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# **EnPI 4.0**

## *Functional Requirements and Mock Ups*

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V 4.7

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**Prepared For  
DOE EERE Advanced Manufacturing Office (AMO)**

**Submitted 4/28/2014**



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## Definition of Symbols

The following symbols and abbreviations are used in the *Facility Level Calculations* and *Corporate Level Calculations* sections of the document.

<b>AI</b>	Annual Improvement (Annual change) in Energy Intensity for Current Year (%)
<b>BM</b>	Baseline Month
<b>BY</b>	Baseline Year
<b>CI</b>	Cumulative Improvement (Total Change) in Energy Intensity from Baseline Year (%)
<b>CM</b>	Current Month
<b>CY</b>	Current Year
<b>Corp</b>	Corporate level total
<b><math>\widehat{EC}</math></b>	Modeled Source (Primary) Energy Consumption (MMBtu)
<b>EC</b>	Actual Source (Primary) Energy Consumption (MMBtu)
<b>EI</b>	Energy Intensity or Energy Normalized for Relevant Factors (MMBtu/ Unit of Production or MMBtu/sq. ft.)
<b>MM</b>	Model Month
<b>MY</b>	Model Year
<b>N</b>	Number of plants within the company
<b>PY</b>	Previous Year
<b>SEnPI</b>	Superior Energy Performance Indicator

## 1 Overview

The following document provides additional information regarding the requirements for the EnPI tool upgrade<sup>1</sup>. Modifications listed in this document were identified after version 3.0 was released on November 20<sup>th</sup>, 2012 by the Department of Energy (DOE), SEP Participants, Better Plants Partners, Better Plants Technical Account Managers (TAMs) and general end users. Over 75 recommendations were collected and provided to DOE for consideration. In December 2013, DOE selected 24 recommendations for implementation. This document only discusses potential additions selected by DOE in December 2013. The full list of recommendations is maintained by Project Performance Company (PPC) and is available to DOE for consideration for a future update.

## 2 Detailed Requirements

The following section provides additional information on the upgrades selected by DOE in December 2013 for implementation. The updates are ordered below based on the type of change.

### 2.1 Calculation Changes

The following modifications to the EnPI tool require the addition of a calculated field or a change to a calculated field.

#### 2.1.1. Modifications to the inputs collected.

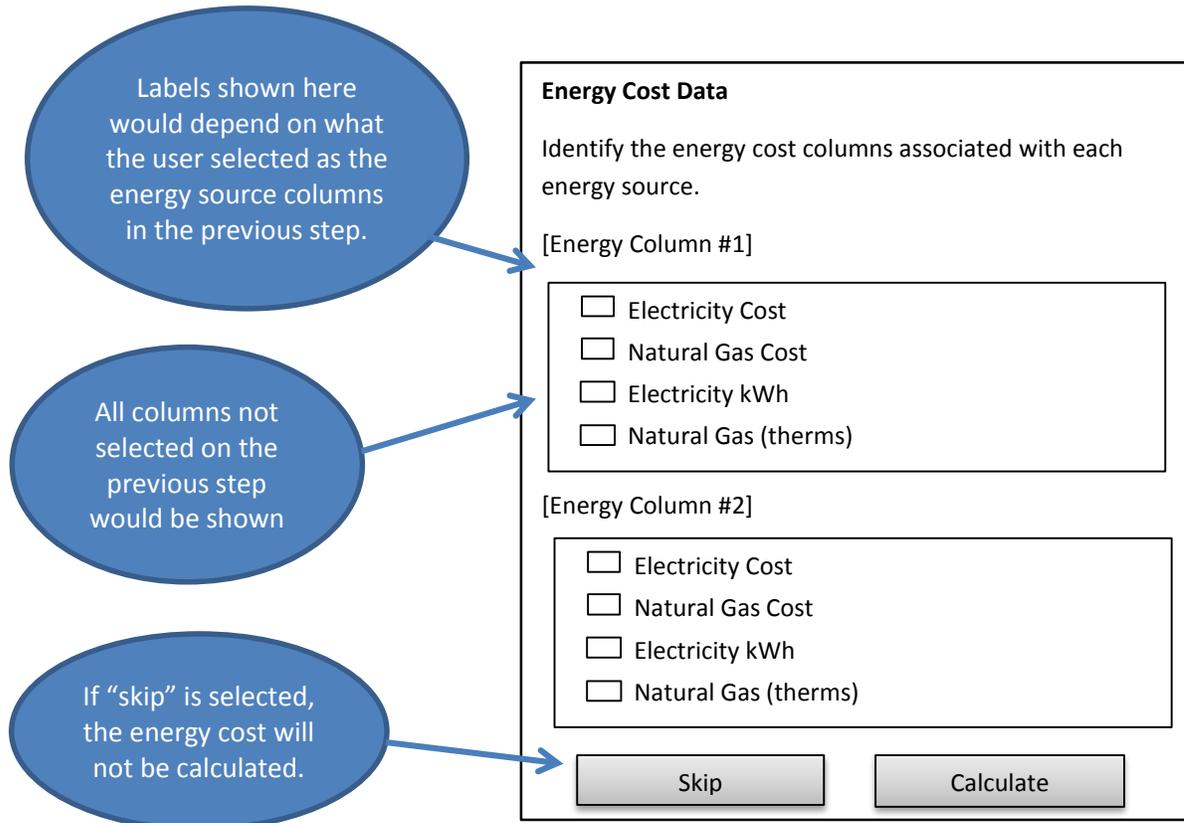
##### 2.1.1.1. Collect energy cost in the inputs.

