European Network of
Transmission System Operators
for Electricity

entsoe

Real Grid Test Configuration

Version 2

CGMES 2.4.15

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1. Introduction

The document is providing an overview of the Real Grid Test Configuration applicable for the ENTSO-E Common Grid Model Exchange Standard (CGMES) Conformity Assessment Framework hereafter referred as “the Framework”.

Versioning of the document is following the rules specified in the Chapter 5.1 of the CGMES.

Disclaimer

The Test Configurations (test models) are owned by ENTSO-E and are provided by ENTSO-E “as it is”. To the fullest extent permitted by law, ENTSO-E shall not be liable for any damages of any kind arising out of the use of the models (including any of their subsequent modifications). ENTSO-E neither warrants, nor represents that the use of the models will not infringe the rights of third parties. Any use of the models shall include a reference to ENTSO-E. ENTSO-E web site is the only official source of information related to these models.

2. Usage and content of the test configuration

The Real Grid (RG) test configuration is available as a zip package which contains instance data for the following CGMES profiles:

- Equipment;
- Topology;
- Steady State Hypothesis;
- State Variables.

The RG test configuration represents a bus-branch model of a real power system. The test configuration does not include boundary set as the model has no dangling references to external power systems or boundaries.

It includes only useful switches, so the topology can be considered as semi-detailed topology.

rdf:ID is expressed as a string (see R.4.1.2.4).

3. CIMdesk validation report

3.1. Validation report on the EQ instance file

Type	Class	Recurrence	Description
Warning	VoltageLevel	1166/5577	The VoltageLevel doesn't contain any child instances (or is not referenced by other instances).
Warning	ACLineSegment	53/7561	ACLineSegment.x/ACLineSegment.r ratio is too large.

The warning on VoltageLevel appears because TP file is not merged into EQ file.

The warning on ACLineSegment is a real data issue (and not a format issue).

3.2. Validation report on the TP instance file

Type	Class	Recurrence	Description
Warning	TopologicalNode	42/7359	Fewer than 2 Terminals are associated with TopologicalNode via Association Terminal.TopologicalNode, expecting at least 2.

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The warning on TopologicalNode is due to semi detailed topology.

3.3. Validation report on the SSH instance file

There are no errors and warning reported by CIMDesk.

3.4. Validation report on the SV instance file

There are no errors and warning reported by CIMDesk.

3.5. Validation report on the complete model

Type	Class	Recurrence	Description
Warning	TopologicalNode	42/7359	Fewer than 2 Terminals are associated with TopologicalNode via Association Terminal.TopologicalNode, expecting at least 2.
Warning	SvVoltage	240/7359	The voltage value of the SvVoltage is 10% greater or less than the nominal voltage.
Warning	TopologicalNode	204/7359	The TopologicalNode is an island without Terminals connected or with all of the associated Terminals disconnected.
Warning	SvPowerFlow	4/8348	The positive active power is injected into a SynchronousMachine.
Warning	SvPowerFlow	253/8348	The negative active power is consumed by a EnergyConsumer.
Warning	PowerTransformerEnd	18/3018	The rated voltage doesn't match the nominal voltage of the connected node.
Warning	RegulatingControl	10/1350	The target voltage specified in the RegulatingControl doesn't match the nominal voltage of the regulated node.
Warning	TapChangerControl	9/1194	The target voltage specified in the RegulatingControl doesn't match the nominal voltage of the regulated node.
Warning	ACLineSegment	53/7561	ACLineSegment.x/ACLineSegment.r ratio is too large.

All these warning are acceptable for this model. They are read data issues. For instance:

- The first warning on TopologicalNode is already commented above.
- The second warning on TopologicalNode is due to semi detailed topology.
- The three warnings on SvVoltage and SvPowerFlow are real data issues (and not a format issue).
- The warning on PowerTransformerEnd is a real data issue (and not a format issue).
- The warning on RegulatingControl is a real data issue (and not a format issue).
- The warning on TapChangerControl is a real data issue (and not a format issue).
- The warning on ACLineSegment is a real data issue (and not a format issue).

Type	Class	Recurrence	Description
Alert	PowerTransformer	191/1509	The PowerTransformer connects two different Substations.

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The alert on PowerTransformer is a real data issue (and not a format issue).

