entsoe

IMPACT ASSESSMENT MATRIX
PROFILE SPECIFICATION

2022-02-16

SOC APPROVED
VERSION 2.0

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17 **NOTE CONCERNING WORDING USED IN THIS DOCUMENT**

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

20 • SHALL: This word, or the terms "REQUIRED" or "MUST", means that the definition is an
21 absolute requirement of the specification.

22 • SHALL NOT: This phrase, or the phrase "MUST NOT", means that the definition is an
23 absolute prohibition of the specification.

24 • SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid
25 reasons in particular circumstances to ignore a particular item, but the full implications must
26 be understood and carefully weighed before choosing a different course.

27 • SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there may
28 exist valid reasons in particular circumstances when the particular behaviour is acceptable
29 or even useful, but the full implications should be understood and the case carefully weighed
30 before implementing any behaviour described with this label.

31 • MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional.

32

33   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. No major update. Due to update of the extensions some elements are updated. Approved by SOC.

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1 Introduction

The impact assessment matrix profile is a profile to exchange impact assessment matrices that are needed within the process.

The impact assessment matrix is an output of the impact assessment done on proposed remedial actions.

Three impact assessment matrices can be exchanged: list-based impact assessment matrix, calculation-based impact assessment matrix and coordination impact assessment matrix. The coordination impact assessment matrix aggregates or considers the information from other two impact assessment matrices. The connecting TSO matrix is not explicitly exchanged as it can be derived from the available remedial action data exchange.

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: Impact Assessment Matrix Vocabulary

- Keyword: IAM

- Description: This vocabulary is describing the impact assessment matrix profile.

- Version IRI: http://entsoe.eu/ns/CIM/ImpactAssessmentMatrix-EU/2.0

- Version info: 2.0.0

- Prior version: http://entsoe.eu/ns/CIM/ImpactAssessmentMatrix-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:1eb41c0b-3c58-4762-a79b-33220d051d32

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}"

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.

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

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

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

130 **2.3   Profile constraints**

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

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

136 • C:452:ALL:NA:datatypes

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

139 • R:452:ALL:NA:exchange

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

142 • R:452:ALL:NA:exchange1

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

148 • R:452:ALL:NA:exchange2

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

157 • R:452:ALL:NA:exchange3

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

161 • R:452:ALL:NA:exchange4

162 From the standpoint of the model import used by a data recipient, the document
163 describes a subset of the CIM that importing software shall be able to interpret in order
164 to import exported models. Data providers are free to exceed the minimum requirements
165 described herein as long as their resulting data files are compliant with the CIM Schema
166 and the conventions established in Clause 5. The document, therefore, describes
167 additional classes and class data that, although not required, exporters will, in all

168　　likelihood, choose to include in their data files. The additional classes and data are
169　　labelled as required (cardinality 1..1) or as optional (cardinality 0..1) to distinguish them
170　　from their required counterparts. Please note, however, that data importers could
171　　potentially receive data containing instances of any and all classes described by the
172　　CIM Schema.

173　　• R:452:ALL:NA:cardinality

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

179　　• R:452:ALL:NA:associations

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

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

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

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

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

194　　• R:452:ALL:NA:uniqueIdentifier

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

197　　• R:452:ALL:NA:unitMultiplier

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

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

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

202　　• C:452:ALL:IdentifiedObject.description:stringLength

203　　The string IdentifiedObject.description is maximum 256 characters.

204　　• C:452:ALL:NA:float

205　　An attribute that is defined as float (e.g. has a type Float or a type which is a Datatype
206　　with .value attribute of type Float) shall support ISO/IEC 60559:2020 for floating-point
207　　arithmetic using single precision floating point. A single precision float supports 7
208　　significant digits where the significant digits are described as an integer, or a decimal

209 number with 6 decimal digits. Two float values are equal when the significant with 7
210 digits are identical, e.g. 1234567 is equal 1.234567E6 and so are 1.2345678 and
211 1.234567E0.

212 • R:NC:ALL:Region:reference

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

215 • R:NC:ALL:SystemOperator:reference

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

217 • C:NC:IAM:OutcomeValue.RemedialAction:listBasedImpactAssessmentMatrix

218 For a ListBasedImpactAssessmentMatrix, the multiplicity of the association end
219 OutcomeValue.RemedialAction is restricted to 1. In this case, the association
220 OutcomeValue.RemedialActionSchedule shall not be exchanged.

