European Network of
Transmission System Operators
for Electricity

ASSESSED ELEMENT PROFILE SPECIFICATION

2022-02-16

SOC APPROVED
VERSION 2.0

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NOTE CONCERNING WORDING USED IN THIS DOCUMENT

The force of the following words is modified by the requirement level of the document in which they are used.

- SHALL: This word, or the terms “REQUIRED” or “MUST”, means that the definition is an absolute requirement of the specification.
- SHALL NOT: This phrase, or the phrase “MUST NOT”, means that the definition is an absolute prohibition of the specification.
- SHOULD: This word, or the adjective “RECOMMENDED”, means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
- SHOULD NOT: This phrase, or the phrase “NOT RECOMMENDED”, means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
- MAY: This word, or the adjective “OPTIONAL”, means that an item is truly optional.

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Revision History

Version	Release	Date	Paragraph	Comments
1	0	2021-03-22		Document for SOC approval.
2	0	2022-02-16		For CIM EG review. Additional associations added to Region, OverlapingZone and PowerSystemCorridor. Approved by SOC.

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1 Introduction

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

An assessed element is a network element for which the electrical state is evaluated in a regional or cross-regional process and which value is expected to fulfil regional rules function of the operational security limits.[1]

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

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

2 Application profile specification

2.1 Version information

The content is generated from UML model file CGMES30v25_501-20v01_HeaderMetaData-10v08_NC20v70.eap.

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

- Title: Assessed Element Vocabulary
- Keyword: AE
- Description: This vocabulary is describing the aseessed element profile.
- Version IRI: http://entsoe.eu/ns/CIM/AssessedElement-EU/2.0
- Version info: 2.0.0
- Prior version: http://entsoe.eu/ns/CIM/AssessedElement-EU/1.0
- Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-7:amd1|file://iec61970cim17v40_iec61968cim13v13a_iec62325cim03v17a.eap|urn:iso:std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-2|file://CGMES-30v25_501-20v01.eap
- Identifier: urn:uuid:a2de1738-214d-4552-b894-5b33cbc34218

2.2 Constraints naming convention

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

“{rule.Type}:{rule.Standard}:{rule.Profile}:{rule.Property}:{rule.Name}”

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

where

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

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

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

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

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

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

2.3 Profile constraints

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

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

- C:452:ALL:NA:datatypes

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

- R:452:ALL:NA:exchange

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

- R:452:ALL:NA:exchange1

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

- R:452:ALL:NA:exchange2

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

- R:452:ALL:NA:exchange3

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

- R:452:ALL:NA:exchange4

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

- R:452:ALL:NA:cardinality

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

- R:452:ALL:NA:associations

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

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

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

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

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

- R:452:ALL:NA:uniqueIdentifier

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

- R:452:ALL:NA:unitMultiplier

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

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

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

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

  The string IdentifiedObject.description is maximum 256 characters.

- C:452:ALL:NA:float

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

- R:NC:ALL:Region:reference

  The reference to the Region is normally a reference to the capacity calculation region, which is identified by “Y” EIC code of the capacity calculation region.

- R:NC:ALL:SystemOperator:reference

  The reference to the System Operator is normally identified by “X” EIC code of TSO.

- R:NC:AE:AssessedElement:usage

  All elements that need to be scanned for a base case or contingencies shall be explicitly defined. If not specified otherwise in another document, an application that performs contingency analysis will only report violations that occur on an assessed element and will not report any other violations on elements that have operational limits defined, but the object in the equipment is not designated as an AssessedElement. Therefore, the choice which equipment is scanned shall be made considering multiple factors among which the probability of missing potential violations and the performance of the contingency analysis.

- C:NC:AE:AssessedElement:associations

  An AssessedElement shall be associated with either AssessedElement.ConductingEquipment or AssessedElement.AssessedTerminal.

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.

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 (prov:Agent).

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.

3 Detailed Profile Specification

3.1 General

This package contains assessed element profile.