If a user wants to calculate cost savings, the user will be required to enter energy cost data corresponding to the intervals and time period in which energy data is entered. For example, if monthly natural gas data is entered, the user would be required to enter monthly natural gas costs.

Change the label on the button on the “Use Regression” and “Use Actual” window to be “Next”. After “Next” is selected, show the following window.

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<sup>1</sup> This document explains how each potential addition would be addressed in Microsoft Excel 2007 and 2010. Many of the changes are not possible in Microsoft Excel 2003. This document also does not include a modification to make the tool work in Office 2013. If DOE would like to consider creating a Microsoft Excel 2003 or 2013 compatible version of the EnPI tool, an alternative approach would be needed for each item



2.1.2. Modifications to the outputs shown on the "Model Data" output sheet.

2.1.2.1. Show the allowable range for each variable, according to the SEP Program.

Allowable range is calculated by:

- Low end: the lower of the following two values:
  - Minimum data point from the model year
  - The average of the model year – 3\*the standard deviation of the model year
- High end: the higher of the following two values:
  - Maximum data point from the model year
  - The average of the model year + 3\*the standard deviation of the model year

The table listing the allowable range will be added to the top of the Model Data sheet. A screenshot of the added table is shown below.

Data Set 2

The table below shows the energy and independent variable data originally entered in the tool, the adjusted data, adjustment method, and totals. The data used for the model year is highlighted in green.

If a new model is selected for an individual energy source, the adjusted values below will be updated. The EnPI/SEnPI results pages are also linked to this page. Therefore, if changes are made to the adjusted data in the columns below, the results shown in the EnPI and SEnPI pages will update. However, this data is not linked to the original source data, so changes made to this page will not affect the data originally entered.

**Validation Check**

having acceptable R-squared and p-values, the average of the variables entered into the model must fall within one of the following ranges:

1. The range of observed data that went into the model OR
2. Three standard deviations from the mean of the data that went into the model

The following table shows these ranges for the data set provided.

		Production	Temperature
Range 1	Minimum or Model Variable	9,117	43
	Maximum or Model Variable	18,872	87
Range 2	Model Avg - 3 Std Dev	22,352	109
	Model Avg + 3 Std Dev	7,528	23

Electricity (kWh)	Electricity (MMBTU)	Natural gas (therm)	Natural gas (MMBTU)	Production	Temperature	Date	Period	TOTAL (MMBTU)
15,281,844	156,431	855,491	85,549	24,993	55	1/1/2006	FY1	241
13,804,495	141,309	823,635	82,364	22,542	49	2/1/2006	FY1	223
15,084,654	154,413	832,492	83,249	24,714	62	3/1/2006	FY1	237
14,992,023	153,465	767,139	76,714	23,713	72	4/1/2006	FY1	230
14,710,694	150,585	766,639	76,664	22,903	78	5/1/2006	FY1	227

The number of columns in the table will depend on the number of variables selected in the inputs. A column will be shown for each variable selected.

2.1.2.2. Add a column for monthly energy savings by fuel type.

“Use Actual” calculation:

$$\text{Monthly Savings}_{\text{Fuel X}} = \text{Current Month Energy Consumption}_{\text{Fuel X}} - \text{Baseline Month Energy Consumption}_{\text{Fuel X}}$$

“Use Regression” calculation:

Forecasting:

$$\text{Monthly Energy Savings}_{\text{Fuel X}} = \text{Monthly Modeled Energy Consumption}_{\text{Fuel X}} - \text{Monthly Actual Energy Consumption}_{\text{Fuel X}}$$

Chaining:

Calculation for the model year and all years prior to the model year:

$$\begin{aligned} \text{Monthly Energy Savings}_{\text{Fuel X}} = & \text{Previous Month Energy Savings}_{\text{Fuel X}} + \\ & [(\text{Previous Month Actual Energy Consumption}_{\text{Fuel X}} - \\ & \text{Previous Month Modeled Energy Consumption}_{\text{Fuel X}}) - \\ & (\text{Current Month Actual Energy Consumption}_{\text{Fuel X}} - \\ & \text{Current Month Modeled Energy Consumption}_{\text{Fuel X}})] \end{aligned}$$