4. Number and types of elements in the model

Class	# of Objects
ACLineSegment	7561
BaseVoltage	8
ControlArea	1
ControlAreaGeneratingUnit	1
CurrentLimit	32182
CurveData	2720
EnergyConsumer	6687
FossilFuel	138
GeneratingUnit	25
GeographicalRegion	1
HydroGeneratingUnit	727
HydroPump	2
LinearShuntCompensator	311
LoadResponseCharacteristic	6687
NuclearGeneratingUnit	59
OperationalLimitSet	17960
OperationalLimitType	6
PhaseTapChangerTable	9
PhaseTapChangerTablePoint	280
PhaseTapChangerTabular	9
PowerTransformer	1509
PowerTransformerEnd	3018
RatioTapChanger	1185
ReactiveCapabilityCurve	1347
RegulatingControl	1350
StaticVarCompensator	3
SubGeographicalRegion	7
Substation	4875
SvPowerFlow	8348
SvShuntCompensatorSections	311
SvTapStep	1194
SvVoltage	7359
Switch	1292
SynchronousMachine	1347
TapChangerControl	1194
Terminal	29072
ThermalGeneratingUnit	138
TopologicalIsland	131
TopologicalNode	7359
VoltageLevel	5577
WindGeneratingUnit	398

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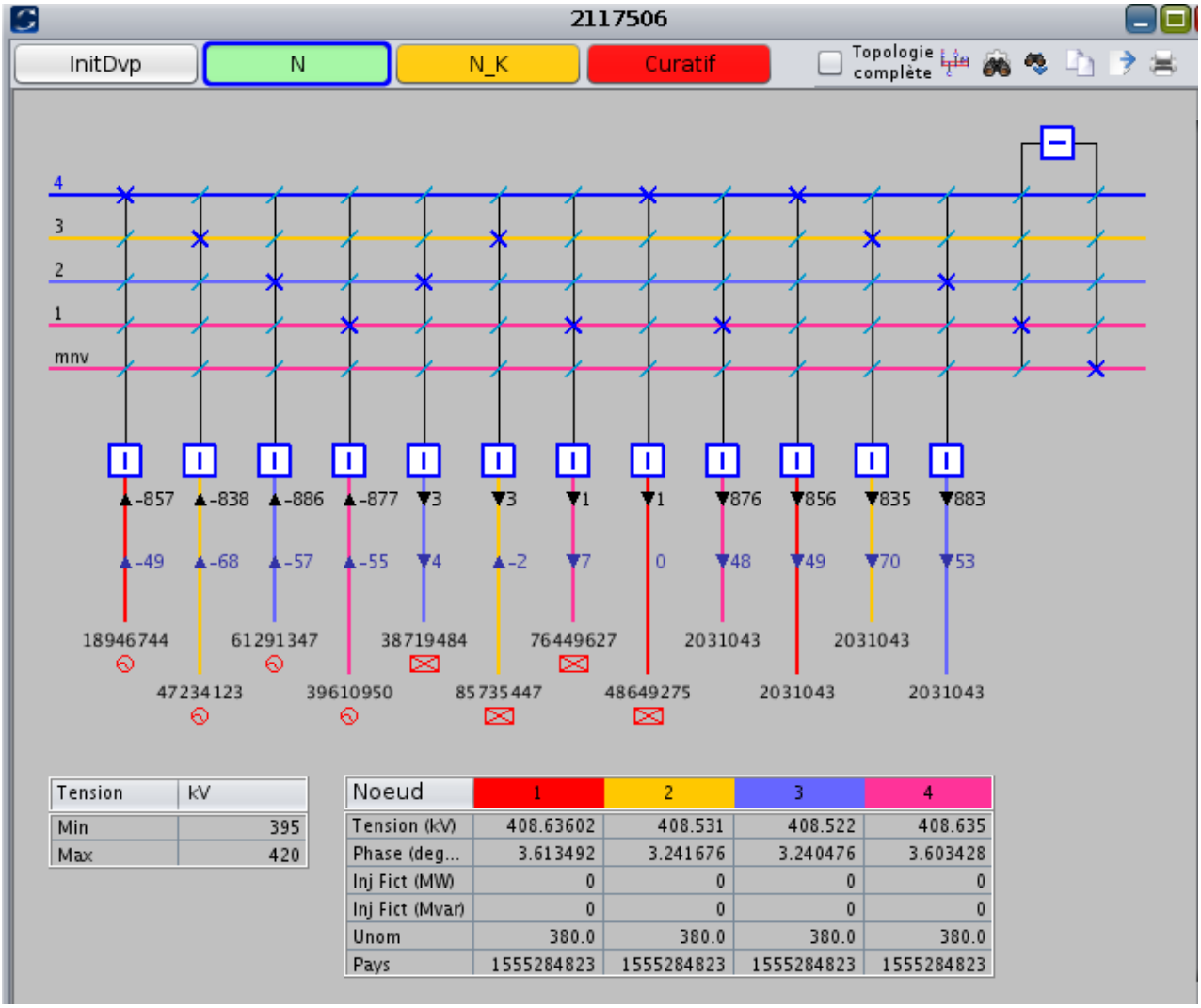
5. Example of a 380 kV substation (substation 2117506)

In the following diagrams:

- black arrows represent active injection (P)
- blue arrows represent reactive injection (Q)



Tension	kV
Min	395
Max	420

Noeud	1	2	3	4
Tension (kV)	408.63602	408.531	408.522	408.635
Phase (deg...	3.613492	3.241676	3.240476	3.603428
Inj Fict (MW)	0	0	0	0
Inj Fict (Mvar)	0	0	0	0
Unom	380.0	380.0	380.0	380.0
Pays	1555284823	1555284823	1555284823	1555284823

