NEPLAN®
Smarter Tools

NEPLAN ListXML format

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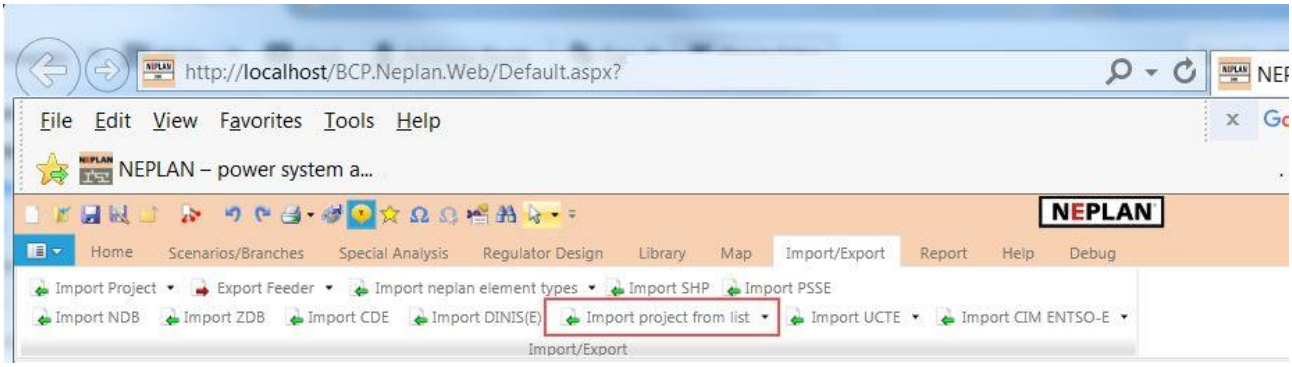
Introduction

The ListXML format is an open protocol, which can be used to create a NEPLAN 360 project from external data. It is an XML format that can be validated with ImportProjectContainer.xsd. Once a valid file was created it can be imported in NEPLAN 360 in the tab “Import/Export” choosing “Import project from list”.



In case the data from which the List.xml file is generated originates from a geographic database like a GIS coordinates in meters in the country’s projection should be used, not unprojected longitude/latitude values.

In the following the single parameters are described.

Main structure

The XML file starts with the following lines:

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<ImportProjectContainer xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema">
```

And ends with

```
</ImportProjectContainer>
```

The tag ImportProjectContainer embraces the following parameters:

- `Name`; The name of the project created in NEPLAN 360 by importing this file
- `Description`; Textual description of the project
- `BusFrequency`;
- `Version`; The most recent version is 2.0. Specifying this version makes sure, that the coordinates of symbols and nodes are interpreted as their center.

- `GraphicScalingFactor`; Defines the scaling factor of the NEPLAN project, that later can be modified in NEPLAN 360 in Diagram Properties -> Coordinate System -> Factor
- `DiagramName`; Name of the first diagram in the NEPLAN project
- `ProjectLibrayName`; Name of the project library to use (has to be present in the moment when the XML file is imported.
- `DoReduceLines`; true/false: If lines with same line type are connected, the nodes between them will be reduced. Nodes which connect 3 lines are not reduced.
- `DoPhaseBalancing`; true/false: Single phase loads are distributed in order to have a symmetrical loading, if possible.
- `DoBuildLineSections`; true/false: If lines with any line type are connected, the nodes between them will be reduced and then grouped to a single line. These lines will then consist of different line sections. Nodes which connect 3 lines are not reduced.
- `IsAsymmetricalNetwork`; true/false: Indicates, if the imported network is asymmetrical.
- `CalcWithLoadBalance`; true/false: Indicates, if the Loadflow calculation parameter will be set (calculation with load balancing)
- DoUpdate; true/false: if this is true elements of an existing project with the same name can be modified or extended. If a node of the existing project is defined, all its parameters will be refined, including its position. If existing lines and other elements are redefined they will be deleted and created again. Default is false.
- `CoordinateUnits`; 0 = mm or meters, 1= points
- `ImportWithGraphic`; Create also graphical representations of the elements in NEPLAN360
- `ScalingTrafoFactor`; Specific scaling factor for transformer symbol
- `YAxesIsUp`; if true, y values on top are higher than on bottom. Must be true for all geographic networks. Can be modified in NEPLAN 360 in Diagram Properties -> Coordinate System -> Is direction up
- `IsSchematicNetwork`; false if it is a geographic network, true it is a schematic one.
- `ShowLogSwitch`; true if a logical switch should be shown on each pin of an network element. Can be modified in NEPLAN 360 in Diagram Properties -> General -> Show log. switches
- `AutoCalculationLengths`; If true and a new line is drawn in a project imported to NEPLAN 360, the length will be calculated automatically. Can be modified in Diagram Properties -> Coordinate System -> Automatically configure line lengths

- `ElementList`. Contains a list with definitions of all network elements. The basic structure is the following:

```
<ElementList>
    <ImportElementItem>
(…)
    </ImportElementItem>
    <ImportElementItem>
(…)
    </ImportElementItem>
</ElementList>
```

  For more details see chapter below.

- `FeederList`. Contains a list with definitions of all feeders. The basic structure is the following:

```
<FeederList>
    <ImportFeederItem>
(…)
    </ ImportFeederItem >
    < ImportFeederItem >
(…)
    </ ImportFeederItem >
</FeederList>
```

  For more details see the following chapter.

ImportElementItem

Each Node, Line, Transformer, Switch, Valve etc. has to be described with an `ImportElementItem`. The following parameters are available:

- `Name`; Name of the element. **Important**, the name must be unique over the entire project!
- `aliasName1`: optional textual information displayed in the element properties of NEPLAN360
- `aliasName2`: optional textual information displayed in the element properties of NEPLAN360
- `Un`; Voltage in case of electrical networks
- `Length`; length of line

- `remove`; true or false; if this is set to true and `DoUpdate` is set to true as well this element in an existing project with the same name will be deleted. In this case the `ImportElementItem` needs to have only the parameters `Name` and `remove` defined.

- `elementType`; type of element, like Line, Busbar etc. **Must** be defined! You find a list of possible values in the appendix 1.

- `librayType`; reference to NEPLAN library; Must be defined if electrical (or water, gas) parameters are defined through the library

- `NodeName1`; not used for nodes (busbars) **must** be defined for lines and other devices (Loads, Transformers etc.). Name of the Node to which the device is connected. If the element is not connected to any device **must** be defined at least as empty string.

- `NodeName2`; In case of lines and other devices: like `NodeName1`, but for second connection of a 2- or 3 pole device.

- `NodeName3`; In case of other devices: like `NodeName1`, but for third connection of a 3 pole device.

- `OnPortNr`;

- `CoordinatesLink1`; as said before coordinates for geographical data should be in meters of the country's geosystem. For details how to define the coordinates see chapter "Defining the coordinates of nodes, devices and lines"

- `CoordinatesLink2`; In case of other devices: like `CoordinatesLink1` but for second connection of a 2- or 3 pole device

- `CoordinatesLink3`; In case of other devices: like `CoordinatesLink1` but for third connection of a 3 pole device

- `SymbolName`; NEPLAN name of symbol like `StandardBusbar` or `STANDARD`. Should **not** be defined for lines.

- `SymbolAngle`; defines rotation angle of network element in degrees. Define `<SymbolAngle>0</SymbolAngle>` for lines.

- `SymbolSize`; defines size of network element. If not defined value is 1. Should not be defined for lines.

- `numConnections`; This parameter has the value 999 for nodes, 2 for lines and for the devices it corresponds to the number of connections, e.g. 3 for a three-pole device

- `Phase`;

- `ZoneName`; name of the zone to witch this element belongs to. Optional
- `AreaName`; name of the area to witch this element belongs to. Optional
- `SubAreaName`; name of the subarea to witch this element belongs to. Optional
- `LogicalSwitch`; not for nodes (busbars); if value is 0 logical switch is closed, if value is 1 logical switch is open. Default is 0; Optional
- `IsProjected`: if true this line or element was not installed yet and is projected only. Optional
- `IsInMaintenance`: if true this line or element is in maintenance at the moment. Optional
- `IsForwardNetwork`; Optional
- `Elevation`: Only for nodes in gas and water networks. Altitude in meters of the network element. Optional
- `InstallationYear`: year, when the line or element was installed. Optional
- `Diameter`; used for lines and pipes. Defines if the diameter in mm of lines and pipes
- `Material`; used for electrical lines; Defines if the material of the line: 0 is copper (CU), 1 is aluminium (Al), 2 is steel (St). In NEPLAN360 it can be changed in the properties of the line in Parameters -> Layout/Material. Optional
- `CableOrOHL`; used for lines; Cable is 0, Overhead line is 1, Mixed is 2. In NEPLAN360 it can be changed in the properties of the line (Type of line) . Optional
- `Layout`; used for lines; Defines if the layout of the line is in Earth (0) or in air (1). In NEPLAN360 it can be changed in the properties of the line in Parameters -> Layout/Material. Optional
- `xLocation`; in first instance for non-geographic networks. You can give here the x-coordinate in unprojected WGS1984 geo system (longitude). This can be used in certain features of NEPLAN. Optional
- `yLocation`; in first instance for non-geographic networks. You can give here the y-coordinate in unprojected WGS1984 geo system (latitude). This can be used in certain features of NEPLAN. Optional
- `TechDataValues`; In case the electrical (gas-, water-) properties are not defined via libraries with this parameter they can be defined directly in the ListXML. For details see chapter “TechDataValues”. Optional

- `listLineSections`; A line or pipe connection between two nodes can be represented as a single line also if it is composed of different section with different cable types. With this parameter a list of sections can be defined. For details see chapter "LineSections". Optional

- `ZOrderNum`; With this parameter you can define the drawing order of the elements. Elements with a low `ZOrderNum` are drawn before elements with a high value. Optional

- `Substation`; Only for elements with `<elementType>Station</elementType>`. Defines the name of the substation. Optional

- `Bay`; Defines the name of ElementContainer to which this element belongs to. Optional
- `BayesInStation`; Only for elements with `<elementType>Station</elementType>`. Defines which bays (ElementContainer) belong to a station. Optional. Example:

```
<BayesInStation>
  <string>Bay-1</string>
  <string>Bay-2</string>
  <string>Bay-3</string>
</BayesInStation>
```

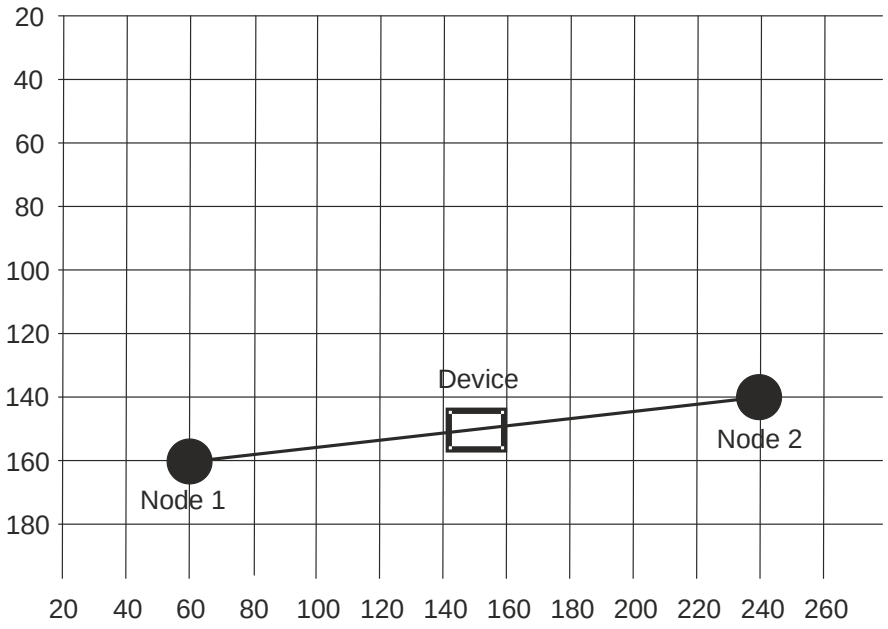
Defining the coordinates of nodes, devices and lines

The coordinates of lines, nodes and symbols are defined with the parameters `CoordinatesLink1`, `CoordinatesLink2`, `CoordinatesLink3`. Nodes must always define `CoordinatesLink1`. Coordinates are given as a pair of x,y values, starting with x:

```
<CoordinatesLink1>
  <double>60</double>
  <double>160</double>
</CoordinatesLink1>
```

Devices (Loads, Transformers, CircuitBreakers, etc.) and lines (cables, pipes etc.) do not need to define any coordinates. In this case they are positioned in the middle between the two nodes to which they are connected. In this case `CoordinatesLink1`, `CoordinatesLink2`, `CoordinatesLink3` don't need to be defined.

In the following an example of such a network with a Device, that has no CoordinatesLink is defined:



For nodes additionally the following parameters must be set:

- `numConnections` must be set to 999
- `SymbolName` must be "StandardBusbar"
- elementType must be "Busbar"

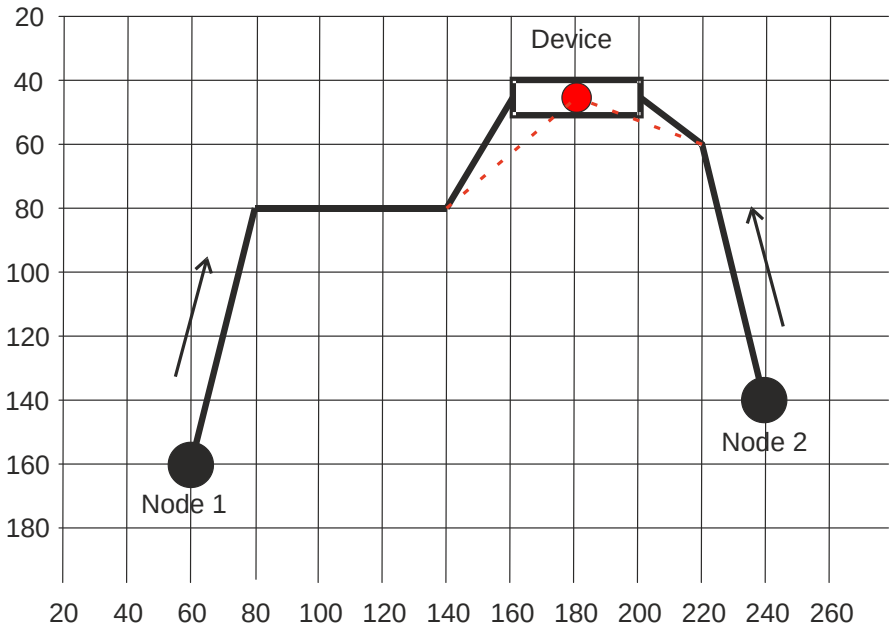
One-, Two- and Three-Pole-Devices with defined CoodinatesLinks

For one-pole devices (Loads, ExternalGrid etc.) `CoordinatesLink1` can be filled with a list of coordinates, for two-pole devices (Transformers, CircuitBreaker etc.) additionally `CoordinatesLink2`, for three-pole (3-pole Transformer) devices additionally `CoordinatesLink3`.
In a two-pole device `CoordinatesLink1` and `CoordinatesLink2` could contain a list of x,y pairs. These pairs define the intermediate points of the device legs. The list starts with the coordinates of a node (the coordinates of `NodeName1` in case of `CoordinatesLink1`) and ends with coordinates of the device. As coordinates for the device the **center** of the symbol must me used (see parts marked in red) even though the connections will not go this coordinates. (In version 1.0 of the LisXML protocol it was the upper left corner) for example:
(this example can be found in appendix 2)

```
<CoordinatesLink1>
  <double>60</double>
  <double>160</double>
  <double>80</double>
  <double>80</double>
  <double>140</double>
```