Calculation for all years after the model year:

$$\text{Monthly Energy Savings}_{\text{Fuel X}} = \text{Monthly Modeled Energy Consumption}_{\text{Fuel X}} - \text{Monthly Actual Energy Consumption}_{\text{Fuel X}}$$

Backcasting:

$$\begin{aligned} \text{Monthly Energy Savings}_{\text{Fuel X}} = & \text{Previous Month Energy Savings}_{\text{Fuel X}} + \\ & [(\text{Previous Month Actual Energy Consumption}_{\text{Fuel X}} - \\ & \text{Previous Month Modeled Energy Consumption}_{\text{Fuel X}}) - \\ & (\text{Current Month Actual Energy Consumption}_{\text{Fuel X}} - \\ & \text{Current Month Modeled Energy Consumption}_{\text{Fuel X}})] \end{aligned}$$

2.1.2.3. Add a column for monthly energy cost. One column would be added for each energy source.

$$\text{Monthly Unit Energy Cost}_{\text{Fuel X}} = \text{Monthly Energy Cost}_{\text{Fuel X}} / \text{Monthly Energy Consumption}_{\text{Fuel X}}$$

2.1.2.4. Add a column for monthly energy cost savings. One column would be added for each energy source.

$$\text{Monthly Cost Savings}_{\text{Fuel X}} = \text{Monthly Unit Energy Cost}_{\text{Fuel X}} \times \text{Monthly Energy Savings}_{\text{Fuel X}}$$

2.1.2.5. Add the CUSUM to the Modeled Data sheet. The new column would be added below the “annual improvement” row. The calculation for CUSUM would be:

$$\begin{aligned} \text{CUSUM} = & (\text{Current Month Total Actual Energy Consumption} \\ & - \text{Current Month Total of Modeled Energy Consumption}) \\ & + \text{Previous Month CUSUM} \end{aligned}$$

A CUSUM value would not be calculated for the model year data points. When chaining is selected as the regression method, the calculation for the first data point after the model year is:

$$\begin{aligned} \text{CUSUM} = & (\text{Current Month Total Actual Energy Consumption} \\ & - \text{Current Month Total of Modeled Energy Consumption}) \end{aligned}$$

A screenshot showing where these columns would be added along with the format of the label and numbers is shown below.

Total of Modeled Values	SEP CUSUM	Energy Savings: Electricity (kWh)(MMBT)	Energy Savings: Natural Gas (MMBTU)	Unit Cost: Electricity (kWh)(MMBT)	Unit Cost: Natural Gas (MMBTU)	Cost Savings: Electricity (kWh)(MMBT)	Cost Savings: Natural Gas (MMBTU)
61,752		2,371	-312	\$ 0.11	\$ 9.48	\$ 270.19	\$ (2,958.15)
63,986		1,719	1,319	\$ 0.10	\$ 11.34	\$ 180.10	\$ 14,958.27
68,425		4,269	247	\$ 0.10	\$ 10.09	\$ 435.25	\$ 2,487.46
63,730		-3,560	-195	\$ 0.09	\$ 11.28	\$ (328.46)	\$ (2,198.57)
73,451		237	953	\$ 0.09	\$ 9.24	\$ 21.16	\$ 8,806.60
69,235		-843	-2,981	\$ 0.09	\$ 7.98	\$ (77.64)	\$ (23,801.82)
71,856		-3,288	721	\$ 0.09	\$ 8.28	\$ (292.03)	\$ 5,966.72
58,272		-3,969	-1,232	\$ 0.11	\$ 9.07	\$ (422.87)	\$ (11,168.33)
69,325		802	473	\$ 0.11	\$ 6.56	\$ 88.73	\$ 3,101.88
64,005		-1,319	-1,100	\$ 0.11	\$ 6.58	\$ (151.22)	\$ (7,233.91)
60,510		2,657	-775	\$ 0.12	\$ 8.10	\$ 331.29	\$ (6,271.90)
59,432		924	2,882	\$ 0.12	\$ 11.15	\$ 109.52	\$ 32,131.35
58,738	-4,668	4,185	483	\$ 0.12	\$ 11.33	\$ 512.45	\$ 5,475.46
58,464	-10,872	3,908	2,296	\$ 0.12	\$ 15.64	\$ 458.00	\$ 35,899.20
68,018	-22,391	7,632	3,887	\$ 0.11	\$ 13.15	\$ 846.38	\$ 51,089.00
67,905	-30,274	3,086	4,797	\$ 0.10	\$ 14.80	\$ 309.30	\$ 71,006.13
68,766	-36,681	2,530	3,877	\$ 0.10	\$ 13.07	\$ 248.60	\$ 50,681.67
66,826	-42,288	2,711	2,896	\$ 0.10	\$ 12.64	\$ 274.65	\$ 36,603.05
73,072	-46,707	-4	4,423	\$ 0.09	\$ 9.40	\$ (0.34)	\$ 41,591.07
64,022	-47,208	314	187	\$ 0.11	\$ 9.17	\$ 33.33	\$ 1,712.35
63,874	-43,674	-2,045	-1,489	\$ 0.11	\$ 6.79	\$ (225.65)	\$ (10,106.55)
65,045	-40,715	-1,591	-1,369	\$ 0.11	\$ 6.39	\$ (178.68)	\$ (8,741.93)
65,043	-42,964	2,843	-593	\$ 0.12	\$ 7.06	\$ 342.15	\$ (4,186.98)
66,777	-48,153	3,636	1,553	\$ 0.11	\$ 9.06	\$ 498.68	\$ 14,078.40