221 • C:NC:IAM:OutcomeValue.RemedialActionSchedule:calculationBasedImpactAssessme
222 ntMatrix

223 For a CalculationBasedImpactAssessmentMatrix, the multiplicity of the association end
224 OutcomeValue.RemedialActionSchedule is restricted to 1. In this case, the association
225 OutcomeValue.RemedialAction shall not be exchanged.

226 • C:NC:IAM:CoordinatedImpactAssessmentMatrix:outcomeValue

227 For a CalculationBasedImpactAssessmentMatrix, an OutcomeValue shall be associated
228 with either OutcomeValue.RemedialAction or OutcomeValue.RemedialActionSchedule.

229 ### 2.4   Metadata

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

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

240 #### 2.4.1   Constraints

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

243 • R:NC:ALL:wasAttributedTo:usage

244 The prov:wasAttributedTo should normally be the "X" EIC code of the actor (prov:Agent).

245

246 #### 2.4.2   Reference metadata

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

250 identifiers are referenced from the header to enable the receiving entity to retrieve the "static"
251 (reference) information that is not modified frequently. This approach imposes a requirement
252 that both the sending entity and the receiving entity have access to a unique version of the
253 reference metadata. Therefore, each business process shall define which reference metadata
254 is used and where it is located.

3   Detailed Profile Specification

255

3.1   General

256

257 This package contains impact assessment matrix profile.

258
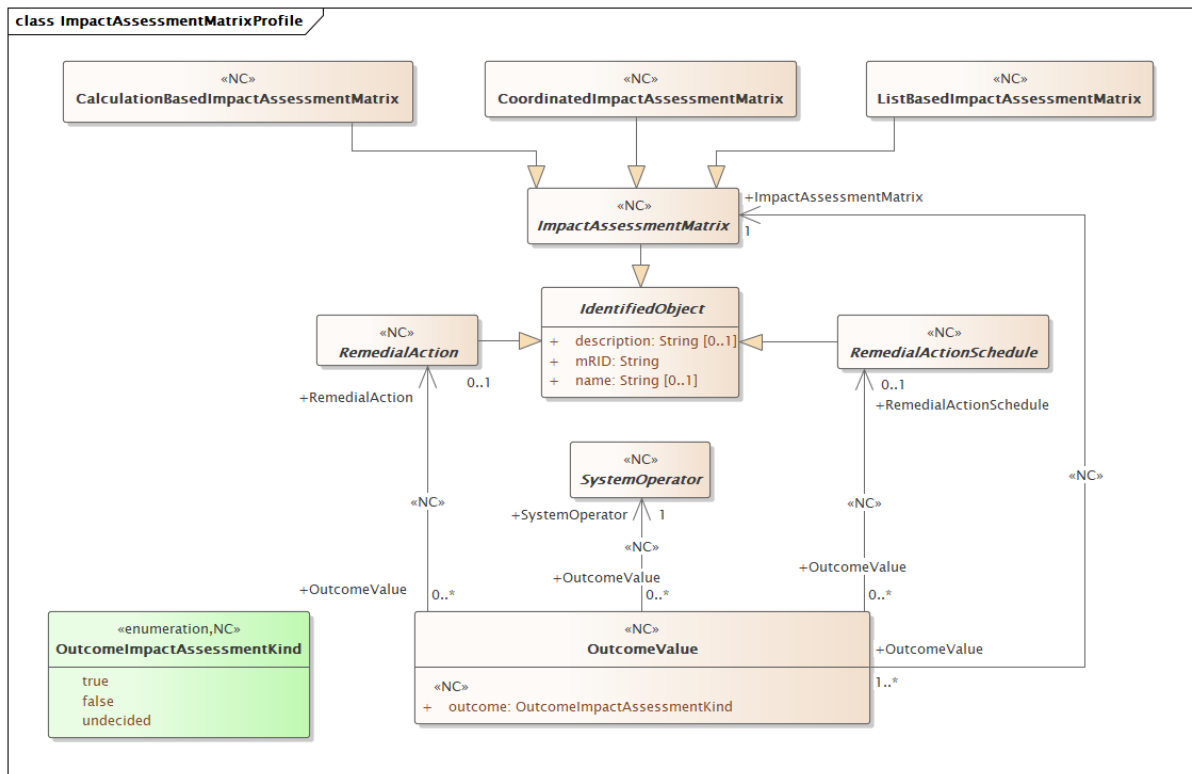
259   **Figure 1 – Class diagram**
260   **ImpactAssessmentMatrixProfile::ImpactAssessmentMatrixProfile**