```
    <double>80</double>
    <double>160</double>
    <double>40</double>
  </CoordinatesLink1>
  <CoordinatesLink2>
    <double>240</double>
    <double>140</double>
    <double>220</double>
    <double>60</double>
    <double>160</double>
    <double>40</double>
  </CoordinatesLink2>
```

In this case the device would be located at 180, 40, see image below.



For one-, two, and three-pole devices additionally the following parameters must be set:

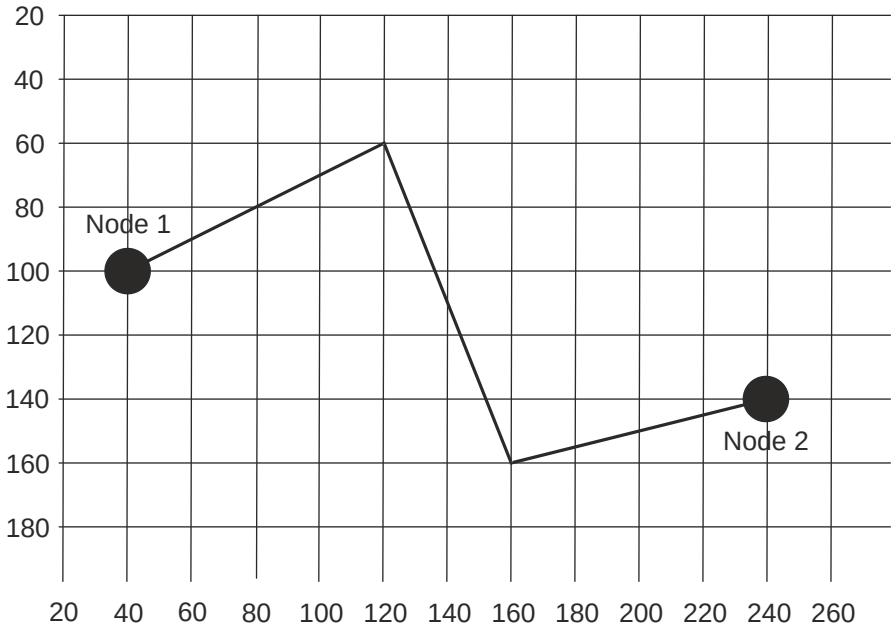
- `numConnections` must be set to 1,2 or 3 depending on the number of connections
- `SymbolName` must contain the name of the symbol of this device in NEPLAN
- elementType must contain one of the types listed in appendix 1.

Lines with defined CoordinatesLink

As one-, two -and three-pole devices also lines can be without CoodinatesLink. In this case the line connects two nodes with a straight line. In many cases instead, the intermediate points of the lines are defined through parameter `CoordinatesLink1`. Here an example:

```
  <CoordinatesLink1>
```

```
    <double>40</double>
    <double>100</double>
    <double>120</double>
    <double>60</double>
    <double>160</double>
    <double>160</double>
    <double>240</double>
    <double>140</double>
  </CoordinatesLink1>
```



For lines additionally the following parameters must be set:

- `numConnections` must be set to 2
- `SymbolName` must not be defined
- elementType must be “Line”

TechDataValues

In case the electrical (gas-, water-) properties are not defined via libraries they can be directly defined through the parameter `TechDataValues` of the `ImportElementItem` in the ListXML. For each device like transformer, load, disconnection switch there is a different set of available parameters corresponding to the one that can be seen in the GUI of NEPLAN360. Here an example for a Load:

```
  <TechDataValues>
    <TechDataValue>
      <VariableName>P</VariableName>
      <Value>2</Value>
```

```
    </TechDataValue>
    <TechDataValue>
      <VariableName>Description</VariableName>
      <Value>Müllerstraße</Value>
    </TechDataValue>
  </TechDataValues>
```

In this case the parameter “P” (Power) gets the value 2, the “Description” (aliasName 1) gets the value “Müllerstraße”. A detailed list of parameters for each of the device types is available separately in the files TypeParameter_Power (Electricity), TypeParameter_Gas, TypeParameter_Heating, TypeParameter_Water.

LineSections

A line or pipe connection between two nodes can be represented as a single line also if it is composed of different sections with different cable types. A list of sections can be defined witch is embraced by the tag `listLineSections`. For The single entries are embraced by the tag `LineSectionData` . For each section there is a different set of available parameters corresponding to the one that can be seen in the GUI of NEPLAN360. Here an example:

```
  <listLineSections>
    <LineSectionData>
      <LibraryType>NYSEY 3x300/35</LibraryType>
      <Length>0.7</Length>
      <Diameter>300</Diameter>
      <Material>0</Material>
      <CableOrOHL>0</CableOrOHL>
      <InstallationYear>0</InstallationYear>
      <Layout>0</Layout>
    </LineSectionData>
    <LineSectionData>
      <LibraryType>NAKBA 3x185</LibraryType>
      <Length>1.8</Length>
      <Diameter>185</Diameter>
      <Material>1</Material>
      <CableOrOHL>0</CableOrOHL>
      <InstallationYear>0</InstallationYear>
      <Layout>1</Layout>
    </LineSectionData>
  </listLineSections>
```

ImportFeederItem

- `name`; the name of the feeder

- `atNodeName`; name of the node where the feeder starts
- `atElementName`; name of the line connected to the node defined in `atNodeName`. Only exactly one line might be connected to this node.
- `color`; hex value of the colour used for this feeder. It is composed of 3 2-digit hex numbers for the 3 colours R, G and B preceeded by a "#", for example "#3C0000"
- `PloadFactor`; factor for PLoad, default is 1.
- `QLoadFactor`; factor for QLoad, default is 1.

Special case: OnElements

On-Elements are not connected between 2 nodes, but reside on a line or on the links to another element. Defining elements as On-Elements gives the advantage of having fewer nodes in the network, resulting in a faster calculation and a faster display. This is particularly important for big networks.

These are the differences in the ListXML between On-Elements and normal elements:

- `elementType`; There are special elementTypes for OnElements, e.g. `DisconnectSwitchOnElem` is used instead of `DisconnectSwitch`, see appendix 1.
- `NodeName1`; This parameter contains the name of the line or the other device, **not** the name of a node
- `NodeName2`, `NodeName3`; This parameters are not used
- `numConnections`; This parameter must have the value 0
- `CoordinatesLink1`, `CoordinatesLink2`, `CoordinatesLink3`; This parameters are not used
- `LogicalSwitch`; This parameter is not used

Appendix 1

The parameter `elementType` describes the single device having one or more symbols in NEPLAN. Below the possible values. Normally the physical properties of the devices are defined through the libraries. In case they are set directly using the above explained `TechDataValue` the parameters for each device need to be known. For this purpose separate EXCEL sheets are available.

ACCompressedAirEnergyStorage	EnergyStorage	PWM
ACDisperseGenerator	EquivalentSerieLF	PWM3Pole
ACFlyWheel	EquivalentSerieSC	Pylon
AsynchronousMachine	EquivalentShuntLF	Reactor
Busbar	EquivalentShuntSC	Regulator
BusbarCoupler	ExternalGrid	SerieEarthRLC
CircuitBreaker	FaultIndicator	SerieRLC
CircuitBreakerOnElem	Filter	SerieTransformator
CompositeLoad	FrequencyRelais	Shunt
CurrentTransformer	FunctionBlock	STATCOM
CustomerConnection	Fuse	Station
DCBattery	GenericModel	SurgeArrester
DCConverter	GroundElement	SVC
DCConverter3Pole	HarmonicCurrentSource	SynchronousMachine
DCFlyWheel	HarmonicVoltageSource	Table
DCFuelCell	Inertia	TCSC
DCGround	Line	Trafo2Winding
DCLine	LineAsym	Trafo2WindingAsym
DCLoad	LineCoupling	Trafo3Winding
DCMotor	LineSection	Trafo4Winding
DCNode	Load	TrafoRegulator
DCPhotoVoltaic	LoadSwitch	Turbine
DCReactor	LoadSwitchOnElem	Unknown
DCShunt	MeasurementDevice	UPFC
DCVoltageSource	MechanicalLoad	UserDefinedPort0
DFIG	MinMaxRelaisOnLink	UserDefinedPort1
DisconnectSwitch	MinMaxRelaisOnNode	UserDefinedPort2
DisconnectSwitchOnElem	NestedBlockCCT	UserDefinedPort3
DistanceRelais	OvercurrentRelais	UserDefinedPort4
EarthingSystem	ParallelRLC	VoltageRelais
EarthSwitch	PoleSlipRelais	VoltageTransformer
	PowerRelais	

Appendix 2

Simple, working list XML example:

```
<ImportProjectContainer xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <Name>SimpleNetwork</Name>
  <Description>Example network</Description>
  <BusFrequency>50</BusFrequency>
  <GraphicScalingFactor>1</GraphicScalingFactor>
  <DiagramName>Diagram 0</DiagramName>
  <ProjectLibrayName />
  <CopySettingsFromProjectName>SimpleProjectTemplate</CopySettingsFromProjectName>
  <DoReduceLines>false</DoReduceLines>
  <DoPhaseBalancing>false</DoPhaseBalancing>
  <DoBuildLineSections>false</DoBuildLineSections>
  <ImportWithGraphic>true</ImportWithGraphic>
  <IsAsymmetricalNetwork>false</IsAsymmetricalNetwork>
  <ScalingTrafoFactor>0</ScalingTrafoFactor>
  <CalcWithLoadBalance>false</CalcWithLoadBalance>
  <YAxesIsUp>false</YAxesIsUp>
  <CoordinateUnits>1</CoordinateUnits>
  <LibraryName />
  <LibrarySubname />
  <ProjectionDefault>0</ProjectionDefault>
  <ProjectionActual>0</ProjectionActual>
  <IsSchematicNetwork>true</IsSchematicNetwork>
  <ShowLogSwitch>false</ShowLogSwitch>
  <AutoCalculationLengths>false</AutoCalculationLengths>
  <FeederList />
  <ElementList>
    <ImportElementItem>
      <name>Node 1</name>
      <un>10</un>
      <length>0</length>
      <Diameter>0</Diameter>
      <Material>0</Material>
      <CableOrOHL>0</CableOrOHL>
      <elementType>Busbar</elementType>
      <librayType />
      <libraryType />
      <OnPortNr>0</OnPortNr>
      <CoordinatesLink1>
        <double>60</double>
        <double>160</double>
      </CoordinatesLink1>
      <SymbolName>StandardBusbar</SymbolName>
      <SymbolAngle>0</SymbolAngle>
      <SymbolSize>0</SymbolSize>
      <numConnections>999</numConnections>
      <phase>0</phase>
      <ZoneName>Default Zone</ZoneName>
      <AreaName>Default Area</AreaName>
      <SubAreaName>Default SubArea</SubAreaName>
      <LogicalSwitch>0</LogicalSwitch>
      <IsProjected>false</IsProjected>
      <IsInMaintenance>false</IsInMaintenance>
```

