

## **Calculating EUI: Behind the Numbers**

Energy Use Intensity (EUI) is a measurement of building energy efficiency. A building's utilities are all measured using different metrics (kWh, therms, etc.) and EUI boils all of this information into one number that can be compared against other buildings and historical performance. There are two types of EUI: site and source. Site EUI is the amount of heat and electricity a building consumes as reflected in utility bills. Source EUI traces heat and electricity use back to the original raw input creating a more holistic understanding of a building's energy use. Therefore, Sustainable Jersey uses source EUI as the most complete measure of building energy performance.

### **Step #1 Calculate a Baseline Source EUI**

The first step for schools is to calculate a baseline source EUI. This involves the gathering of at least 12 months of utility data for electricity, natural gas, oil, and propane. The simplest way for most schools and districts to acquire a baseline would be to utilize an energy tracking and management system such as Energy Star Portfolio Manager. If the school pursues the Local Government Energy Audit (LGEA) program, the auditing firm may calculate EUI for the school's buildings or overall portfolio. However, the school and district can complete the source EUI calculations itself utilizing Sustainable Jersey's Source EUI Calculation worksheet.

### **Step #2 Calculate a Projected Source EUI**

If the school is submitting a post-implementation realized source EUI, this can be calculated in the same manner as the baseline EUI.

Calculating a projected EUI is a bit more complicated. This will not be provided in the LGEA report and the school or district will have to calculate this number itself. This calculation will utilize information from either the Direct Install program, the LGEA program, or a private audit.

#### *Direct Install*

Some schools will look towards the information gathered in the Direct Install energy assessment to calculate a projected EUI. The relevant information for these calculations can be found on the sheet entitled 'Direct Install Energy Assessment Tool.' The Project Summary portion of the document will provide projected energy reductions in electricity, gas, oil, and propane measures. Each of these should be summed. However, each will be represented in different units. Electricity will be shown in kilowatt hours (kWh), gas in therms, and oil and propane in gallons. To calculate EUI, these must all be converted to common unit. The British Thermal Unit (btu) is the standard for these calculations, and these figures should be converted into kbtu. This can be done by utilizing the US Energy Information Association's conversion calculator located in the Resources section of this document.

#### *LGEA or Private Audit*

The projected EUI calculation for LGEA or private audit will be very similar to that of Direct Install program. The major difference is that the audit report may not sum the energy reduction in the categories of electricity, gas, oil, and propane. Schools utilizing information from the audit will have to sum these figures themselves. Once the potential for energy reductions in each of four categories has been compiled, the process will be the same for schools engaged in either the Direct Install program, the LGEA program, or a private audit.

Consider an example calculation case. EUI will have to first be calculated for each building in the school's portfolio. Note: This conversions can be completed using the US Energy Information Association's conversion calculator.

Building: 10,000 square feet
<i>Savings Projections</i>
Electricity: 50,000 kWh
Gas: 1,500 therms
Oil: 100 gallons
Propane: 200 gallons
On-site Renewable: +10,000 kWh (This school will be adding on-site electricity through renewables)

This table shows energy reductions for the four major energy inputs. However, on-site electricity has increased because the sample school is installing a solar electricity system.

- 1) The school will first convert all inputs into kbtu.

50,000 kWh=176,600 kbtu

1,500 therms=153,750 kbtu

100 gallons of oil=13,869 kbtu

200 gallons of propane=18,266 kbtu

- 2) These figures must be multiplied by an additional factor to calculate source EUI to create a more holistic picture of energy use. Sustainable Jersey requires the use of Energy Star Portfolio Manager's source-site national ratios. These specific ratios can be in the Energy Star Portfolio Manager Technical Resource in the 'Resources' section.

170,600\*3.14= 535684 kbtu

153,750\*1.05= 161437.5 kbtu

13,869\*1.01= 14007.69 kbtu

18,266\*1.01= 18448.66 kbtu

Source adjusted sub-total: 729577.9 kbtu

- 3) However, the school cannot forget about the added on-site renewable generation.

10,000 kWh=34120 kbtu.

34,120\*1.0= 34210 kbtu

This will be **subtracted** from the source adjusted sub-total because energy savings are diminished.

New source adjusted total= 729577.9-34120= 695457.9 kbtu

- 4) To calculate source EUI the kbtu total must be divided by the building's square footage.

$695457.9/10,000 = 69.55 \text{ kbtu/sq.ft}$

Therefore our sample school has a potential energy reduction of 70 EUI

- 5) Finally the school or district must compare projected EUI against a baseline to calculate a percentage change. If the building's starting EUI was 200, then the projected post-implementation EUI is 130, which is a reduction of 35%.

These calculations will quantify the potential impact of energy measures on the school's building energy efficiency. Projected reductions in source EUI are eligible for points in the Implement Building Energy Measures for 2 years. After that time, the school or district must demonstrate measured EUI reductions. Our sample school would receive 30 points for two years because their projected EUI improvement is over 30%. After two years, the school must prove actual improvement to maintain points.

Resources:

Energy Star Portfolio Manager's Source Energy Technical Resource:

<http://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-source-energy>

US Energy Information Association: [http://www.eia.gov/energyexplained/index.cfm?page=about\\_btu](http://www.eia.gov/energyexplained/index.cfm?page=about_btu)