Long Term Development Statement (LTDS)

Grid Modelling Appendix 2: LTDS Information Model Extension Definitions and Diagrams

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This document outlines the LTDS extensions to the information model on which the LTDS data exchange definitions are based. LTDS data exchange definitions describe the structure and content of the information supplied under the Grid Modelling section of the Long Term Development Statement (LTDS) Form of Statement.

Contents

1 Extensions to CIM Production package

1.1 General

This package contains extensions related to generation.
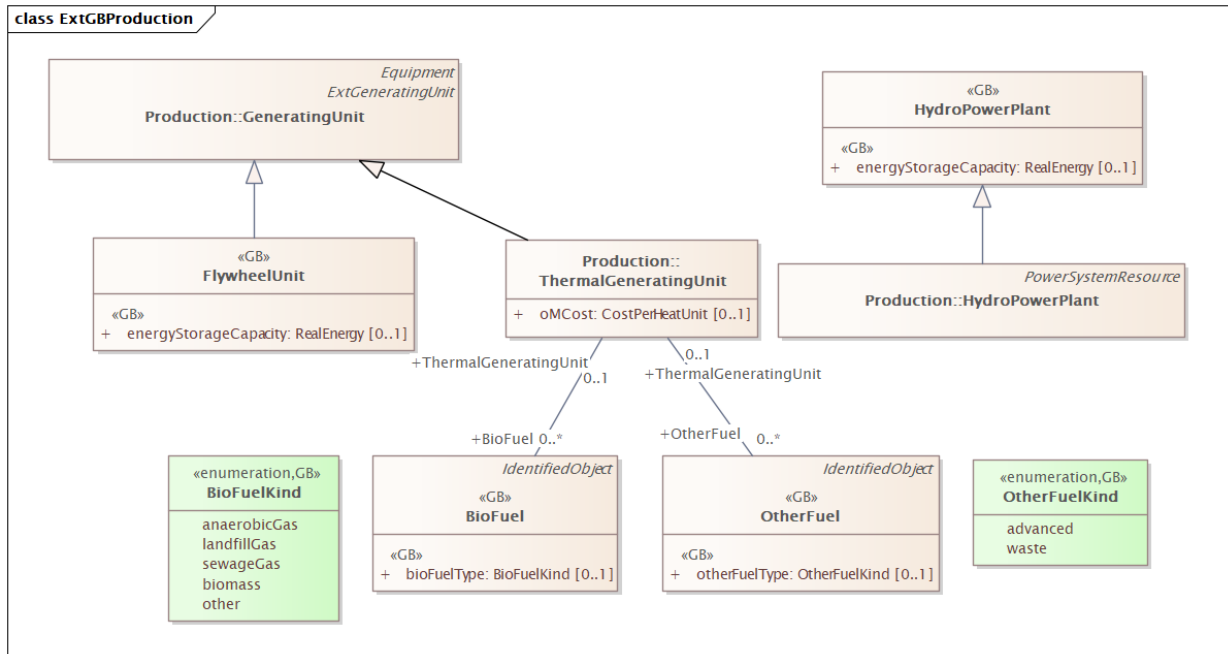
Figure 1 – Class diagram ExtGBProduction::ExtGBProduction

Figure 1: The diagram shows extensions related to generation.

1.2 (GB) BioFuel

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

The bio fuel consumed by the non-nuclear thermal generating unit.

Table 1 shows all attributes of BioFuel.

Table 1 – Attributes of ExtGBProduction::BioFuel

name	mult	type	description
bioFuelType	0..1	BioFuelKind	(GB) The type of bio fuel.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

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

Table 2 – Association ends of ExtGBProduction::BioFuel with other classes

mult from	name	mult to	type	description
0..*	ThermalGeneratingUnit	0..1	ThermalGeneratingUnit	The generating unit that has this bio fuel.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

1.3 (GB) FlywheelUnit

Inheritance path = GeneratingUnit : Equipment : PowerSystemResource : IdentifiedObject : ExtEuIdentifiedObject : ExtGeneratingUnit

A flywheel is a mechanical device which uses the conservation of angular momentum to store rotational energy. Therefore, it is a heavy wheel attached to a rotating shaft so as to smooth out delivery of power from a motor to a machine. The inertia of the flywheel opposes and moderates fluctuations in the speed of the engine and stores the excess energy for intermittent use.

Table 3 shows all attributes of FlywheelUnit.

