# 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.
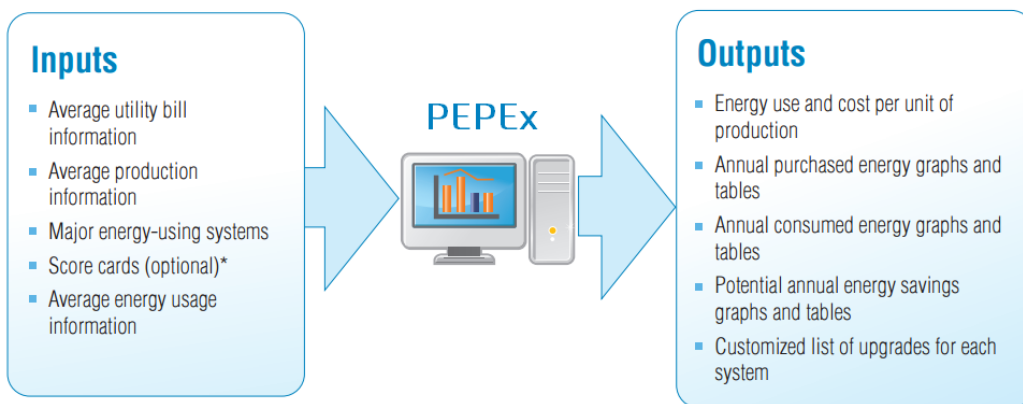
Understanding Tool Layout

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.

Gray	User Input required
Orange	Choose from drop down list
Yellow	No inputs required – Formulas Inserted

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 madated field in this sheet is the "Indusrty 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.

Choose the unit of measurement for your energy sources

Leave the units blank if the fuel is not used in your facility.

*Steam is to be defined as an energy source only if user buys steam from a utility or a third-party enterprise.

Choose the energy metric for your output.

	A	B				H	I	J	
7	Please DO NOT insert any value in cells colored in yellow								
8									
9	Units of Measurement:								
10	Unit for Electricity	kWh		Other Fuel	Propane				
11	Unit for Natural Gas	Therms		Unit for Other fuel	Therms		Output Energy Metric	MMBTU	
12	Unit for Steam								
13									
14	Note:		Please provide either monthly or annual energy and production data. While most of the PEPEx results can be generated with just the annual data, some of them graphs/tables make use of monthly data.						
15	Facility's Energy and Production Data:								
16	Data Interval	Monthly							
17	Year 1 (Baseline Year):								

Choose the interval for energy data input based on the granularity of data available.

	Month	Monthly Site Electricity Consumption(kWh)	Total Monthly Electricity Cost($)	Monthly Natural Gas Consumption(Therms)	Total Monthly Natural Gas Cost ($)	Monthly Steam Consumption (0)	Total Monthly Steam Consumption Cost ($)	Monthly Other Fuel Consumption (Therms)	Total Monthly Other Fuel Cost ($)	Monthly Production (Product 1) Unit	Mo
20	January	467,593	70,818	45,204	23,400			1324	1490	85681	
21	February	477,607	70,814	39,339	18,881			1219	1371	75777	
22	March	469,662	68,166	47,523	22,279			1179	1326	114956	
23	April	469,701	69,244	38,835	17,552			1049	1180	101291	
24	May	523,937	75,115	43,073	19,807			1066	1199	69347	
25	June	566,123	76,188	46,988	22,901			1115	1254	96315	
26	July	547,930	74,146	44,400	22,141			1115	1254	101789	
27	August	566,444	77,166	46,862	23,136			1006	1132	118622	
28	September	642,177	81,052	49,733	23,292			1105	1243	113167	
29	October	609,255	83,445	47,057	21,457			1016	1143		
30	November	633,266	83,626	48,707	20,335			1183	1331		
31	December	516,814	73,437	49,060	22,704			1269	1428		
32	Year 1 - Grand Total	6,490,509	$903,217	546,781	$257,886	0	$0	13,646	$15,352	876,946	
33	Year 2:	1									
34	January										
35	February										

Instruction | Basic Info | Energy & Production | Energy Use System | Energy saving Opportunities | Results | Tutorial

Input Energy, Cost and Production data for each

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 optons 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.

