Task 2

Assess the provided EQ profile instance (CGMES model format in xml containing information on network physical elements) .

1. What is the total production capacity of the generators in the model?
   The nominal production capacity of the generators is 1440 MW and the total production capacity at maximum operating value is 1500 MW.

```
<cim:GeneratingUnit rdf:ID="_049438a6-780a-44fe-a788-ebe385d98e25">
  <cim:IdentifiedObject.name>Gen-12923</cim:IdentifiedObject.name>
  <cim:IdentifiedObject.description>Machine</cim:IdentifiedObject.description>
  <cim:Equipment.aggregate>false</cim:Equipment.aggregate>
  <cim:Equipment.EquipmentContainer rdf:resource="#_c49942d6-8b01-4b01-b5e8-f1180f84906c" />
  <cim:GeneratingUnit.genControlSource rdf:resource="http://iec.ch/TC57/CIM100#GeneratorContro
  <cim:GeneratingUnit.maxOperatingP>1000</cim:GeneratingUnit.maxOperatingP>
  <cim:GeneratingUnit.minOperatingP>300</cim:GeneratingUnit.minOperatingP>
  <cim:GeneratingUnit.nominalP>990</cim:GeneratingUnit.nominalP>
  <cim:IdentifiedObject.mRID>049438a6-780a-44fe-a788-ebe385d98e25</cim:IdentifiedObject.mRID>
<cim:GeneratingUnit rdf:ID="_ca80ee09-3bed-4884-bc28-6dc89d067289">
  <cim:IdentifiedObject.name>Gen-12910</cim:IdentifiedObject.name>
  <cim:IdentifiedObject.description>Machine</cim:IdentifiedObject.description>
  <cim:Equipment.aggregate>false</cim:Equipment.aggregate>
  <cim:Equipment.EquipmentContainer rdf:resource="#_c49942d6-8b01-4b01-b5e8-f1180f84906c" />
  <cim:GeneratingUnit.genControlSource rdf:resource="http://iec.ch/TC57/CIM100#GeneratorControl
  <cim:GeneratingUnit.maxOperatingP>250</cim:GeneratingUnit.maxOperatingP>
  <cim:GeneratingUnit.minOperatingP>130</cim:GeneratingUnit.minOperatingP>
  <cim:GeneratingUnit.nominalP>225</cim:GeneratingUnit.nominalP>
  <cim:IdentifiedObject.mRID>ca80ee09-3bed-4884-bc28-6dc89d067289</cim:IdentifiedObject.mRID>
</cim:GeneratingUnit>
<cim:GeneratingUnit rdf:ID="_b850063d-eae7-4675-bc98-4642d3076783">
  <cim:IdentifiedObject.name>Gen-12908</cim:IdentifiedObject.name>
  <cim:IdentifiedObject.description>Machine</cim:IdentifiedObject.description>
  <cim:Equipment.aggregate>false</cim:Equipment.aggregate>
  <cim:Equipment.EquipmentContainer rdf:resource="#_c49942d6-8b01-4b01-b5e8-f1180f84906c" />
  <cim:GeneratingUnit.genControlSource rdf:resource="http://iec.ch/TC57/CIM100#GeneratorControl
  <cim:GeneratingUnit.maxOperatingP>250</cim:GeneratingUnit.maxOperatingP>
  <cim:GeneratingUnit.minOperatingP>130</cim:GeneratingUnit.minOperatingP>
  <cim:GeneratingUnit.nominalP>225</cim:GeneratingUnit.nominalP>
  <cim:IdentifiedObject.mRID>b850063d-eae7-4675-bc98-4642d3076783</cim:IdentifiedObject.mRID>
```