Table 3 – Attributes of ExtGBProduction::FlywheelUnit

name	mult	type	description
energyStorageCapacity	0..1	RealEnergy	(GB) The rated energy storage capacity. The attribute shall be a positive value.
allocSpinResP	0..1	ActivePower	inherited from: GeneratingUnit
autoCntrlMarginP	0..1	ActivePower	inherited from: GeneratingUnit
baseP	0..1	ActivePower	inherited from: GeneratingUnit
controlDeadband	0..1	ActivePower	inherited from: GeneratingUnit
controlPulseHigh	0..1	Seconds	inherited from: GeneratingUnit
controlPulseLow	0..1	Seconds	inherited from: GeneratingUnit
controlResponseRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
efficiency	0..1	PerCent	inherited from: GeneratingUnit
genControlMode	0..1	GeneratorControlMode	inherited from: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	inherited from: GeneratingUnit
governorMPL	0..1	PU	inherited from: GeneratingUnit
governorSCD	0..1	PerCent	inherited from: GeneratingUnit
highControlLimit	0..1	ActivePower	inherited from: GeneratingUnit
initialP	0..1	ActivePower	inherited from: GeneratingUnit
longPF	0..1	Float	inherited from: GeneratingUnit
lowControlLimit	0..1	ActivePower	inherited from: GeneratingUnit
lowerRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
maxEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
maximumAllowableSpinningReserve	0..1	ActivePower	inherited from: GeneratingUnit

name	mult	type	description
maxOperatingP	0..1	ActivePower	inherited from: GeneratingUnit
minEconomicP	0..1	ActivePower	inherited from: GeneratingUnit
minimumOffTime	0..1	Seconds	inherited from: GeneratingUnit
minOperatingP	0..1	ActivePower	inherited from: GeneratingUnit
modelDetail	0..1	Classification	inherited from: GeneratingUnit
nominalP	0..1	ActivePower	inherited from: GeneratingUnit
normalPF	0..1	Float	inherited from: GeneratingUnit
penaltyFactor	0..1	Float	inherited from: GeneratingUnit
raiseRampRate	0..1	ActivePowerChangeRate	inherited from: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	inherited from: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	inherited from: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	inherited from: GeneratingUnit
shortPF	0..1	Float	inherited from: GeneratingUnit
startupCost	0..1	Money	inherited from: GeneratingUnit
startupTime	0..1	Seconds	inherited from: GeneratingUnit
tieLinePF	0..1	Float	inherited from: GeneratingUnit
totalEfficiency	0..1	PerCent	inherited from: GeneratingUnit
variableCost	0..1	Money	inherited from: GeneratingUnit
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
normallyInService	0..1	Boolean	inherited from: Equipment
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shutdownTime	0..1	Seconds	(NC) inherited from: ExtGeneratingUnit
shutdownCost	0..1	Money	(NC) inherited from: ExtGeneratingUnit
maxStartupLoad	0..1	ActivePower	(NC) inherited from: ExtGeneratingUnit
participationFactor	0..1	Float	(NC) inherited from: ExtGeneratingUnit

Table 4 shows all association ends of FlywheelUnit with other classes.

Table 4 – Association ends of ExtGBProduction::FlywheelUnit with other classes

mult from	name	mult to	type	description
0..1	RotatingMachine	0..*	RotatingMachine	inherited from: GeneratingUnit
1..1	GenUnitOpCostCurves	0..*	GenUnitOpCostCurve	inherited from: GeneratingUnit
1..1	GenUnitOpSchedule	0..1	GenUnitOpSchedule	inherited from: GeneratingUnit
1..1	ControlAreaGeneratingUnit	0..*	ControlAreaGeneratingUnit	inherited from: GeneratingUnit

mult from	name	mult to	type	description
1..1	GrossToNetActivePower Curves	0..*	GrossToNetActivePower Curve	inherited from: GeneratingUnit
0..*	AggregatedEquipment	0..1	Equipment	(NC) inherited from: Equipment
0..1	OperationalLimitSet	0..*	OperationalLimitSet	inherited from: Equipment
1..1	ContingencyEquipment	0..*	ContingencyEquipment	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..1	Faults	0..*	Fault	inherited from: Equipment
0..*	AdditionalEquipmentCo ntainer	0..*	EquipmentContainer	inherited from: Equipment
0..1	DetailedModelDynamics	0..*	DetailedModelDynamics	inherited from: Equipment
0..1	DetailedEquipment	0..*	Equipment	(NC) inherited from: Equipment
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource
0..1	Controls	0..*	Control	inherited from: PowerSystemResource
0..1	Measurements	0..*	Measurement	inherited from: PowerSystemResource
1..1	OperatingShare	0..*	OperatingShare	inherited from: PowerSystemResource
0..*	ReportingGroup	0..*	ReportingGroup	inherited from: PowerSystemResource
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

1.4 (GB) HydroPowerPlant root class

Class that extends CIM HydroPowerPlant.