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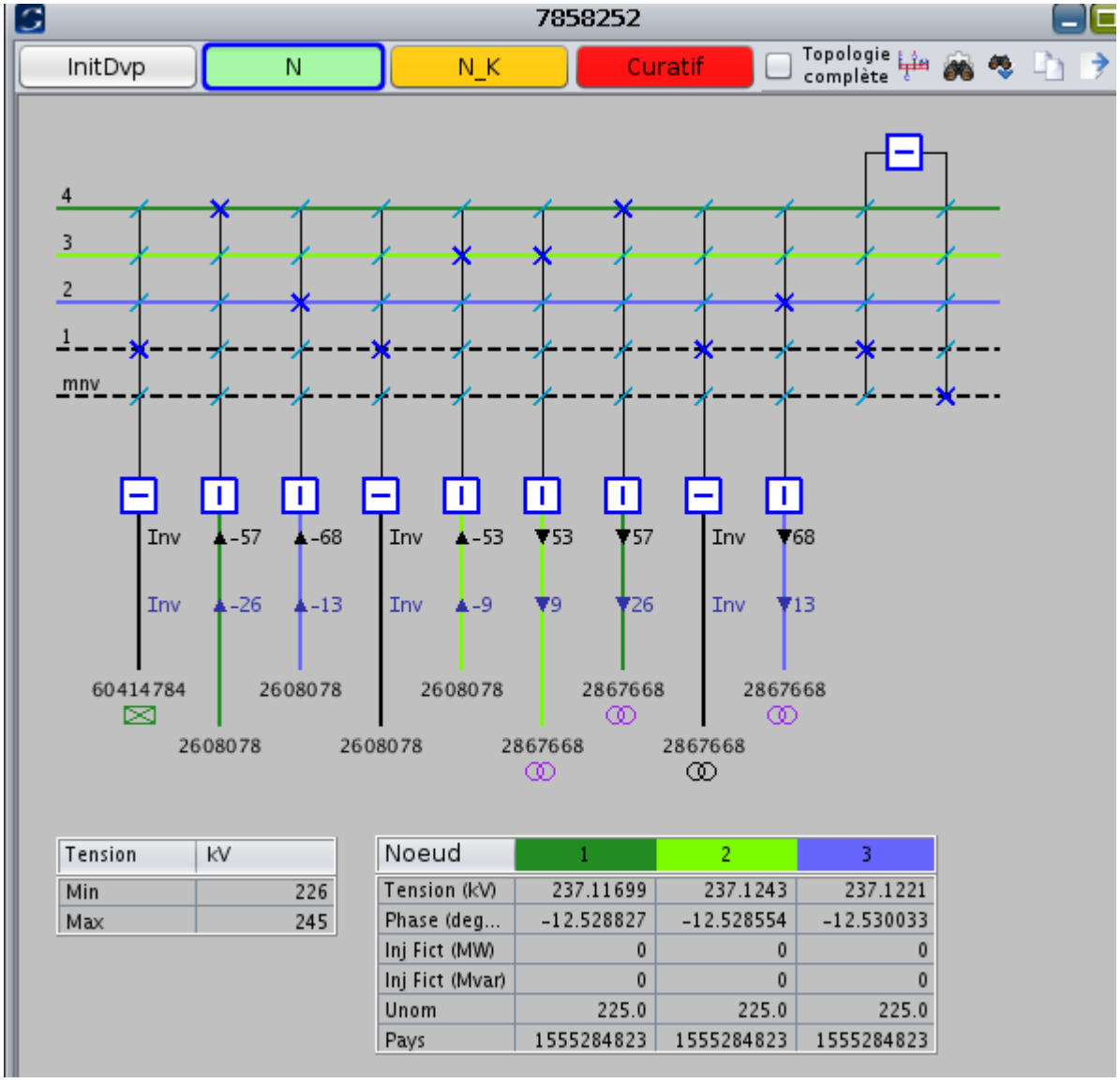
6. Example of a 225 kV substation (substation 7858252)



Tension	kV
Min	226
Max	245

Noeud	1	2	3
Tension (kV)	237.11699	237.1243	237.1221
Phase (deg...	-12.528827	-12.528554	-12.530033
Inj Fict (MW)	0	0	0
Inj Fict (Mvar)	0	0	0
Unom	225.0	225.0	225.0
Pays	1555284823	1555284823	1555284823

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7. Load flow calculation information

We have used the Newton-Raphson load flow with reactive limits and with fixed tap changers.

Number of iteration: 9.

Intermediary slack bus: 25940661, followed by slack distribution over all buses.

Total losses: 974 MW

Total generation: 51 699 MW

Total load: 50 725 MW

Load flow results are given in a separated spreadsheet.

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