PEPEx Tutorial

What is PEPEx?

This software tool helps plants quickly “diagnose” their energy use and begin identifying opportunities for savings. It does this by providing an overview of the amount of energy that your plant purchases, identifying the major industrial systems that consume that energy, describing your plant’s savings potential, and pointing out specific measures you can take to realize savings. PEPEx is like a road map that directs you to specific, targeted ways to save energy and money.

Using PEPex and information about your particular plant, you can complete a plant profile in about one hour. This tutorial explains the information you’ll need to complete the profile.

Understanding Tool Layout

PHASTEx consist of 7 core excel worksheets. Based on its function the sheets are categorized as introduction sheets, user input sheets and result sheet. The user manually completes the input data sheets and the output graphs and tables are populated accordingly in the “Results” sheet.
### Input Sheets – Color Scheme

All the fields in the input tabs follow the color scheme listed below.

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray</td>
<td>User Input required</td>
</tr>
<tr>
<td>Orange</td>
<td>Choose from drop down list</td>
</tr>
<tr>
<td>Yellow</td>
<td>No inputs required – Formulas Inserted</td>
</tr>
</tbody>
</table>

### Mandatory and Non-Mandatory Fields

While the sheets have many input fields, only a couple are mandatory for the results to populate. These mandatory fields, in each sheet, have their headings marked in “Red” which turn “Black” when these fields are completed. The rest of the fields are provided for book keeping purposes.

### Step 1: Basic Information

The Basic Information sheet is the first step in PEPex. On this screen you will enter some basic information about your facility.

Mandatory Fields are marked in “Red” and turn “Black” when Complete

The only mandated field in this sheet is the “Industry Type”. PEPEx uses the industry type data to calculate default breakdown of the energy uses per system in Step 3.

The remaining questions which include basic information regarding the plant location, operating schedule and energy management are primarily for book keeping purposes and do not affect the results.
Step 2: Energy and Production Data

The second input sheet in the PEPEx application is “Energy and Production”. You are asked to enter data from utility bills and/or sub meter recordings. Some of the important fields on this sheet are discussed below.

Units of Measurement

PEPEx allows you to input your energy data for each fuel in the unit which is most familiar to you. Only when presenting results for the various energy sources together does PEPEx convert all units to a common output unit. The user further has the option to choose this output unit from a list of options from the dropdown box in cell I11.

Facility’s Energy and Production

On cell B16, the user can choose to use either annual or monthly data for energy and production inputs. The appropriate tables popup based on the selection. Most of the PEPEx results can be generated with just the annual data, some of the graphs/tables need monthly data. These graphs/tables will be hidden from the results if annual data is used.

Site to Source conversion (optional)

The user also has the option to input a source energy factor for each fuel used. The default factor of 1 is used for all cases. This results in the outputs being populated with site numbers.

The user may wish to make appropriate changes to this factor to account for losses associated with transmission, delivery, and production of each energy stream.
In Step 3, select the energy end use systems that consume energy at your plant from the dropdown in Column C, rows 24 to 35. For each system that is used in the plant it is necessary to choose a primary energy source.

Based on this information PEPEx populates the default energy breakdown based on the industry type, defined in Step 1, in cells F39 – G50. The default percentages are based on data collected by the Manufacturing Energy Consumption Survey (MECS) administered by the U.S. Energy Information Administration in 2010.

The user may override these default values by providing an estimate of the facilities actual percentages in cells F24 – G35. For more accurate results, it is recommended that the user overrides the default values, even if it is with partial information. If you are not sure how much energy is used for each of the breakout categories, you can leave these cells blank and the default percentages will be used.
Step 4: Energy Savings Opportunities

The fourth and final input sheet in the PEPEx application allows users to define the potential energy savings opportunities for each system. This is done by choosing between High/Medium and Low from the drop down list in rows 17 – 28. A high level guideline to determine the existing potential can be found in the instructions above the table.

User also have the option to use a more rigorous approach to determine energy savings potential associated with a system by making use of the scorecards.

Energy use System Scorecard (Optional)

When you first arrive at the “Energy savings Opportunities” sheet, each of the scorecards will be hidden by default. To “Unhide” a scorecard, click on the arrow in the right corner of the corresponding cell and choose “Use scorecard”. This will make the scorecard to open so the questions can be viewed.

Scorecards are not available for electrochemical processes, industrial facilities, fans and blowers, materials handling, or materials processing.

You are not required to answer all of the questions in Scorecard, although it is recommended to answer as many questions as possible to help PEPEx more accurately profile your facility.

After completing the scorecard questions, simple go back to the “Energy Savings Opportunities” tab to continue your data input.
### Results

The final step in PEPEx is the results screen. The PEPEx results report has tables and graphs that show how much energy you are purchasing (and how much it costs), how you are consuming that energy, and potentially how much energy and money you could save. The graphs and tables in the results page can be broadly categorized into 5 groups listed below.

**I. Energy Usage Summary - Tables/ Figures 1 to 3.**

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Site Energy Use</th>
<th>Source Energy Use (MMBTU)</th>
<th>Site Energy Cost($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>6,490,509 kWh</td>
<td>22,147</td>
<td>$903,217</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>546,781 Therms</td>
<td>54,678</td>
<td>$257,886</td>
</tr>
<tr>
<td>Steam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propane</td>
<td>13,646 Therms</td>
<td>1,365</td>
<td>$15,352</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>78,189</strong></td>
<td><strong>$1,176,454</strong></td>
<td></td>
</tr>
</tbody>
</table>

**II. Total Energy Savings Potential – Tables/ Figures 4.**

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**III. Energy Savings Potential by Energy Source - Tables / Figures 5 to 9.**

*Figures 6b presents the breakdown of the annual electricity consumption and the potential electricity saving by system in a stacked bar chart.*

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*Table 2: Annual Energy Use Summary*

*Fig. 4b: Energy consumption and the potential energy saving for each fuel source*

*Fig. 6b: Electricity - Usage And Potential Savings*
IV. Potential Emission Reductions

Annual Carbon Dioxide - Emissions and Potential Reduction

- Carbon Dioxide Emissions (Metric ton)
- Energy Source: Natural Gas, Electricity, Coal
- Graph showing Total Metric Ton CO2 and Metric Ton Saved CO2

V. Energy Efficiency Opportunities

<table>
<thead>
<tr>
<th>Steam Generation Equipment</th>
<th>1. Implement a best practices based leak management program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Improve boiler efficiency by proper air/fuel control</td>
</tr>
<tr>
<td></td>
<td>3. Improve boiler efficiency by proper blowdown management</td>
</tr>
<tr>
<td></td>
<td>4. Improve condensate recovery</td>
</tr>
<tr>
<td></td>
<td>5. Improve thermal insulation of the overall steam system</td>
</tr>
<tr>
<td></td>
<td>6. Perform a detailed Steam Energy System Assessment at your site.</td>
</tr>
</tbody>
</table>