Table 5 shows all attributes of HydroPowerPlant.

Table 5 – Attributes of ExtGBProduction::HydroPowerPlant

name	mult	type	description
energyStorageCapacity	0..1	RealEnergy	(GB) The rated energy storage capacity. The attribute shall be a positive value.

1.5 (GB) OtherFuel

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

The other fuel consumed by the non-nuclear thermal generating unit.

Table 6 shows all attributes of OtherFuel.

Table 6 – Attributes of ExtGBProduction::OtherFuel

name	mult	type	description
otherFuelType	0..1	OtherFuelKind	(GB) The type of other fuel.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 7 shows all association ends of OtherFuel with other classes.

Table 7 – Association ends of ExtGBProduction::OtherFuel with other classes

mult from	name	mult to	type	description
0..*	ThermalGeneratingUnit	0..1	ThermalGeneratingUnit	The generating unit that has this fuel.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

1.6 (GB) BioFuelKind enumeration

Kinds of bio fuel.

Table 8 shows all literals of BioFuelKind.

Table 8 – Literals of ExtGBProduction::BioFuelKind

literal	value	description
anaerobicGas		Anaerobic gas.
landfillGas		Landfill gas.
sewageGas		Sewage gas.
biomass		Biomass.
other		Other.

1.7 (GB) OtherFuelKind enumeration

Kinds of other fuels.

Table 9 shows all literals of OtherFuelKind.

Table 9 – Literals of ExtGBProduction::OtherFuelKind

literal	value	description
advanced		Advanced fuel.
waste		Waste fuel.

2 Extensions to CIM OperationalLimits

2.1 General

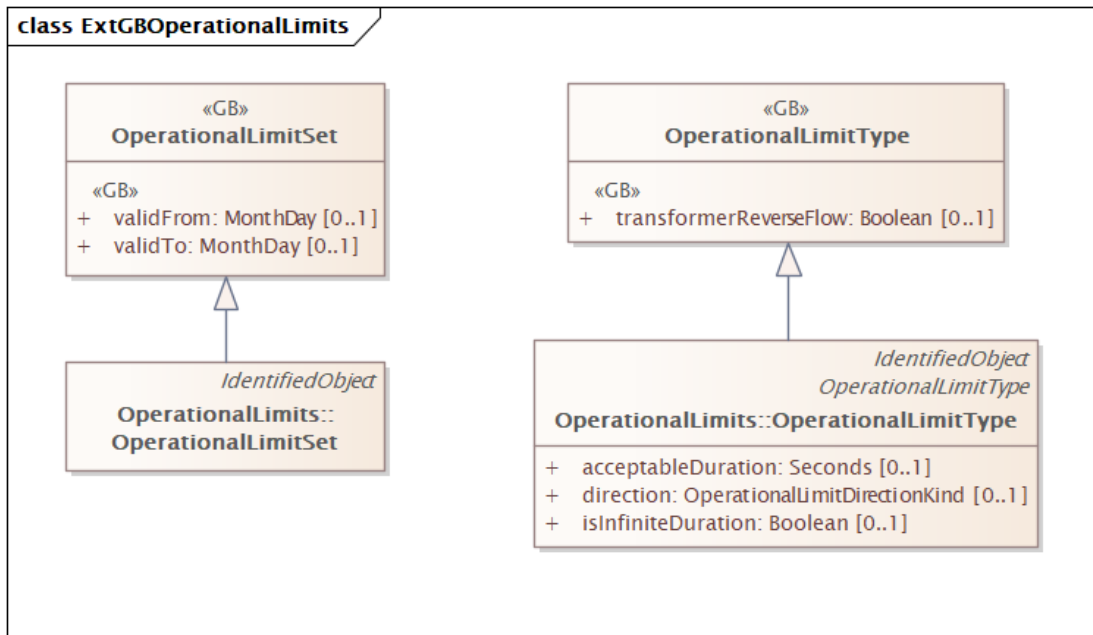This package contains extensions of operational limits.

Figure 2 – Class diagram ExtGBOperationalLimits::ExtGBOperationalLimits

Figure 2: The diagram shows extensions related to operational limits.

2.2 (GB) OperationalLimitSet root class

Class that extends CIM OperationalLimitSet.

Table 10 shows all attributes of OperationalLimitSet.

Table 10 – Attributes of ExtGBOperationalLimits::OperationalLimitSet

name	mult	type	description
validFrom	0..1	MonthDay	(GB) Defines the beginning of the validity period of the operational limit set.
validTo	0..1	MonthDay	(GB) Defines the end of the validity period of the operational limit set. Used only in combination with validFrom and in case duration is not provided.

