Network Code (NC) profiles

Release 2.4

Document Version 1.0.1
CIM WG agreed on 09 March 2026

Document Version 1.0.0
ICTC approved on 11 September 2025

Release notes

ENTSO-E updated the CIM-based Network Code Profiles extensions and relevant artifacts—*Application Profiles* (RDFS and SHACL) available on the CGMES Library—to consider new use cases and correct identified bugs.

Release 2.4.1

- The following profiles changed and they are versioned individually (refer to specifications per profile):
    - EquipmentReliability
    - ObjectRegistry

- The following profiles did not change with respect to release 2.4.0:
    - AssessedElement
    - Contingency
    - ImpactAssessmentMatrix
    - NetworkCodeRelatedCanonicalExtensions
    - PowerSchedule
    - RemedialAction
    - RemedialActionSchedule
    - SecurityAnalysisResults
    - StateInstructionSchedule
    - SteadyStateHypothesisSchedule
    - SteadyStateInstruction
    - AvailabilitySchedule
    - GridDisturbance
    - MonitoringArea
    - PowerSystemProject
    - SensitivityMatrix

- Changes magnitude: minor

- o Bug Solving | BiddingZoneBorder.FromBiddingZone cardinality change.
    - BiddingZone.FromBiddingZoneBorder multiplicity changed from 1..n to 0..n.
    - BiddingZone.SchedulingArea multiplicity changed from 1..n to 0..n.
    - SchedulingArea.BiddingZone multiplicity changed from 1 to 0..1.
  - o Items IdentifiedObject.energyIdentCodeEic namespace changed from https://cim.ucaiug.io/ns# to https://cim.ucaiug.io/ns/eu# .
  - o Change of cardinality: BiddingZoneBorder (0...*) <-> (0..1) TieCorridor.
- Changes nature: specifications, information model (UML) and Application Profiles (RDFS, SHACL) change.
- Changes' description:
  - o New Chaper 3 Namespaces presented in Network Code Related Canonical Extensions.

Release 2.4

- The following profiles changed and they are versioned individually (refer to specifications per profile):
  - o AssessedElement
  - o Contingency
  - o EquipmentReliability
  - o ImpactAssessmentMatrix
  - o NetworkCodeRelatedCanonicalExtensions
  - o PowerSchedule
  - o RemedialAction
  - o RemedialActionSchedule
  - o SecurityAnalysisResults
  - o StateInstructionSchedule
  - o SteadyStateHypothesisSchedule
  - o SteadyStateInstruction
- The following profiles did not change with respect to release 2.3.2:
  - o AvailabilitySchedule
  - o GridDisturbance
  - o MonitoringArea
  - o ObjectRegistry
  - o PowerSystemProject
  - o SensitivityMatrix
- Changes magnitude: minor.
  - o Many functionalities are added in a backward compatible manner.
    - Nevertheless, some changes may be considered as breaking changes (not backwards compatible) like changes in attributes/classes names or addition of new ones.

The technical agreement is to tag the release as a minor release due to the fact that there is no real implementation of v2.3 of NC profiles at regional level and the expected impact of release 2.4 is not major.

- o The structural part of the data does not change. However, there are new behaviours of the information model in comparison to the previous version.

- o Addition of functionalities.

- o Change in the way the classes attributes in the information model (UML) are used and interlinked.

- o Addition of use cases: implementers add new reasons to use the standard.

- o Addition of test use cases: implementers add/provide test models to showcase such functionalities.

- Changes nature: specifications, information model (UML) and Application Profiles (RDFS, SHACL) change.

The release 2.4 of the Network Code Profiles features the following main changes. For a complete and machine-readable list of the changes, please refer to the difference dataset (*DIFF file*) that ENTSO-E will publish on the CGMES Library.

- Changes' description:

  - o RemedialActionDependency.normalEnabled attribute description changed to "If true, the remedial action dependency within a group shall be considered under normal operating conditions."
  - o More guidance on how to define granularity of activation and shutdown costs
    - ▪ PowerBidScheduleTimePoint.price description changed to "Price given in the time point."
    - ▪ activationCost and shutdownCost added to PowerBidScheduleTimePoint
    - ▪ in SIS profile PowerBidScheduleTimePoint.p was made optional in order to allow for the SHACL constraints.
  - o Association between PowerCapacity class and SchedulingArea class in EquipmentReliability profile to enable capacity calculation studies for long-term market studies.
  - o The use of the *TriggerCondition* class in *RemedialActionSchedule* profile was deprecated.
  - o RangeConstraint.valueKind attribute in SteadyStateInstruction profile is made mandatory.
  - o Making *shutDownCost* attribute on *GeneratingUnit* class available in a scheduled (hourly) basis:
    - ▪ Added *GeneratingUnit.costCurrency* in extensions.
    - ▪ Changed the datatype to *GeneratingUnit.normalStartupCost*, *.normalWarmStartupCost*, *.shutdownCost*, *.warmStartupCost* to Decimal.
    - ▪ *GeneratingUnit.normalShutdownCost* added to extensions.
    - ▪ *GeneratingUnit.normalShutdownCost* added to ER together with *.costCurrency*; *GeneratingUnit.shutdownCost* was deleted in ER. Money datatypes were changed to Decimal. Money datatype deleted in ER.
    - ▪ *GeneratingUnit.costCurrency* added to SSI and the datatype of *.warmStartupCost* was changed to Decimal. Money is kept in the profile as it is used by *startupCost* which is CIM attribute.
    - ▪ shutdownCost is added to SSI.
    - ▪ shutdownCost in added SIS (in UnitCostTimePoint class).
  - o Reviewing the concepts of *Money* and *Currency:*
    - ▪ *PowerSchedule.currency* added to extensions.