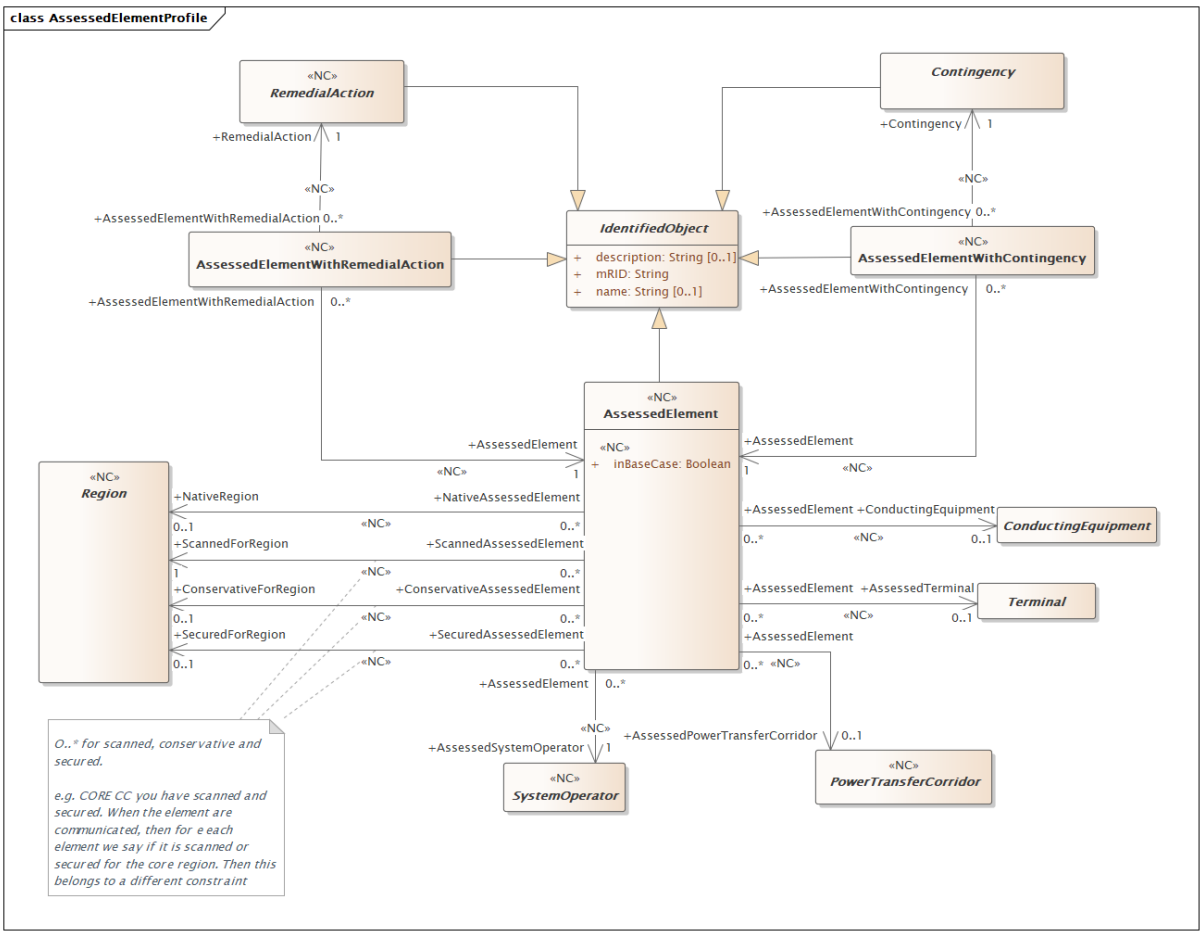

Figure 1 – Class diagram AssessedElementProfile::AssessedElementProfile

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

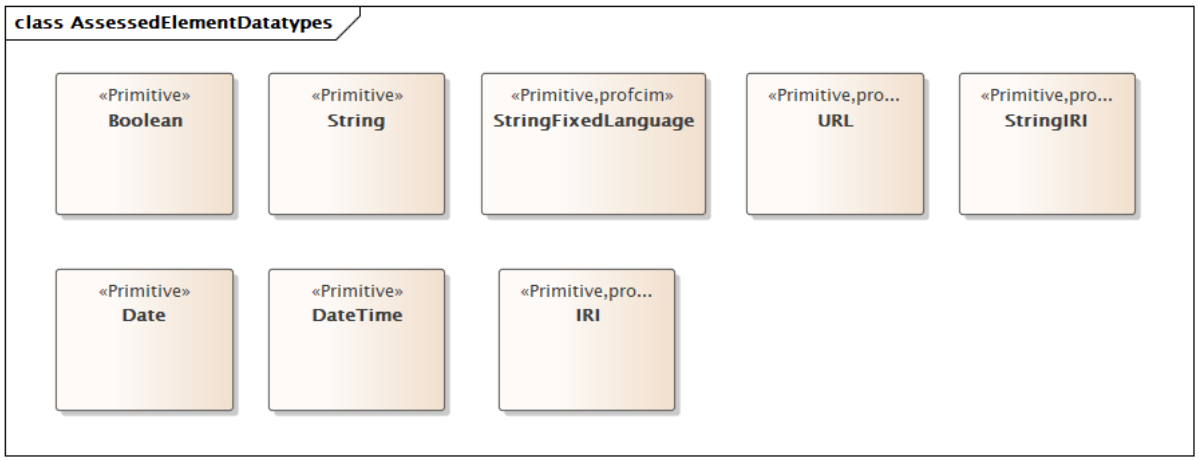

Figure 2 – Class diagram AssessedElementProfile::AssessedElementDatatypes

Figure 2: The diagram shows datatypes that are used by classes in the profile. Stereotypes are used to describe the datatypes. The following stereotypes are defined:
<<enumeration>> A list of permissible constant values.
<<Primitive>> The most basic data types used to compose all other data types.
<<CIMDatatype>> A datatype that contains a value attribute, an optional unit of measure and a unit multiplier. The unit and multiplier may be specified as a static variable initialized to the allowed value.
<<Compound>> A composite of Primitive, enumeration, CIMDatatype or other Compound classes, as long as the Compound classes do not recurse.
For all datatypes both positive and negative values are allowed unless stated otherwise for a particular datatype.

3.2 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.
Table 1 shows all attributes of IdentifiedObject.

Table 1 – Attributes of AssessedElementProfile::IdentifiedObject

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

3.3 (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 information of the validity period of the assessed element is derived from the conducting equipment.
The measurements and limits are as defined in the steady state hypothesis.
Table 2 shows all attributes of AssessedElement.