### 2.1.3. Modifications to the “EnPI Results” and “SEnPI Results” output sheets.

#### 2.1.3.1. Show energy savings by energy source on the EnPI and SEnPI Sheets.

The calculation would be the same as the total savings calculation, only the “actual” and “modeled” values used for the calculation would not be the sum of the energy sources, but rather the value for each individual energy source.

Forecasting (Model year = baseline year)

$$\text{Annual Savings}_{CY} = \widehat{EC}_{CY} - EC_{CY}$$

Chaining (Model year does not = baseline year, and does not = last reporting year)

Calculation for the model year, and all years prior to the model year:

$$\begin{aligned} \text{Annual Savings}_{CY} &= \text{Annual Savings}_{PY} \\ &+ [(EC_{PY} - \widehat{EC}_{PY}) - (EC_{CY} - \widehat{EC}_{CY})] \end{aligned}$$

Calculation for all years after the model year:

$$\text{Annual Savings}_{CY} = \widehat{EC}_{CY} - EC_{CY}$$

Backcasting (Model year = last reporting year)

$$\begin{aligned} \text{Annual Savings}_{CY} &= \text{Annual Savings}_{PY} \\ &+ [(EC_{PY} - \widehat{EC}_{PY}) - (EC_{CY} - \widehat{EC}_{CY})] \end{aligned}$$

#### 2.1.3.2. Show estimated cost savings on the EnPI and SEnPI Sheets.

To calculate the annual cost savings for each fuel source, sum the monthly cost savings calculated on the model data sheet for each fuel type for each year.

A screenshot showing where the estimated savings would be added to the EnPI results sheet is shown below.

General Energy Performance Results					
The table below shows the unadjusted and adjusted energy consumption and intensity data. The models used to adjust the data for each energy source are shown below the plots and on the individual sheets for each energy source. Note that the tool selects the model that is appropriate for the SEP Program and has the highest adjusted R-squared value.					
	FY1	FY2	FY3	FY4	FY5
Electricity (MMBTU)	579,429	554,418	555,293	538,598	517,390
Natural Gas (MMBTU)	204,549	183,422	203,875	199,798	199,798
TOTAL (MMBtu)	783,978	737,840	759,168	738,396	717,188
Adjustment Method	Model Year	Forecast	Forecast	Forecast	Forecast
Modeled Electricity (MMBTU)	579,429	581,623	591,812	592,713	581,617
Electricity (MMBtu) Annual Savings	0	27,205	36,519	54,115	64,227
Electricity (MMBtu) <i>Estimated Cost Savings</i>	\$ -	\$ 4,080.80	\$ 5,477.92	\$ 8,117.26	\$ 9,634.00
Modeled Natural Gas (MMBTU)	204,549	204,370	210,790	209,658	201,698
Natural Gas (MMBtu) Annual Savings	0	20,948	6,915	9,860	1,900
Natural Gas <i>Estimated Cost Savings</i>	\$ -	\$ 41,896.32	\$ 13,829.59	\$ 19,720.08	\$ 3,800.04
Total of Modeled Values	783,978	785,993	802,602	802,371	783,314
Total Improvement in Energy Intensity (%)	0.00%	6.13%	5.41%	7.97%	8.44%
Annual Improvement in Energy Intensity (%)	0.00%	6.13%	-0.71%	2.56%	0.47%
Total Energy Savings since Baseline Year (MMBtu/Year)	0	48,153	43,434	63,975	66,127
New Energy Savings for Current Year (MMBtu/year)	0	48,153	-4,719	20,541	2,152
Adjustment for Baseline Primary Energy Use (MMBtu/year)	0	2,016	18,624	18,393	-663
<i>Estimated Annual Cost Savings</i>	\$ -	\$ 45,977	\$ 19,308	\$ 27,837	\$ 13,434

2.1.3.4 Add the cumulative savings row to the SENPI Sheet only.

*Cumulative Savings*

$$= \text{Cumulative Savings for the Previous Year} + \text{Annual Savings for the Current Year}$$

An updated SENPI Results table is shown below.