```
  <IsForwardNetwork>false</IsForwardNetwork>
  <Elevation>0</Elevation>
  <InstallationYear>0</InstallationYear>
  <Layout>0</Layout>
  <Type>0</Type>
</ImportElementItem>
<ImportElementItem>
  <name>CircuitBreaker</name>
  <un>10</un>
  <length>0</length>
  <Diameter>0</Diameter>
  <Material>0</Material>
  <CableOrOHL>0</CableOrOHL>
  <elementType>CircuitBreaker</elementType>
  <librayType />
  <libraryType />
  <NodeName1>Node 1</NodeName1>
  <NodeName2>Node 2</NodeName2>
  <OnPortNr>0</OnPortNr>
  <CoordinatesLink1>
    <double>60</double>
    <double>160</double>
    <double>80</double>
    <double>80</double>
    <double>140</double>
    <double>80</double>
    <double>180</double>
    <double>40</double>
  </CoordinatesLink1>
  <CoordinatesLink2>
    <double>240</double>
    <double>140</double>
    <double>220</double>
    <double>60</double>
    <double>180</double>
    <double>40</double>
  </CoordinatesLink2>
  <SymbolName>STANDARD_H</SymbolName>
  <SymbolAngle>0</SymbolAngle>
  <SymbolSize>0</SymbolSize>
  <numConnections>2</numConnections>
  <phase>0</phase>
  <ZoneName>Default Zone</ZoneName>
  <AreaName>Default Area</AreaName>
  <SubAreaName>Default SubArea</SubAreaName>
  <LogicalSwitch>0</LogicalSwitch>
  <IsProjected>false</IsProjected>
  <IsInMaintenance>false</IsInMaintenance>
  <IsForwardNetwork>false</IsForwardNetwork>
  <Elevation>0</Elevation>
  <InstallationYear>0</InstallationYear>
  <Layout>0</Layout>
  <Type>0</Type>
</ImportElementItem>
<ImportElementItem>
  <name>Node 2</name>
  <un>10</un>
  <length>0</length>
  <Diameter>0</Diameter>
  <Material>0</Material>
  <CableOrOHL>0</CableOrOHL>
  <elementType>Busbar</elementType>
  <librayType />
  <libraryType />
```

```
      <OnPortNr>0</OnPortNr>
      <CoordinatesLink1>
        <double>240</double>
        <double>140</double>
      </CoordinatesLink1>
      <SymbolName>StandardBusbar</SymbolName>
      <SymbolAngle>0</SymbolAngle>
      <SymbolSize>0</SymbolSize>
      <numConnections>999</numConnections>
      <phase>0</phase>
      <ZoneName>Default Zone</ZoneName>
      <AreaName>Default Area</AreaName>
      <SubAreaName>Default SubArea</SubAreaName>
      <LogicalSwitch>0</LogicalSwitch>
      <IsProjected>false</IsProjected>
      <IsInMaintenance>false</IsInMaintenance>
      <IsForwardNetwork>false</IsForwardNetwork>
      <Elevation>0</Elevation>
      <InstallationYear>0</InstallationYear>
      <Layout>0</Layout>
      <Type>0</Type>
    </ImportElementItem>
  </ElementList>
</ImportProjectContainer>
```