Table 2 – Attributes of AssessedElementProfile::AssessedElement

name	mult	type	description
inBaseCase	1..1	Boolean	(NC) Indicates if the assessed element is scanned in the base case. True means that the assessed element is scanned in the base case. False means it is not scanned in the base case. In case of false the association AssessedElement.Contingency is required.
description	0..1	String	inherited from: IdentifiedObject
mRID	1..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

Table 3 shows all association ends of AssessedElement with other classes.

Table 3 – Association ends of AssessedElementProfile::AssessedElement with other classes

mult from	name	mult to	type	description
0..*	ConductingEquipment	0..1	ConductingEquipment	(NC) The conducting equipment that is designated as an assessed element, i.e. the equipment that is assessed.
0..*	AssessedSystemOperator	1..1	SystemOperator	(NC) A system operator that assesses the element.
0..*	AssessedTerminal	0..1	Terminal	(NC) The terminal that is assessed.
0..*	SecuredForRegion	0..1	Region	(NC) This is the region where the element is secured.
0..*	ScannedForRegion	1..1	Region	(NC) This is the region in which this assessed element is scanned.
0..*	ConservativeForRegion	0..1	Region	(NC) This is the region where the element is considered conservative.
0..*	NativeRegion	0..1	Region	(NC) The native region for an assessed element.
0..*	AssessedPowerTransferCorridor	0..1	PowerTransferCorridor	(NC) The power transfer corridor that is designated as an assessed element.