Superior Energy Performance Results					
The table below shows the unadjusted and adjusted energy consumption and intensity data. The models used to adjust the data for each energy source are shown below the plots and on the individual sheets for each energy source. Note that the tool selects the model that is appropriate for the SEP Program and has the highest adjusted R-squared value.					
	FY1	FY2	FY3	FY4	FY5
Electricity (MMBTU)	579,429	554,418	555,293	538,598	517,390
Natural Gas (MMBTU)	204,549	183,422	203,875	199,798	199,798
TOTAL (MMBtu)	783,978	737,840	759,168	738,396	717,188
Adjustment Method	Model Year	Forecast	Forecast	Forecast	Forecast
Modeled Electricity (MMBTU)	579,429	581,623	591,812	592,713	581,617
Electricity (MMBtu) Annual Savings	0	27,205	36,519	54,115	64,227
Electricity (MMBtu) <i>Estimated Cost Savings</i>	\$ -	\$ 4,080.80	\$ 5,477.92	\$ 8,117.26	\$ 9,634.00
Modeled Natural Gas (MMBTU)	204,549	204,370	210,790	209,658	201,698
Natural Gas (MMBtu) Annual Savings	0	20,948	6,915	9,860	1,900
Natural Gas <i>Estimated Cost Savings</i>	\$ -	\$ 41,896.32	\$ 13,829.59	\$ 19,720.08	\$ 3,800.04
Total of Modeled Values	783,978	785,993	802,602	802,371	783,314
Total SENPI Cumulative	1.000	0.939	0.946	0.920	0.916
Cumulative Improvement (%)	0.00%	6.13%	5.41%	7.97%	8.44%
Annual Improvement (%)	0.00%	6.13%	-0.71%	2.56%	0.47%
Annual Savings (MMBtu/year)	0	48,153	43,434	63,975	66,127
Cumulative Savings (MMBtu)	0	48,153	91,588	155,563	221,690
<i>Estimated Annual Cost Savings</i>	\$ -	\$ 211,658	\$ 72,070	\$ 102,930	\$ 24,138

## 2.1.4. Modifications to the corporate roll-up calculations and outputs.

2.1.4.1. Update the results to show the energy use for each plant broken down by type (electricity, natural gas, etc.) and total energy use for the corporation broken down by fuel type.

<b>Corporate Roll-up</b>			
	2007	2008	2009
<b>IGH</b>			
Electricity (MMBtu)	330,322	287,269	299,324
Natural Gas (MMBtu)	495,483	430,904	448,986
TOTAL Primary Energy Consumed (MMBtu/year)	825,805	718,173	748,310
TOTAL MODELED Primary Energy Consumed (MMBtu/year)	825,805	784,138	789,448
Annual Improvement (%)	0.0%	8.4%	-3.2%
Total Improvement (%)	0.0%	8.4%	5.2%
New Energy Savings for Current Year (MMBtu/year)	0	65,965	-24,827
Total Energy Savings since Baseline Year (MMBtu/year)	0	65,965	41,138
<b>McLean -ACT</b>			
Electricity (MMBtu)	330,322	287,269	299,324
Natural Gas (MMBtu)	495,483	430,904	448,986
TOTAL Primary Energy Consumed (MMBtu/year)	825,805	718,173	748,310
TOTAL MODELED Primary Energy Consumed (MMBtu/year)	825,805	718,173	748,310
Annual Improvement (%)	0.0%	5.5%	-2.6%
Total Improvement (%)	0.0%	5.5%	2.9%
New Energy Savings for Current Year (MMBtu/year)	0	107,632	-30,136
Total Energy Savings since Baseline Year (MMBtu/year)	0	107,632	77,495
<b>Rochester - reg</b>			
Electricity (MMBtu)	1,037,882	809,869	677,371
Natural Gas (MMBtu)	1,556,823	1,214,803	1,016,056
TOTAL Primary Energy Consumed (MMBtu/year)	2,594,704	2,024,672	1,693,426
TOTAL MODELED Primary Energy Consumed (MMBtu/year)	2,594,704	2,116,493	1,897,843
Annual Improvement (%)	0.0%	4.3%	6.4%
Total Improvement (%)	0.0%	4.3%	10.8%
New Energy Savings for Current Year (MMBtu/year)	0	91,821	112,596
Total Energy Savings since Baseline Year (MMBtu/year)	0	91,821	204,417
<b>Corporate Totals</b>			
<b>Total Electricity (MMBtu)</b>	<b>1,698,526</b>	<b>1,384,407</b>	<b>1,276,018</b>
<b>Total Natural Gas (MMBtu)</b>	<b>2,547,788</b>	<b>2,076,611</b>	<b>1,914,027</b>
<b>TOTAL Primary Energy Consumed (MMBtu/year)</b>	<b>330,322</b>	<b>353,234</b>	<b>340,462</b>
<b>Adjustment for Baseline Primary Energy Use (MMBtu)</b>	<b>2,382,627</b>	<b>1,955,889</b>	<b>1,774,506</b>
<b>Adjusted Baseline Primary Energy Use (MMBtu/year)</b>	<b>2,712,949</b>	<b>2,286,210</b>	<b>2,104,828</b>
<b>Annual Improvement (%)</b>	<b>0.0%</b>	<b>5.4%</b>	<b>2.8%</b>
<b>Total Improvement (%)</b>	<b>0.0%</b>	<b>5.4%</b>	<b>8.2%</b>
<b>New Energy Savings for Current Year (MMBtu/year)</b>	<b>0</b>	<b>-449,651</b>	<b>-168,611</b>
<b>Total Energy Savings since Baseline Year (MMBtu/year)</b>	<b>2,382,627</b>	<b>1,932,976</b>	<b>1,764,365</b>