Step 3: Energy Use Systems

	A	B	C	D	E	F	G	H	I
19			4) Default energy distribution values are based on the Energy Information Administration 2010						
20			5) If the user wants to use default value please use the table Energy Use Systems Used in the Plant (User						
21									

Energy Use Systems Used in the Plant (User Defined):

System	Energy System in use (Please select Yes/No)	Primary Energy Source	Secondary Energy Source	% Primary Energy Source	% Secondary Energy Source	Annual Consumption(MMBTU)	Annual Cost($)
24 Combined Heat and Power (Cogeneration)	No					0	$0
25 Compressed Air	Yes	Electricity				0	$0
26 Electrochemical Processes	Yes	Electricity				0	$0
27 Fans and Blowers	Yes	Electricity				0	$0
28 Industrial Facilities (Lighting)	Yes	Electricity				0	$0
29 Industrial Facilities (HVAC)	Yes	Electricity	Other Fuel		100%	1,365	$15,352
30 Material Handling	Yes	Electricity				0	$0
31 Material Processing	Yes	Electricity	Natural Gas		25%	13,670	$64,471
32 Process Cooling and Refrigeration	Yes	Electricity				0	$0
33 Process Heating	Yes	Natural Gas		75%		41,009	$193,414
34 Pumps						0	$0
35 Steam Generation Equipment	Yes / No / N/A					0	$0
36							

User defined percent energy used that overrides the default values

Energy Use Systems Used in the Plant (Default):

System	Energy System in use (Please select Yes/No)	Primary Energy Source	Secondary Energy Source	% Primary Energy Source	% Secondary Energy Source	Annual Consumption MMBTU	
39 Combined Heat and Power (Cogeneration)	No	0	0	0%	0%		
40 Compressed Air	Yes	Electricity	0	5%			
41 Electrochemical Processes	Yes	Electricity	0	4%			
42 Fans and Blowers	Yes	Electricity	0	5%			
43 Industrial Facilities (Lighting)	Yes	Electricity	0	5%	0%	1,107	$45,101
44 Industrial Facilities (HVAC)	Yes	Electricity	Other Fuel	9%	100%	3,358	$96,641
45 Material Handling	Yes	Electricity	0	14%	0%	3,101	$126,450
46 Material Processing	Yes	Electricity	Natural Gas	3%	25%	14,334	$91,568
47 Process Cooling and Refrigeration	Yes	Electricity	0	2%	0%	443	$18,064
48 Process Heating	Yes	Natural Gas	0	75%	0%	41,009	$193,414
49 Pumps	0	0	0	0%	0%		
50 Steam Generation Equipment	0	0	0	0%	0%		
51							

Default percent energy used by each system based on MECS database

Sheet tabs: Instruction | Basic Info | Energy & Production | **Energy Use System** | Energy saving Opportunities | Results | Tutorial

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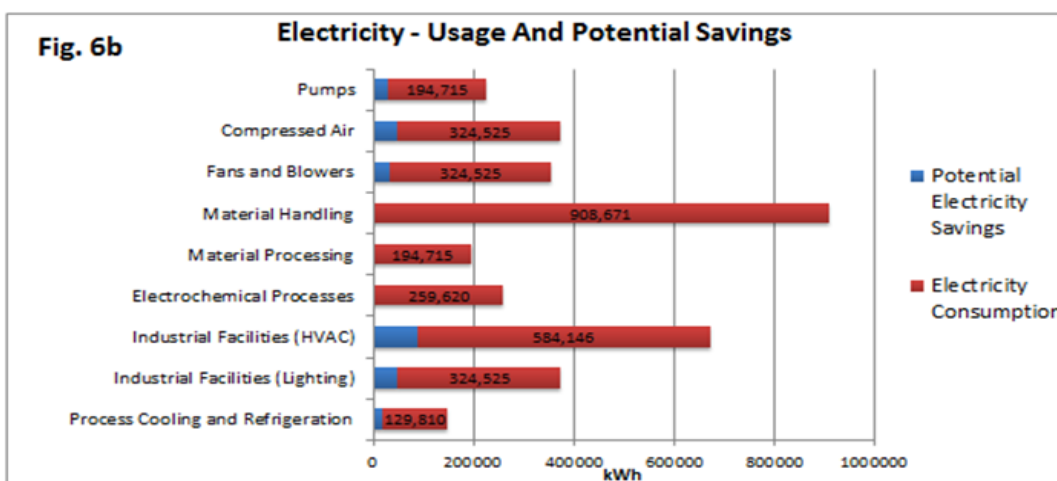
I. **Energy Usage Summary - Tables/ Figures 1 to 3.**