2.3 (GB) OperationalLimitType root class

Class that extends CIM OperationalLimitType.

Table 11 shows all attributes of OperationalLimitType.

Table 11 – Attributes of ExtGBOperationalLimits::OperationalLimitType

name	mult	type	description
transformerReverseFlow	0..1	Boolean	(GB) Limit applies to transformer flow in reverse of normal (high to low voltage level) direction. High is the winding that has TransformerEnd.endNumber equal to 1. If true,

name	mult	type	description
			the OperationalLimitType defines a type for reverse limit.

3 Extensions related to Busbar results and capacities

3.1 General

This package includes extensions related to an exchange of summary results on short circuit and firm capacity.
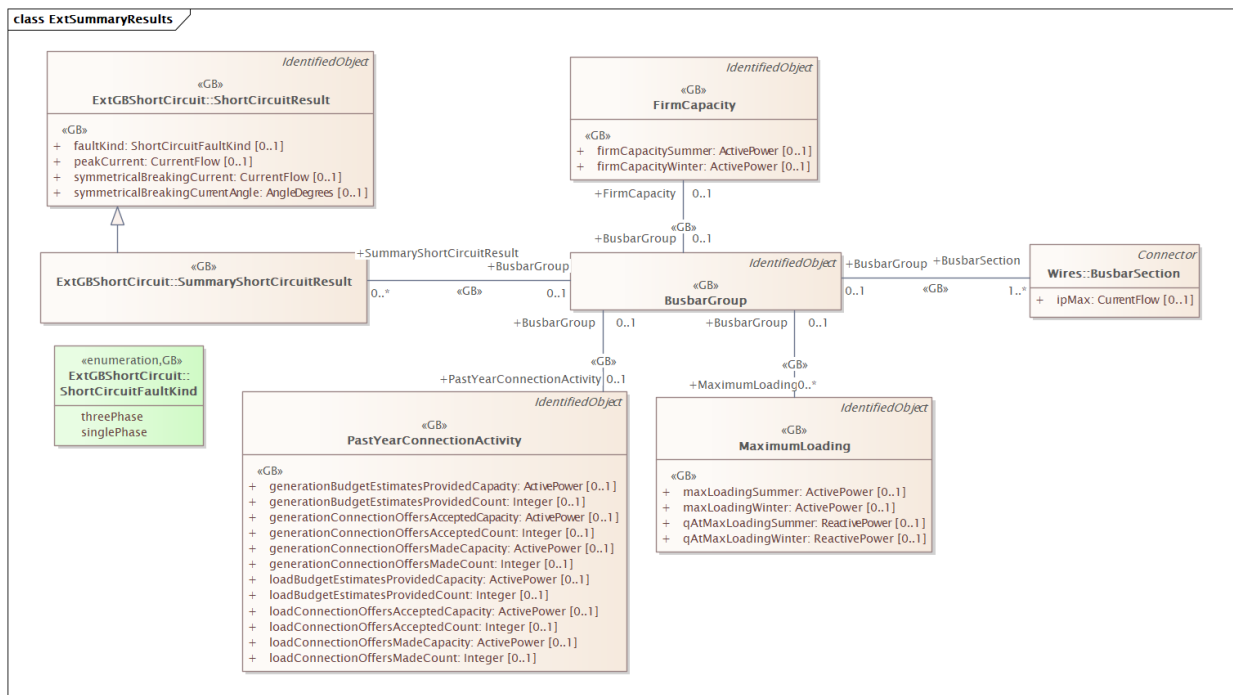
Figure 3 – Class diagram ExtGBSummaryResults::ExtSummaryResults

Figure 3: This diagram shows the model for summary results.

3.2 (GB) BusbarGroup

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

Collection of busbar sections for the purpose of reporting results applicable to the group.

Table 12 shows all attributes of BusbarGroup.

Table 12 – Attributes of ExtGBSummaryResults::BusbarGroup

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

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 13 shows all association ends of BusbarGroup with other classes.

Table 13 – Association ends of ExtGBSummaryResults::BusbarGroup with other classes

mult from	name	mult to	type	description
0..1	BusbarSection	1..*	BusbarSection	(GB) The busbar section included in this busbar group.
0..1	SummaryShortCircuitResult	0..*	SummaryShortCircuitResult	(GB) The summary of short circuit results related to this busbar group.
0..1	FirmCapacity	0..1	FirmCapacity	(GB) The firm capacity that belongs to this busbar group.
0..1	MaximumLoading	0..*	MaximumLoading	(GB) The maximum loading that is assigned to this busbar group.
0..1	PastYearConnectionActivity	0..1	PastYearConnectionActivity	(GB) The part year connection activity that belongs to this busbar group.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

3.3 (GB) FirmCapacity

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

Seasonal busbar group firm capacity information.