## 2.1.5 Modifications to the base calculations.

2.1.5.4 Remove the ratio of Modeled-Model Year Energy Consumption and Model-Actual Year Energy Consumption from the SEnPI Calculation. The new equations for SEnPI are shown below.

Forecasting (Model year = baseline year)

Calculation for the model year:

$$SEnPI_{MY} = 1$$

Calculation for all years after the model year:

$$SEnPI_{CY} = \frac{EC_{CY}}{\widehat{EC}_{CY}}$$

Chaining (Model year does not = baseline year, and does not = last reporting year)

Calculation for all years prior to the model year, including the baseline year:

$$SEnPI_{CY} = \frac{\widehat{EC}_{CY}}{EC_{CY}}$$

Calculation for the model year:

$$SEnPI_{MY} = 1$$

Calculation for all years after the model year:

$$SEnPI_{CY} = \frac{EC_{CY}}{EC_{BY}} \times \frac{\widehat{EC}_{BY}}{\widehat{EC}_{CY}}$$

Backcasting (Model year = last reporting year)

Calculation for all years prior to the model year, including the baseline year:

$$SEnPI_{CY} = \frac{\widehat{EC}_{CY}}{EC_{CY}}$$

Calculation for the model year:

$$SEnPI_{MY} = 1$$

## 2.2 Format Changes

The following changes are to formatting only and do not require additional inputs, changes to the calculations, or changes to the functionality.

### 2.2.1 Modifications to the format of the “Model Data” sheet.

2.2.1.1 When a user changes the model using “change models”, change the model which is shown in green to be the model selected by the user.

For example, if in the case shown in the mock-up below, the user changed the model from 4 to 5, the following would be shown.

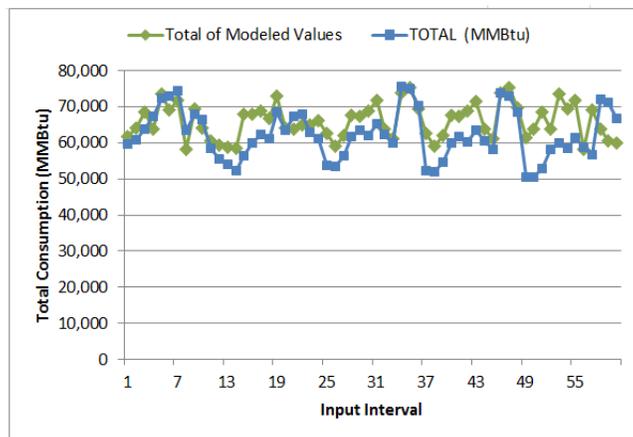
**3 Electricity (kWh)(MMBTU) Models**

The table below shows all possible models for 3 Electricity (kWh)(MMBTU) consumption. The model highlighted in green in the table below is the model with the highest Adjusted R2 value. If "true" is shown in column B, the model is designated as valid. A model is considered valid if the model p-value is less than 0.10. The model highlighted in green is used to calculate the adjusted data on the EnPI Results, SEnPI Results, and Adjusted Data tabs. If the model is switched, the corresponding data will be updated with the model selected. The models can be switched using the "Change Models" icon in the top navigation.