Table 2: Annual Energy Use Summary			
Energy Type	**Site Energy Use**	**Source Energy Use (MMBTU)**	**Site Energy Cost($)**
Electricity	6,490,509 kWh	22,147	$903,217
Natural Gas	546,781 Therms	54,678	$257,886
Steam			
Propane	13,646 Therms	1,365	$15,352
Grand Total		78,189	$1,176,454

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

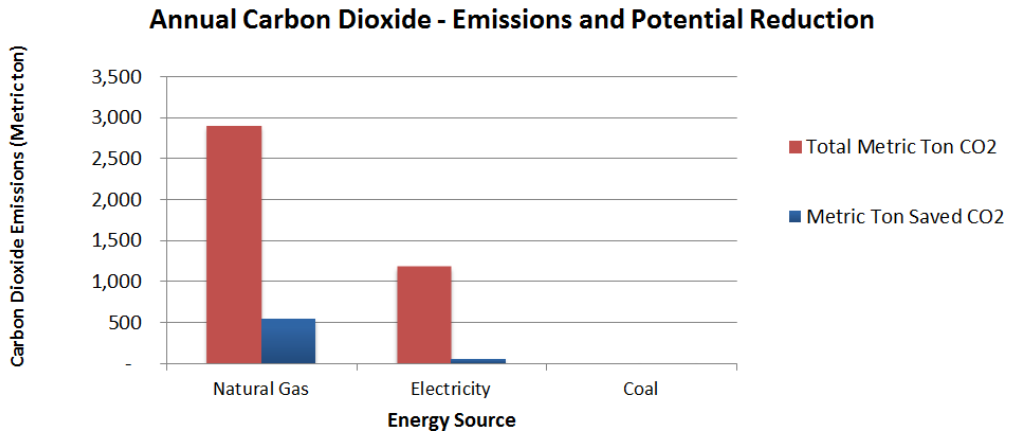Fig. 4b   Energy consumption and the potential energy saving for each fuel source
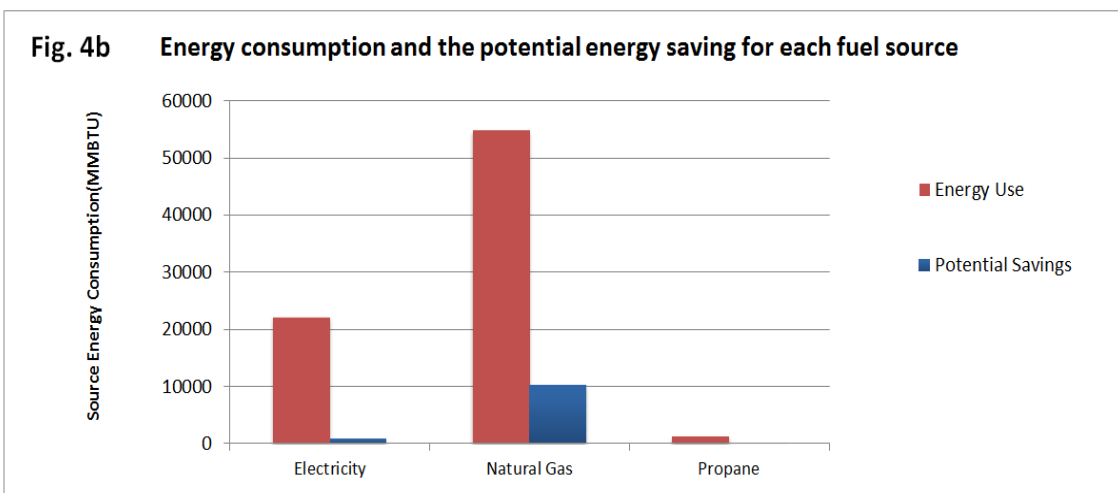
III. **Energy Savings Potential by Energy Source - Tables / Figures 5 to 9.**

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

Fig. 6b   Electricity - Usage And Potential Savings

IV.   Potential Emission Reductions

Annual Carbon Dioxide - Emissions and Potential Reduction

V.   Energy Efficiency Opportunities

Steam Generation Equipment	1)Implement a Best Practices based leak management program
	2)Improve boiler efficiency by proper air/fuel control
	3)Improve boiler efficiency by proper blowdown management
	4)Improve condensate recovery
	5)Improve thermal insulation of the overall steam system
	6)Perform a detailed Steam Energy System Assessment at your site.