Table 14 shows all attributes of FirmCapacity.

Table 14 – Attributes of ExtGBSummaryResults::FirmCapacity

name	mult	type	description
firmCapacitySummer	0..1	ActivePower	(GB) Summer firm capacity.
firmCapacityWinter	0..1	ActivePower	(GB) Winter firm capacity.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject

name	mult	type	description
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 15 shows all association ends of FirmCapacity with other classes.

Table 15 – Association ends of ExtGBSummaryResults::FirmCapacity with other classes

mult from	name	mult to	type	description
0..1	BusbarGroup	0..1	BusbarGroup	(GB) The busbar group that has this firm capacity.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

3.4 (GB) MaximumLoading

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

Information on maximum busbar group loading during summer and winter periods.

Information may be historic or forecast.

Table 16 shows all attributes of MaximumLoading.

Table 16 – Attributes of ExtGBSummaryResults::MaximumLoading

name	mult	type	description
maxLoadingSummer	0..1	ActivePower	(GB) Summer active power maximum loading.
qAtMaxLoadingSummer	0..1	ReactivePower	(GB) Reactive power at time of summer active power maximum loading.
maxLoadingWinter	0..1	ActivePower	(GB) Winter active power maximum loading.
qAtMaxLoadingWinter	0..1	ReactivePower	(GB) Reactive power at time of winter active power maximum loading.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 17 shows all association ends of MaximumLoading with other classes.

Table 17 – Association ends of ExtGBSummaryResults::MaximumLoading with other classes

mult from	name	mult to	type	description
0..*	BusbarGroup	0..1	BusbarGroup	(GB) The busbar group that has maximum loading.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

3.5 (GB) PastYearConnectionActivity

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

A summary of load and generation connection activity over the last year related to a given busbar group. Counts and capacities of proposed connections, aggregated at the busbar group level, are provided for the following activities: budget estimates provided, connections offered and connection offers accepted.

Table 18 shows all attributes of PastYearConnectionActivity.

Table 18 – Attributes of ExtGBSummaryResults::PastYearConnectionActivity

name	mult	type	description
generationBudgetEstimatesProvidedCount	0..1	Integer	(GB) Count of generation connection requests associated with a busbar group for which budget estimates were provided in the last year.
generationBudgetEstimatesProvidedCapacity	0..1	ActivePower	(GB) Total active power capacity of connection requests counted by generationBudgetEstimatesProvidedCount.
generationConnectionOffersMadeCount	0..1	Integer	(GB) Count of generation connection requests associated with a busbar group for which connection offers were made in the last year.
generationConnectionOffersMadeCapacity	0..1	ActivePower	(GB) Total active power capacity of connection requests counted by generationConnectionOffersMadeCount.
generationConnectionOffersAcceptedCount	0..1	Integer	(GB) Count of generation connection requests associated with a busbar group for which connection offers were accepted in the last year.
generationConnectionOffersAcceptedCapacity	0..1	ActivePower	(GB) Total active power capacity of connection requests counted by generationConnectionOffersAcceptedCount.
loadBudgetEstimatesProvidedCount	0..1	Integer	(GB) Count of load connection requests associated with a busbar group for which budget estimates were provided in the last year.

name	mult	type	description
loadBudgetEstimatesProvidedCapacity	0..1	ActivePower	(GB) Total active power capacity of connection requests counted by loadBudgetEstimatesProvidedCount.
loadConnectionOffersMadeCount	0..1	Integer	(GB) Count of load connection requests associated with a busbar group for which connection offers were made in the last year.
loadConnectionOffersMadeCapacity	0..1	ActivePower	(GB) Total active power capacity of connection requests counted by loadConnectionOffersMadeCount.
loadConnectionOffersAcceptedCount	0..1	Integer	(GB) Count of load connection requests associated with the busbar group for which connection offers were accepted in the last year.
loadConnectionOffersAcceptedCapacity	0..1	ActivePower	(GB) Total active power capacity of connection requests counted by loadConnectionOffersAcceptedCount.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

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

Table 19 – Association ends of ExtGBSummaryResults::PastYearConnectionActivity with other classes

mult from	name	mult to	type	description
0..1	BusbarGroup	0..1	BusbarGroup	(GB) The busbar group that has this past year connection activity.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