2. What are the nominal voltages of the windings of the transformer NL_TR2_2 (ID: _2184f365-8cd5-4b5d-8a28-9d68603bb6a4)
   The nominal voltages of the windings are 15,75 kV and 220 V.

```
<cim:PowerTransformerEnd.r>0</cim:PowerTransformerEnd.r>
<cim:PowerTransformerEnd.r0>0</cim:PowerTransformerEnd.r0>
<cim:PowerTransformerEnd.ratedS>1260</cim:PowerTransformerEnd.ratedS>
<cim:PowerTransformerEnd.ratedU>15.75</cim:PowerTransformerEnd.ratedU>
<cim:PowerTransformerEnd.x>0</cim:PowerTransformerEnd.x>
<cim:PowerTransformerEnd.phaseAngleClock>0</cim:PowerTransformerEnd.phaseAngleClock
<cim:PowerTransformerEnd.r>0.069143</cim:PowerTransformerEnd.r>
<cim:PowerTransformerEnd.r0>0.069143</cim:PowerTransformerEnd.r0>
<cim:PowerTransformerEnd.ratedS>1260</cim:PowerTransformerEnd.ratedS>
<cim:PowerTransformerEnd.ratedU>220</cim:PowerTransformerEnd.ratedU>
<cim:PowerTransformerEnd.x>5.377333</cim:PowerTransformerEnd.x>
<cim:PowerTransformerEnd.x0>5.377333</cim:PowerTransformerEnd.x0>
```

3. What is permanently allowed limit for line segment NL-Line_5 (ID: _e8acf6b6-99cb-45ad-b8dc-16c7866a4ddc) and temporarily allowed. What is difference between those limits.

For the line segment NL_Line_5 the permanently allowed limit is 1876 A and the temporarily allowed limit is 500 A.

```
<cim:CurrentLimit rdf:ID="_56105225-1754-40da-b6df-43fd7cfeb50a">
  <cim:IdentifiedObject.name>PATL</cim:IdentifiedObject.name>
  <cim:OperationalLimit.OperationalLimitSet rdf:resource="#_b4d8f5e2-7b7a-45eb-b65a-252843d6acf4" />
  <cim:OperationalLimit.OperationalLimitType rdf:resource="#_1aee0921-7cbe-481c-9078-daf66ab2a950" />
  <cim:CurrentLimit.normalValue>1876</cim:CurrentLimit.normalValue>
  <cim:IdentifiedObject.mRID>56105225-1754-40da-b6df-43fd7cfeb50a</cim:IdentifiedObject.mRID>
</cim:CurrentLimit>
<cim:CurrentLimit rdf:ID="_86764bf6-6472-4ebe-9d6b-bcceffe66dad">
  <cim:IdentifiedObject.name>TATL</cim:IdentifiedObject.name>
  <cim:OperationalLimit.OperationalLimitSet rdf:resource="#_b4d8f5e2-7b7a-45eb-b65a-252843d6acf4" />
  <cim:OperationalLimit.OperationalLimitType rdf:resource="#_bf2a4896-2e92-465b-b5f9-b033993a31c8" />
  <cim:CurrentLimit.normalValue>500</cim:CurrentLimit.normalValue>
  <cim:IdentifiedObject.mRID>86764bf6-6472-4ebe-9d6b-bcceffe66dad</cim:IdentifiedObject.mRID>
</cim:CurrentLimit>
```

Permanent limits are set according to long term limits of lines, generators, transformers etc. These elements also have short term higher electrical limits, that can be reached when a fault or disturbance occurs in the system. The time limit on temporary limits depends on the real electrical parameters of transformers and lines.

4. Which generator is set as slack in the model? Why does model need slack node?

The synchronous machine NL-G1 is set as a slack node. The slack node shows the reactive and active power needed to balance the model. This node also acts as a reference for voltage angles. The generator parameters for the slack node are unspecified. The slack node allows for simulation of loads and different scenarios while showing the total power needed to balance the system.

```
</cim:TieFlow>
<cim:RegulatingControl rdf:ID="_04f338d3-3c0d-433f-a77b-e36dd256f0f0">
  <cim:IdentifiedObject.name>NL-G1</cim:IdentifiedObject.name>
  <cim:RegulatingControl.mode rdf:resource="http://iec.ch/TC57/CIM100#RegulatingControlModeKind.voltage
  <cim:RegulatingControl.Terminal rdf:resource="#_faab7959-f9bf-421b-bc3f-d364e0c1388b" />
  <cim:IdentifiedObject.mRID>04f338d3-3c0d-433f-a77b-e36dd256f0f0</cim:IdentifiedObject.mRID>
</cim:RegulatingControl>
```

5. Find mistakes in the model (both semantic, power system related and logical errors are present)

The limits set on line segment NL_Line_5 should be reversed. The temporary limit should always be higher than the temporary limit.

Three transformers (NL_TR2_2, NL_TR2_3 and NL_TR2_4) all have the same rdf:ID.