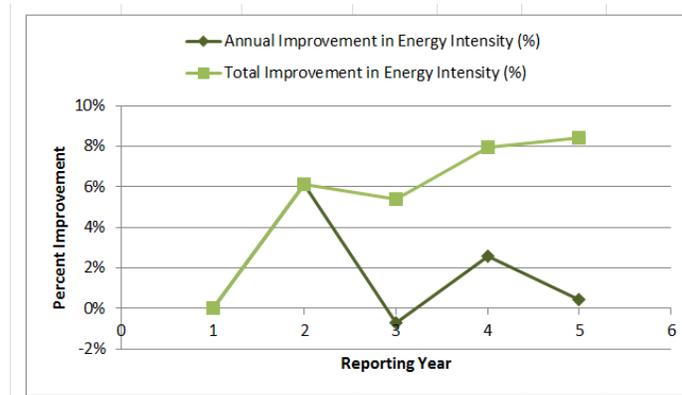
Model Number	Model is Appropriate for SEP	Variables	Variable p-Values	R2	Adjusted R2	Model p-Value	Formula
4	TRUE	Production HDD	0.0139 0.0307	0.7815	0.7329	0.0011	(0.115331637463
5	TRUE	Production CDD	0.0073 0.1244	0.7136	0.6500	0.0036	(0.138903682418
1	TRUE	Production	0.0023	0.6223	0.5845	0.0023	(0.164797572466
2	TRUE	HDD	0.0054	0.5561	0.5117	0.0054	(-6.73771054478
7	FALSE	Production HDD CDD	0.0206 0.1232 0.5597	0.7911	0.7128	0.0043	(0.113301104185

### 2.2.2 EnPI and SEnPI output sheets

2.2.2.1 Change the color of the “TOTAL (MMBtu)” line on the Total Consumption vs. Input Interval plot to be blue. Keep the “Total of Modeled Values” green.



2.3.2.2 On the energy intensity, percent improvement vs. reporting year plot on the EnPI sheet, remove the “Production Energy Intensity” and “Building Energy Intensity” plots.



## 2.4 Wizard

The following changes are to the text on the Wizard. The following changes do not affect the inputs, functionality, calculations, or outputs.

2.4.1. Add step numbers to each step of the wizard. Have the step numbers match the user manual.

The titles of the wizard windows will be changed to:

Step 1: Enter your Energy Data and Independent Variables

Step 1.1: Enter your Energy Data

Step 1.2: Enter Independent Variables

Step 2: Assign Labels to your Reporting Periods

Step 3: Energy Data Conversions

Step 4: Select a Calculation Method

Step 5: Select Data for Calculations (note - would only appear at the top of the “use actual” and “use regression” input windows if navigated to from the wizard)

2.4.2. Update the descriptive text on the “Label Reporting Period” step.

Change the text at the top of the label reporting period step to say:

A “Period” column needs to be added to define the reporting periods for each data point. Reporting period labels are required for the tool to calculate the performance indicators. The reporting periods assigned to the data do not need to follow the calendar year. If a company reports along their fiscal year, enter the fiscal year which corresponds to each data point in the “Period” column.

The reporting label for each data point in the same reporting year needs to have the same format. For example, if two data points fall within the 2006 fiscal year, only one label can be used for all the data points within the reporting year. If one data point is labeled as “FY2006”, the second data point in the reporting period cannot be labeled as “Fiscal Year 2006”.

The period column can either be entered manually, or using the commands below. For more information on the “Period” column, please see the user manual posted on the EnPI Landing page: [ecenter.ee.doe.gov/EM/tools/Pages/EnPI.aspx](http://ecenter.ee.doe.gov/EM/tools/Pages/EnPI.aspx)

## 2.5 Warnings

The following section describes potential additions to the warnings. The following changes would make the tool easier to use and error messages clearer.

### 2.5.1. Modifications to the warnings which appear when entering input data.

#### 2.5.1.1. Modify the error message shown when a cell is blank in the inputs to say:

A cell in column X is blank. Please either delete the row or enter a zero in the blank cell before proceeding.

### 2.5.2. Modifications to the warnings which appear on the “Modeled data” output sheet.

#### 2.5.2.1. Modify the error message shown at the top of the sheet when the second validation check is triggered. Change the text to the following, and put the error in a separate box, highlighted in red.

Warning: The cells highlighted in red are out of the allowable range of the model year values. Meaning, the model cannot be used to predict the energy use for the time period shown in red if the variables shown in red are included in the model. It is recommended to select an alternative model which meets the R-squared and p-value requirements and does not include the variable shown in the model. If an alternative model cannot be selected with the current model year, try selecting an alternative model year. For more information, see the SEP Measurement and Verification Protocol.

#### 2.5.2.2 Add a 3<sup>rd</sup> check to the EnPI results. If a negative modeled energy consumption value is calculated on the “model data” sheet, the tool will flag the value and show the user a warning. The cell containing the negative value will be shown in yellow and a warning will be shown. For example, the following warning text could be displayed below the 3-std. deviation validation check and above the modeled data table:

“One or more of the calculated modeled energy consumption values is negative. The negative modeled energy value(s) is shown in yellow. Consider deleting this value before proceeding.”