- *PowerSchedule.currency* added to RAS and PS profiles as optional attribute.
- Added *UnitCostSchedule.currency* in the extensions and updated SIS profile.
- Changed *UnitCostSchedule.startupCost* and *UnitCostSchedule.warmStartupCost* to Decimal and updated SIS profile.
- Deleted Money datatype from SIS as it is not used anymore.
- The *PowerBidDenpendency* class now includes *delayKind*, *runtime* and *runtimeKind* attributes enabling the modelling of Core TSOs' use cases "parent-child must run", "child delay", "parent must be active" and "parent-child duration activation relation".
- Attributes isCombinableWithContingency and isCombiablewithRemedialAction are kept optional but the description has changed to "If not provided, the default meaning is true, i.e. the assessed element is combinable".
- Introduced InfeedLimit SHACL rule for restricting usage of attributes.
- Description of *MobileElectricalUnit* class change to support demand response modelling.
- Fixing SMOperatingModePConsistency and SMNullP
  - Fixing inconsistency, cim:SynchronousMachine with cim:SynchronousMachine.operatingMode equal to "motor", cim:RotatingMachine.p shall be greater than or equal to zero.
  - Fixing inconsistency, cim:SynchronousMachine with cim:SynchronousMachine.operatingMode equal to "generator", cim:RotatingMachine.p shall be lesser than or equal to zero.
  - Fixing inconsistency, for cim:SynchronousMachine, if cim:RotatingMachine.p equals zero and cim:RotatingMachine.q is different than zero the cim:SynchronousMachine.operatingMode shall be equal to "condenser"
  - Added GeneratingUnit.isRamping. The attribute is added as required attribute in SSI
  - Added operatingMode to the ReactiveCapabilityCurve in extensions. The attribute is added as optional in ER
- The attribute GateInputPin.logicKind in RA profile was changed to optional.
  - Some of GateInputPin's child classes, e.g. PinGate or PinContingency, do not compare anything.
  - As the value *none* does not exit in the enumeration *LogicalOperatorsKind,* the attribute *logicKind* attribute is made optional.
  - However, SHACL constraints ensure that the attribute *logicKind* is required for GateInputPin some child classes.
- RangeConstraint.valueKind attribute in SteadyStateInstructionProfile is made mandatory
- Impact assessment for a group of Remedial Actions: Remedial Actions might be depending on each other (gathered in a group). One could make an assessment of this group and for the sake of completeness, the class RemedialActionOutputValue and RemedialActionImpact are now associated with to RemedialActionGroup.
  - RemedialActionGroup class is added in ImpactAssessmentMatrix profile.
  - Association added between RemedialActionGroup and RemedialActionOutputValue.
  - Association added between RemedialActionGroup and RemedialActionImpact.
  - Cardinality in association between RemedialAction and RemedialActionOutputValue is relaxed (changed to 0 to 1).
  - Cardinality in association between RemedialAction and RemedialActionImpact is relaxed (changed to 0 to 1).
  - Introduction of SHACL constraints to require that RemedialActionOutputValue instance is only associated with RemedialAction or RemedialActionImpact (but not both).
- Assessed Element with different limits between base case and contingency analysis
  - BaseCaseCurrentLimit added to CIM extensions, AE profile, SSI profile, and SIS profile
    - SHACL constraints are defined:

- o To check that the base case limit is lower than the contingency limit value.
        - o To check that the BaseCaseCurrentLimit association is set only when the inBaseCase attribute in the AssessedElement class is set to TRUE.
    - o Participation factor in SSI profile classes as optional
        - ▪ The participation factor is made optional for the following classes: EnergyBlockOrder, EnergyConsumer, EnergyGroup, GeneratingUnit, HydroPump, PowerElectronicsUnit, ScheduleResource.
    - o Modelling of Conventional and Renewable Generation from Underlaying Network
        - ▪ Added EquivalentGeneratingUnit class in ER profile
        - ▪ SHACL constraint C:NC:ER:RotatingMachine.GeneratingUnit:associationApplicability is added
            - • An EquivalentGeneratingUnit shall not be referenced by a RotatingMachine via the association end RotatingMachine.GeneratingUnit.