3.4 (abstract) ConductingEquipment root class

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

3.5 (abstract,NC) SystemOperator root class

System operator.

3.6 (abstract,NC) Region root class

A region where the system operator belongs to.

3.7 (abstract) Terminal root class

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

3.8 (abstract,NC) PowerTransferCorridor root class

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

3.9 Boolean primitive

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

3.10 String primitive

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

3.11 DateTime primitive

Date and time as "yyyy-mm-ddThh:mm:ss.sss", which conforms with ISO 8601. UTC time zone is specified as "yyyy-mm-ddThh:mm:ss.sssZ". A local timezone relative UTC is specified as "yyyy-mm-ddThh:mm:ss.sss-hh:mm". The second component (shown here as "ss.sss") could have any number of digits in its fractional part to allow any kind of precision beyond seconds.

3.12 Date primitive

Date as "yyyy-mm-dd", which conforms with ISO 8601. UTC time zone is specified as "yyyy-mm-ddZ". A local timezone relative UTC is specified as "yyyy-mm-dd(+/-)hh:mm".

3.13 (NC) AssessedElementWithContingency

Inheritance path = IdentifiedObject
The combination of an assessed element and a contingency.
Table 4 shows all attributes of AssessedElementWithContingency.

Table 4 – Attributes of AssessedElementProfile::AssessedElementWithContingency

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

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

Table 5 – Association ends of AssessedElementProfile::AssessedElementWithContingency with other classes

mult from	name	mult to	type	description
0..*	AssessedElement	1..1	AssessedElement	(NC) The assessed element defined for this contingency and assessed element combination.
0..*	Contingency	1..1	Contingency	(NC) The contingency defined for this contingency and assessed element combination.

3.14 (abstract) Contingency

Inheritance path = IdentifiedObject
An event threatening system reliability, consisting of one or more contingency elements.
Table 6 shows all attributes of Contingency.

Table 6 – Attributes of AssessedElementProfile::Contingency

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

3.15 (NC) AssessedElementWithRemedialAction

Inheritance path = IdentifiedObject

Table 7 shows all attributes of AssessedElementWithRemedialAction.

Table 7 – Attributes of AssessedElementProfile::AssessedElementWithRemedialAction

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

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	AssessedElement	(NC) The assessed element defined for this assessed element and remedial action combination.
0..*	RemedialAction	1..1	RemedialAction	(NC) The remedial action defined for this assessed element and remedial action combination.

3.16 (abstract,NC) RemedialAction

Inheritance path = IdentifiedObject

A remedial action is described by one of many grid state alterations applied to a grid model state or particular scenario in order to resolve one or more Identified constraints. Only costly remedial actions require a cost characteristic.

Table 9 shows all attributes of RemedialAction.

Table 9 – Attributes of AssessedElementProfile::RemedialAction

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

Annex A (informative): Sample data

A.1 General

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

A.2 Sample instance data

```
<nc:AssessedElement rdf:ID="_fd1919e8-b8f9-41d6-870e-785700665e4c">
  <cim:IdentifiedObject.name>AE1</cim:IdentifiedObject.name>
  <cim:IdentifiedObject.mRID>fd1919e8-b8f9-41d6-870e-785700665e4c</cim:IdentifiedObject.mRID>
  <nc:AssessedElement.inBaseCase>true</nc:AssessedElement.inBaseCase>
  <nc:AssessedElement.ConductingEquipment rdf:resource="#_00f5b7fc-e6f4-435d-8826-35abbf388ec7" />
  <nc:AssessedElement.AssessedForSystemOperator rdf:resource="#urn:entsoe.eu:10X1001A1001A094" />
  <nc:AssessedElement.AssessedForSystemOperator rdf:resource #urn:entsoe.eu:10X1001A1001A361" />
  <nc:AssessedElement.ScannedForRegion rdf:resource="#urn:entsoe.eu:10Y1001C--00059P " />
  <nc:AssessedElement.ScannedForRegion rdf:resource="#urn:entsoe.eu:10Y1001C--000239" />
</nc:AssessedElement>
```