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

262

**Figure 2 – Class diagram
ImpactAssessmentMatrixProfile::ImpactAssessmentMatrixDatatypes**

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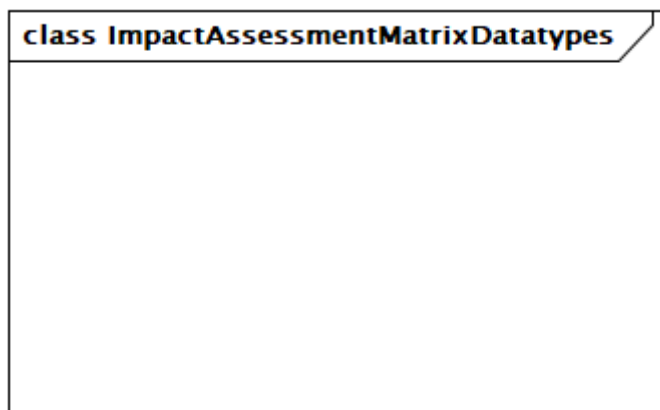266 used to describe the datatypes. The following stereotypes are defined:
267 <<enumeration>> A list of permissible constant values.
268 <<Primitive>> The most basic data types used to compose all other data types.
269 <<CIMDatatype>> A datatype that contains a value attribute, an optional unit of measure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

276 **3.2 (NC) CalculationBasedImpactAssessmentMatrix**

277 Inheritance path = ImpactAssessmentMatrix : IdentifiedObject
278 Calculation based impact assessment matrix. It relates to the remedial action schedule.
279 Table 1 shows all attributes of CalculationBasedImpactAssessmentMatrix.

280 **Table 1 – Attributes of
281 ImpactAssessmentMatrixProfile::CalculationBasedImpactAssessmentMatrix**

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

282

283 **3.3 (NC) CoordinatedImpactAssessmentMatrix**

284 Inheritance path = ImpactAssessmentMatrix : IdentifiedObject
285 Coordinated impact assessment matrix.
286 Table 2 shows all attributes of CoordinatedImpactAssessmentMatrix.

287 **Table 2 – Attributes of
288 ImpactAssessmentMatrixProfile::CoordinatedImpactAssessmentMatrix**

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

289

3.4 (abstract) IdentifiedObject root class

291 This is a root class to provide common identification for all classes needing identification and
292 naming attributes.
293 Table 3 shows all attributes of IdentifiedObject.

294 **Table 3 – Attributes of ImpactAssessmentMatrixProfile::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.

295

3.5 (abstract,NC) ImpactAssessmentMatrix

297 Inheritance path = IdentifiedObject
298 It is the result of an impact assessment analysis for each remedial action or remedial action
299 schedule onto the grid and operation of each system operator.
300 Table 4 shows all attributes of ImpactAssessmentMatrix.

301 **Table 4 – Attributes of ImpactAssessmentMatrixProfile::ImpactAssessmentMatrix**

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

302

3.6 (NC) ListBasedImpactAssessmentMatrix

304 Inheritance path = ImpactAssessmentMatrix : IdentifiedObject
305 List based impact assessment matrix. It refers to the remedial action.
306 Table 5 shows all attributes of ListBasedImpactAssessmentMatrix.

307 **Table 5 – Attributes of**
308 **ImpactAssessmentMatrixProfile::ListBasedImpactAssessmentMatrix**

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

309

3.7 (NC) OutcomeValue root class

311 This is the outcome of an impact assessment matrix.

312   Table 6 shows all attributes of OutcomeValue.

313   **Table 6 – Attributes of ImpactAssessmentMatrixProfile::OutcomeValue**

name	mult	type	description
outcome	1..1	OutcomeImpactAssessmentKind	(NC) Outcome value.

