.

**Table 18 – Attributes of AssessedElementProfile::BaseCaseCurrentLimit**

| name        | mult | type                        | description                                                                                       |
|-------------|------|-----------------------------|---------------------------------------------------------------------------------------------------|
| normalValue | 1..1 | <a href="#">CurrentFlow</a> | (NC) The normal value for limit on current flow. The attribute shall be a positive value or zero. |

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

**Table 19 – Association ends of AssessedElementProfile::BaseCaseCurrentLimit with other classes**

| mult from | name                | mult to | type                                | description                                      |
|-----------|---------------------|---------|-------------------------------------|--------------------------------------------------|
| 0..*      | OperationalLimitSet | 1..1    | <a href="#">OperationalLimitSet</a> | inherited from: <a href="#">OperationalLimit</a> |

**3.29 (Description) OperationalLimitSet**

Inheritance path = [IdentifiedObject](#)

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

Table 20 shows all attributes of OperationalLimitSet.

**Table 20 – Attributes of AssessedElementProfile::OperationalLimitSet**

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

**3.30 CurrentFlow datatype**

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

Table 21 shows all attributes of CurrentFlow.

**Table 21 – Attributes of AssessedElementProfile::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>          |              |

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

### 558 **A.1 General**

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

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

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