4 Extensions to CIM Transformer model

4.1 General

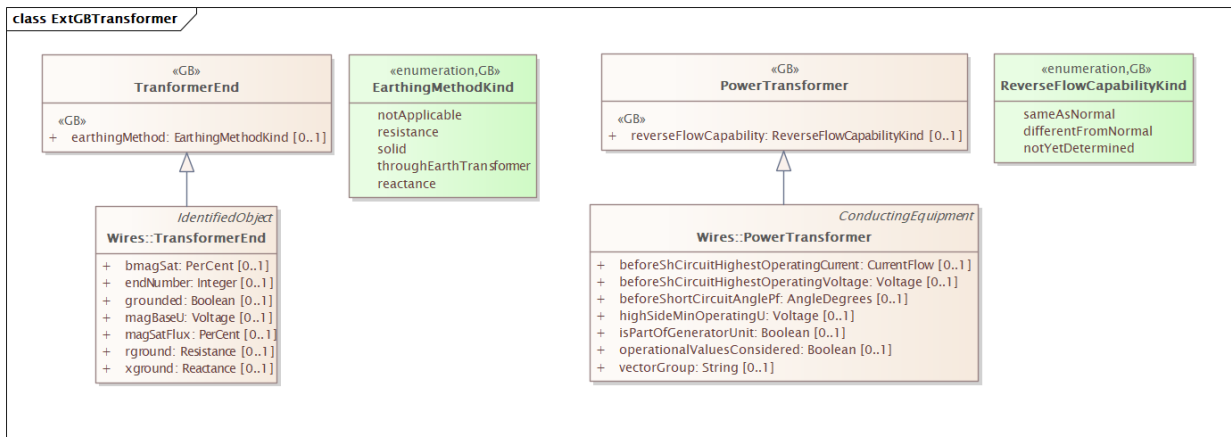This package contains extensions of transformer.

Figure 4 – Class diagram ExtGBTransformer::ExtGBTransformer

Figure 4: The diagram shows extensions related to transformer.

4.2 (GB) PowerTransformer root class

Class that extends CIM PowerTransformer.

Table 20 shows all attributes of PowerTransformer.

Table 20 – Attributes of ExtGBTransformer::PowerTransformer

name	mult	type	description
reverseFlowCapability	0..1	ReverseFlowCapabilityKind	(GB) Nature of transformer's reverse flow capability.

4.3 (GB) TranformerEnd root class

Class that extends CIM TransformerEnd.

Table 21 shows all attributes of TranformerEnd.

Table 21 – Attributes of ExtGBTransformer::TranformerEnd

name	mult	type	description
earthingMethod	0..1	EarthingMethodKind	(GB) Type of grounding.

4.4 (GB) EarthingMethodKind enumeration

The method of grounding employed on a transformer winding.

Table 22 shows all literals of EarthingMethodKind.

Table 22 – Literals of ExtGBTransformer::EarthingMethodKind

literal	value	description
throughEarthTransformer		Through earth transformer (LTDS), Through earthing transformer (GC0139).
solid		Solid grounding (LTDS), Solid (GC0139).
resistance		Resistance grounding (LTDS), Neutral grounding resistors (GC0139).

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literal	value	description
reactance		Reactance grounding (LTDS).
notApplicable		Not earthed.

4.5 (GB) ReverseFlowCapabilityKind enumeration

Describes the transformer's reverse flow capability with respect to its normal flow capability.

Table 23 shows all literals of ReverseFlowCapabilityKind.

Table 23 – Literals of ExtGBTransformer::ReverseFlowCapabilityKind

literal	value	description
sameAsNormal		Transformer's reverse flow capability is same as its normal direction flow capability.
differentFromNormal		Transformer's reverse flow capability is different from its normal direction flow capability.
notYetDetermined		Transformer's reverse flow capability is unknown.

