PV Plant’s Transformer Evaluation Tool: Guide Memo

This Memo will guide you through the steps necessary to input a set of data as well as explaining the embedded output options.

Input Data

<table>
<thead>
<tr>
<th>Ownership Status</th>
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| Initially, the correct ownership status of the PV plant should be selected. This is to perform the appropriate loss evaluation process as per the selected option. The options provided are:

1. Independent PV Power Producer
2. PV Plant is considered as another source of generation in a Regulated Utility

*Note: The format of PV Plant Technical Data and the PV Plant Financial Data is identical for both options. The difference in the two options relies on System Energy Charges.
PV Plant Technical Data

On the **Location** option select an area/city. Each area/city is linked to its corresponding Solar Irradiation Profile provided by PV GIS.

For the **Size of PV Plant** option insert the peak capacity size of the PV plant in MWp. The size of the plant should be an integer number.

For the **Estimated Transformer Life-Time** insert the expected duration of the power transformer operation in years.
### PV Plant Financial Data

On the **PV Plant’s Capital Investment** option insert the initial capital expenditure for the PV plant in €.

![PV Plant Financial Data]

For the **PV Plant’s Operation and Maintenance Cost** option insert the annual expected expenditure for plant’s operation and maintenance in €.

![PV plant’s Operation & Maintenance cost (€)]

For the **Nominal Discount Rate** option choose the interest rate (in %) that will be used in the discounted cash flow (DCF) analysis to determine the present value of future cash flows.

For the **Inflation Rate** option choose the annual expected inflation rate (in %) during the evaluation lifetime.

![Nominal Discount Rate (%)](0%)

![Inflation Rate (%)](0%)
### System Energy Charges

#### Option 1: Independent Power Producers

For the *Industrial/Commercial Energy Charges* option insert the average value of the electricity charge rate (demand + energy) that applies in current year (€/kWh). For the *Annual Escalation Rate of Industrial/Commercial Charges* option insert the estimated annual escalation rate of Industrial/Commercial charges as a percentage (%).

![Image of System Energy Charges form for Option 1]

#### Option 2: Regulated Utilities

For the *Utility Demand Charge* option insert the present utility’s specific demand charge (fixed component – capacity dependent) in €/kW. For the *Utility Energy Charge* option insert the present utility’s specific energy charge (variable component – energy dependent) in €/kWh.

![Image of System Energy Charges form for Option 2]
*Optional: Transformer Total Ownership Cost*

If you wish to calculate the **Total Ownership Cost (TOC)** of candidate transformers you should select the displayed option. If this is the case, the required number of transformers to be compared should be selected. The tool provides the ability to compare up to three transformers.

You should then insert the data provided by the manufacturers. The data should be inserted as follows:

For the **Purchase Price** option insert the required capital expenditure to buy the transformer in €, as provided by the manufacturer.

For the **No-Load Losses** option insert the guaranteed fixed transformer losses due to core energisation, in kW. This is provided by the transformers' manufacturer.

For the **Load Losses** option insert the guaranteed variable transformer losses due to the loading of transformer, in kW. This is provided by the transformers' manufacturer.

For the **Auxiliary Losses** option insert the guaranteed transformer losses due to power lost by the operation of the transformers’ cooling units, in kW. This is provided by the transformers’ manufacturer.

The **Total Ownership Cost** is an output result, providing the sum of the transformer’s purchase price and it’s Total Value of Losses (TVL). This figure is expressed in €.
Output Results

The output results are displayed in a table format. The Table provides the calculated loss cost rates for transformer no-load, load and auxiliary losses. In addition, the PV plant specific Levelized Cost of Electricity of the PV plant is illustrated.

**No-Load Losses Cost Rate (€/kW):** Factor that capitalizes or converts no-load loss costs to present value. This is dependent on the industrial/commercial energy prices and the PV plant's Levelized Cost of Electricity.

**Load Loss Cost Rate (€/kW):** Factor that capitalizes or converts load loss costs to present value. This is dependent on the PV plant's Levelized Cost of Electricity.

**Auxiliary Loss Cost Rate (€/kW):** Factor that capitalizes or converts auxiliary load loss costs to present value. This is dependent on the PV plant's Levelized Cost of Electricity.

**Levelized Cost of Electricity (€/kWh):** It is an economic assessment, in per kWh cost, to build and operate a power-generating asset over its lifetime divided by the total power output of the asset over that lifetime.