314
315   Table 7 shows all association ends of OutcomeValue with other classes.

316   **Table 7 – Association ends of ImpactAssessmentMatrixProfile::OutcomeValue with**
317   **other classes**

mult from	name	mult to	type	description
1..*	ImpactAssessmentMatrix	1..1	ImpactAssessmentMatrix	(NC) the impact assessment matrix which has this value.
0..*	RemedialAction	0..1	RemedialAction	(NC) The remedial action that has an outcome value.
0..*	RemedialActionSchedule	0..1	RemedialActionSchedule	(NC) The remedial action schedule that has an outcome value.
0..*	SystemOperator	1..1	SystemOperator	(NC) The system operator that has an outcome value.

318

319   **3.8   (abstract,NC) RemedialAction**

320   Inheritance path = IdentifiedObject
321   A remedial action is described by one of many grid state alterations applied to a grid model
322   state or particular scenario in order to resolve one or more Identified constraints. Only costly
323   remedial actions require a cost characteristic.
324   Table 8 shows all attributes of RemedialAction.

325   **Table 8 – Attributes of ImpactAssessmentMatrixProfile::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

326

327   **3.9   (abstract,NC) RemedialActionSchedule**

328   Inheritance path = IdentifiedObject
329   This is a schedule for a determined remedial action.
330   Table 9 shows all attributes of RemedialActionSchedule.

331   **Table 9 – Attributes of ImpactAssessmentMatrixProfile::RemedialActionSchedule**

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

332

333   **3.10   (abstract,NC) SystemOperator root class**

334   System operator.

335 **3.11 (NC) OutcomeImpactAssessmentKind enumeration**

336 Outcome impact assessments kinds.
337 Table 10 shows all literals of OutcomeImpactAssessmentKind.

338 **Table 10 – Literals of ImpactAssessmentMatrixProfile::OutcomeImpactAssessmentKind**

literal	value	description
true		True.
false		False.
undecided		Undecided. Used only for list-based impact assessment matrix.

339

340 **3.12 Date primitive**

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

343 **3.13 DateTime primitive**

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

348 **3.14 String primitive**

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

351

352

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:ListBasedImpactAssessmentmatrix rdf:ID="_a7438c6f-5f12-421b-9b39-a42d4194c177">

  <cim:IdentifiedObject.name>IAM1</cim:IdentifiedObject.name>

  <cim:IdentifiedObject.mRID>a7438c6f-5f12-421b-9b39-a42d4194c177</cim:IdentifiedObject.mRID>

</nc:ListBasedImpactAssessmentmatrix>


<nc:OutcomeValue rdf:ID="_cb3a98ed-1bb0-4c03-bdc3-2b403c7333d9">

  <nc:OutcomeValue.outcome rdf:resource="http://entsoe.eu/ns/csa#OutcomeImpactAssessmentKind.true" />

  <nc:OutcomeValue.RemedialAction rdf:resource="#_64ec4c52-5e70-4e5d-acb7-57a6c06dcf07" />

  <nc:OutcomeValue.SystemOperator rdf:resource="#urn:entsoe:10X1001A1001A094" />

  <nc:OutcomeValue.ImpactAssessmentMatrix rdf:resource="#_a7438c6f-5f12-421b-9b39-a42d4194c177" />

</nc:OutcomeValue>


<nc:OutcomeValue rdf:ID="_c710b18a-da3a-43d2-86df-8a6ecc2f00f5">

  <nc:OutcomeValue.outcome rdf:resource="http://entsoe.eu/ns/csa#OutcomeImpactAssessmentKind.false" />

  <nc:OutcomeValue.RemedialAction rdf:resource="#_64ec4c52-5e70-4e5d-acb7-57a6c06dcf07" />

  <nc:OutcomeValue.SystemOperator rdf:resource="#urn:entsoe:10X1001A1001A361" />

  <nc:OutcomeValue.ImpactAssessmentMatrix rdf:resource="#_a7438c6f-5f12-421b-9b39-a42d4194c177" />

</nc:OutcomeValue>
```