5 Extensions related to Short Circuit

5.1 General

This package contains extension proposals to include an exchange of short circuit results.
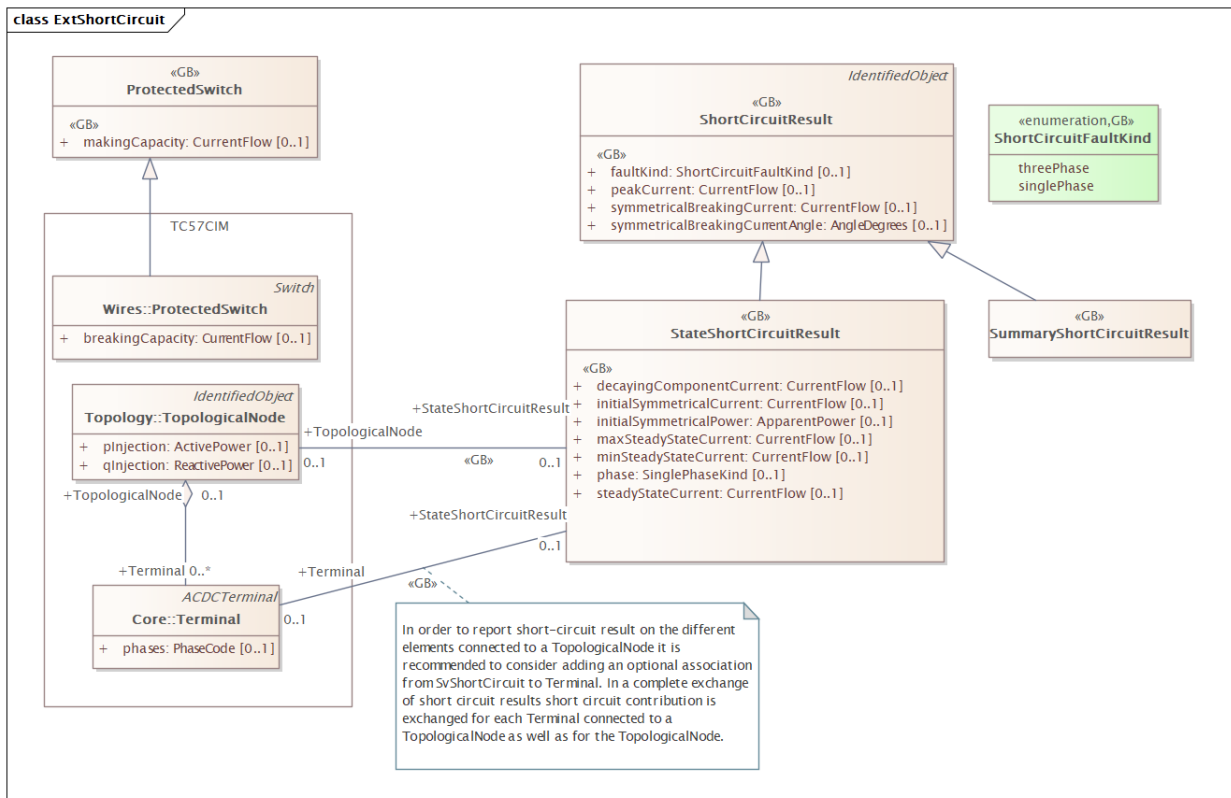
Figure 5 – Class diagram ExtGBShortCircuit::ExtShortCircuit

Figure 5: The diagram presents the extensions related to exchange of short circuit result.

5.2 (GB) ProtectedSwitch root class

Class that extends CIM ProtectedSwitch.

Table 24 shows all attributes of ProtectedSwitch.

Table 24 – Attributes of ExtGBShortCircuit::ProtectedSwitch

name	mult	type	description
makingCapacity	0..1	CurrentFlow	(GB) The making current of the circuit breaker is the maximum peak value of the current that the breaker can interrupt without any damage if the breaker is closed at fault.

5.3 (GB) ShortCircuitResult

Inheritance path = IdentifiedObject : ExtEuIdentifiedObject

Used to report on result of a short circuit calculation or an outcome of multiple calculations.

Table 25 shows all attributes of ShortCircuitResult.

Table 25 – Attributes of ExtGBShortCircuit::ShortCircuitResult

name	mult	type	description
faultKind	0..1	ShortCircuitFaultKind	(GB)

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name	mult	type	description
peakCurrent	0..1	CurrentFlow	(GB) Peak short-circuit current. It is the maximum possible instantaneous value of prospective (available) short-circuit current. It is ip according to IEC 60909-0.
symmetricalBreakingCurrent	0..1	CurrentFlow	(GB) Symmetrical short-circuit breaking current. It is a root mean square value of an integral cycle of the symmetrical alternate current component of the prospective short-circuit current at the instant of contact separation of the first pole to open of a switching device. It is Ib according to IEC 60909-0.
symmetricalBreakingCurrentAngle	0..1	AngleDegrees	(GB) Symmetrical short-circuit breaking current angle. It is the angle of a root mean square value of an integral cycle of the symmetrical alternate current component of the prospective short-circuit current at the instant of contact separation of the first pole to open of a switching device.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 26 shows all association ends of ShortCircuitResult with other classes.

Table 26 – Association ends of ExtGBShortCircuit::ShortCircuitResult with other classes

mult from	name	mult to	type	description
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

5.4 (GB) StateShortCircuitResult

Inheritance path = ShortCircuitResult : IdentifiedObject : ExtEuIdentifiedObject

Short-circuit result calculated on a power system state.