Since the “change models” feature impacts whether a negative modeled energy consumption value is calculated, this check will be cleared and repeated each time the “change models” feature is used.

2.5.3. Modifications to the warnings which appear on the “EnPI Results” and “SEnPI Results” output sheets.

2.5.3.1. Modify the error message shown above the table showing the model when the second validation check is triggered. Update the text to the following:

Warning: The cells highlighted in red on the “Model Data” sheet are out of the allowable range of the model year values. Meaning, the model cannot be used to predict the energy use for the time period shown in red if the variables shown in red are included in the model. It is recommended to select an alternative model which meets the R-squared and p-value requirements and does not include the variable shown in red in the model. If an alternative model cannot be selected with the current model year, try selecting an alternative model year. For more information, see the SEP Measurement and Verification Protocol.

2.5.4. Modifications to the warnings which appear when using the corporate roll-up feature.

2.5.4.1. In the corporate roll-up, if sheets are selected that do not have matching column names, show the user a warning.

The “Period” labels for Plants: X, Y and Z do not match. You must use the same period labels in the plant analysis and corporate roll-up; otherwise, the plant level results will not line up. Would you like to proceed with the current period labels? (yes, no)

2.5.4.2. Show a warning if the user selects workbooks for the corporate roll-up that do not have a “EnPI” or “EnPI Actual” results sheet.

The EnPI tool has not been run in workbook(s): X, Y, Z. The tool must be run at the plant level in workbook X before proceeding. (ok)

- 2.5.4.3. Show the user an error message if there is an issue with the plant level sheets selected to be imported (e.g. a sheet has been deleted).

An error was encountered while attempting to import sheets from workbook X. Please re-run the tool in workbook X before including it in the corporate roll-up. (ok)

## **2.6 User Manual**

The following section describes modifications which will be made to the user manual.

- 2.6.1 Update the user manual to explain the annual savings calculation and that if 12 months of data are not entered, the calculation will be incorrect.
- 2.6.2 Update the user manual to clarify how the short-cuts in the tool are used (e.g. converts, use actual, use regression)
- 2.6.3 Update the user manual to clarify how to set a custom model year (e.g. a 15 month period)

## APPENDIX A: Modifications added April 2014

A.1 Display energy savings by energy source and estimated cost savings on the Use Actual results.

Energy savings by energy source will be calculated using the following equation.

$$\text{Energy Source}_N \text{ Annual Savings} = \text{EC}_{\text{BY}_N} - \text{EC}_{\text{CY}_N}$$

Where the “Energy Source<sub>N</sub> Annual Savings” represents the “total energy savings since baseline year” per energy source (N) entered in the inputs (e.g. electric, natural gas, etc.), EC represents the annual energy consumption, BY represents the baseline year, and CY represents the current year.

The estimated cost savings will be calculated by taking the sum of the monthly cost savings calculated on the detailed data sheet for each fuel type for each year.

A screenshot of the updated “EnPI Actual Results” sheet is shown below.

General Energy Performance Results				
	FY1	FY2	FY3	FY4
Electricity (MMBTU)	579,429	554,418	555,293	538,598
Electricity (MMBTU) Annual Savings	0	25,011	24,136	40,830
Electricity (MMBTU) <i>Estimated Cost Savings</i>	\$ -	\$ 50,021	\$ 48,272	\$ 81,661
Natural Gas (MMBTU)	204,549	183,422	203,875	199,798
Natural Gas (MMBTU) Annual Savings	0	21,127	674	4,752
Natural Gas (MMBTU) <i>Estimated Cost Savings</i>	\$ -	\$ 63,381	\$ 2,022	\$ 14,255
<b>TOTAL (MMBtu)</b>	<b>783,978</b>	<b>737,840</b>	<b>759,168</b>	<b>738,396</b>
Total Production Output	2,638,204	2,649,710	2,734,238	2,734,418
Production Energy Intensity (MMBtu/unit production)	0.297	0.278	0.278	0.270
Total Improvement in Energy Intensity (%)	0.00%	6.29%	6.57%	9.13%
Annual Improvement in Energy Intensity (%)	0.00%	6.29%	0.27%	2.56%
Total Savings Since Baseline Year (MMBtu/Year)	0	46,138	24,810	45,582
New Energy Savings for Current Year (MMBtu/year)	0	46,138	-21,328	20,772
<i>Estimated Annual Cost Savings</i>	\$ -	\$ 113,402	\$ 50,294	\$ 95,915
Avoided CO2 Emissions (Metric Ton/year)	0	7,723	6,408	11,031