Table 27 shows all attributes of StateShortCircuitResult.

Table 27 – Attributes of ExtGBShortCircuit::StateShortCircuitResult

name	mult	type	description
initialSymmetricalCurrent	0..1	CurrentFlow	(GB) Initial symmetrical short-circuit current. It is a root mean square value of the alternate current symmetrical component of a prospective (available) short-circuit current, applicable at the instant of short circuit if the impedance remains at zero-time value. It is Ik" according to IEC 60909-0.
steadyStateCurrent	0..1	CurrentFlow	(GB) Steady state short-circuit current. It is a root mean square value of the short-circuit current which remains after the decay of the transient phenomena. It is Ik according to IEC 60909-0.
initialSymmetricalPower	0..1	ApparentPower	(GB) Initial symmetrical short-circuit power. It is a fictitious value determined as a product of the initial symmetrical short-circuit current, the nominal system voltage and the factor square root of 3. It is Sk" according to IEC 60909-0.
decayingComponentCurrent	0..1	CurrentFlow	(GB) Decaying (aperiodic) component of short-circuit current. It is a mean value between the top and the bottom envelope of a short-circuit current decaying from an initial value to zero. It is idc according to IEC 60909-0.
maxSteadyStateCurrent	0..1	CurrentFlow	(GB) Maximum steady state short-circuit current. It is Ikmax according to IEC 60909-0.
minSteadyStateCurrent	0..1	CurrentFlow	(GB) Minimum steady state short-circuit current. It is Ikmin according to IEC 60909-0.
phase	0..1	SinglePhaseKind	(GB) The terminal phase at which the short-circuit information is valid. If missing, the information is assumed to be three phase.
faultKind	0..1	ShortCircuitFaultKind	(GB) inherited from: ShortCircuitResult
peakCurrent	0..1	CurrentFlow	(GB) inherited from: ShortCircuitResult
symmetricalBreakingCurrent	0..1	CurrentFlow	(GB) inherited from: ShortCircuitResult
symmetricalBreakingCurrentAngle	0..1	AngleDegrees	(GB) inherited from: ShortCircuitResult
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 28 shows all association ends of StateShortCircuitResult with other classes.

Table 28 – Association ends of ExtGBShortCircuit::StateShortCircuitResult with other classes

mult from	name	mult to	type	description
0..1	Terminal	0..1	Terminal	(GB) The terminal to which the result is exchanged.
0..1	TopologicalNode	0..1	TopologicalNode	(GB) The TopologicalNode on which the short-circuit information is reported.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

5.5 (GB) SummaryShortCircuitResult

Inheritance path = ShortCircuitResult : IdentifiedObject : ExtEuIdentifiedObject

Short circuit result obtained from multiple short circuit calculations using different power system states.

Table 29 shows all attributes of SummaryShortCircuitResult.

Table 29 – Attributes of ExtGBShortCircuit::SummaryShortCircuitResult

name	mult	type	description
faultKind	0..1	ShortCircuitFaultKind	(GB) inherited from: ShortCircuitResult
peakCurrent	0..1	CurrentFlow	(GB) inherited from: ShortCircuitResult
symmetricalBreakingCurrent	0..1	CurrentFlow	(GB) inherited from: ShortCircuitResult
symmetricalBreakingCurrentAngle	0..1	AngleDegrees	(GB) inherited from: ShortCircuitResult
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject
energyIdentCodeEic	0..1	String	(European) inherited from: ExtEuIdentifiedObject
shortName	0..1	String	(European) inherited from: ExtEuIdentifiedObject

Table 30 shows all association ends of SummaryShortCircuitResult with other classes.

Table 30 – Association ends of ExtGBShortCircuit::SummaryShortCircuitResult with other classes

mult from	name	mult to	type	description
0..*	BusbarGroup	0..1	BusbarGroup	(GB) The busbar group that has this short circuit result.
0..1	DiagramObjects	0..*	DiagramObject	inherited from: IdentifiedObject
0..1	Name	0..*	Name	(NC) inherited from: IdentifiedObject

mult from	name	mult to	type	description
0..1	ParameterEvent	0..*	ParameterEvent	inherited from: IdentifiedObject
0..1	AlternativeIdentifier	0..*	Name	(NC) inherited from: IdentifiedObject

5.6 (GB) ShortCircuitFaultKind enumeration

Short circuit fault kind.

Table 31 shows all literals of ShortCircuitFaultKind.

Table 31 – Literals of ExtGBShortCircuit::ShortCircuitFaultKind

literal	value	description
threePhase		Three phase short circuit fault.
singlePhase		Single phase short circuit fault.