



The European school challenge

Energy Saving Tool

User Guidelines



2010 - 2011



U4energy is an initiative funded through the Intelligent Energy Europe programme

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INTRODUCTION

This Energy Saving Tool helps schools calculate their energy savings during the **competition year** (2010-2011), by comparing differences to the **reference year** (2009-2010).

Participants are required to provide electricity and heating consumption data for the year prior to the competition, the **reference year**, as well as the **competition year**. Energy savings will be expressed as an increase or decrease of energy consumption (%), financial costs, and CO₂ emitted.

The Energy Saving Tool is an Excel application, composed of eight datasheets. These sheets are divided into two colour categories. The first four sheets (blue) are intended for participants to submit their consumption data.

| |
|--|
| Input |
| ▶ Provide precise energy consumption data |
| Example |
| ▶ See how the input sheet could look like when filled in |
| Graphs |
| ▶ Visualise and compare differences in energy consumption levels between the reference and competition years |
| Results |
| ▶ Find detailed results on energy use, costs and CO ₂ emissions according to the data submitted |

The last four datasheets (green) present important data used for calculations (available to users for information purposes in English):

| |
|--|
| Conversions |
| ▶ Various energy conversions made by the tool |
| CO₂ Emissions |
| ▶ Country specific CO ₂ emissions for the production of electricity |
| Degrees Days |
| ▶ Country specific data on Heating Degrees Days |

Energy Prices

► Country specific energy prices



NB: If you are not an energy expert, you will most probably only be interested in the first four sheets. If you would like to find out more about the source data and internal calculations of the tool, you can consult these four last sheets.

FAQ

How do I feed my energy consumption data into this tool?

Please provide the following energy data for electricity and heating:

- Annual consumption for the reference year (2009-2010)
- Monthly consumption for the competition year (2010-2011)

In total, you will need to provide 20 figures. These include the annual consumption for the reference year for electricity and heating, in addition to the nine monthly consumption figures for electricity and heating for the competition year.

► [View the Input chapter](#)

Where can I visualise my energy savings?

Once your data has been entered, the Energy Saving Tool will automatically calculate your energy savings and present them as graphs.

Savings are measured in terms of energy consumption, financial costs and CO₂ emissions.

► [View the Graphs and Results chapters](#)

How does the tool calculate my savings and CO₂ emissions?

The Energy Saving Tool uses publically available data such as energy prices, CO₂ emissions due to electricity, heating degrees days and other energy conversion factors.

► [View the Calculations chapter](#)



INPUT

You should enter your details and raw consumption data in this sheet.

Input

Energy Saving Tool

| | | | | | | | |
|------------------------|--------------------|-----------|--------------------------------|------------------------------|---------------|-------------|--------------------------------|
| School name: | myschool | | | | | | |
| Class/Teacher: | myclass/myself | | | | | | |
| Country: | Belgium | 0,152 | 0,253 | 10,48 | 0,04400 | 0,20194 | |
| Heating: | Natural Gas | (€/kwh) | (kgCO2/kwh) | (kwh/unit) | (€/kwh) | (kgCO2/kwh) | |
| 2009-2010 | Electricity | | | Heating (Natural Gas) | | | |
| unit | Consumed kwh | Cost € | Emissions KgCO ₂ | Consumed m ³ | Energy kwh | Cost € | Emissions KgCO ₂ |
| Reference year total | 12.345 | 1.876,44 | 3.123 | 1.234 | 12.932 | 569,02 | 2.612 |
| 2010-2011 | Electricity | | | Heating (Natural Gas) | | | |
| unit | Consumed kwh | Cost € | Emissions KgCO ₂ | Consumed m ³ | Energy kwh | Cost € | Emissions KgCO ₂ |
| Sep 2010 | 800 | 121,60 | 202 | 25 | 262 | 11,53 | 53 |
| Oct 2010 | 1.000 | 152,00 | 253 | 50 | 524 | 23,06 | 106 |
| Nov 2010 | 1.200 | 182,40 | 304 | 100 | 1.048 | 46,11 | 212 |
| Dec 2010 | 1.250 | 190,00 | 316 | 200 | 2.096 | 92,22 | 423 |
| Jan 2011 | 1.250 | 190,00 | 316 | 287 | 3.008 | 132,34 | 607 |
| Feb 2011 | 1.200 | 182,40 | 304 | 200 | 2.096 | 92,22 | 423 |
| Mar 2011 | 1.100 | 167,20 | 278 | 100 | 1.048 | 46,11 | 212 |
| Apr 2011 | 1.000 | 152,00 | 253 | 50 | 524 | 23,06 | 106 |
| May 2011 | 800 | 121,60 | 202 | 50 | 524 | 23,06 | 106 |
| Competition year total | 9.600 | 1.459,20 | 2.429 | 1.062 | 11.130 | 489,71 | 2.248 |

Administrative data

The information you submit in this section is crucial as it will determine the accuracy of all calculations made by the tool.

Please make sure to include the following information:

- School name: name of your school
- Class/Teacher: name of the participating class and responsible teacher
- Country: select your home country from the drop-down list
- Heating: select your heating system from the drop-down list of supported heating systems:
 - Natural gas
 - Fuel oil
 - Other

If your school does not use natural gas or fuel oil, please choose the option 'Other', that covers various types of heating systems based on coal, cogeneration, geothermal energy, etc.



- ▶ View the green area at the right of the fields 'Country' & 'Heating' in the Energy Saving Tool's Input sheet.



NB: You can only input data in the empty fields with white background.

Raw consumption data

In this section, you should enter your school's consumption levels (electricity and heating) for the reference and competition years.

For the **reference year**, annual consumption is requested. The beginning/end of this one-year period is not important as long as it covers the entire academic year:

Example I: You have an annual bill covering the period of March 2009 to April 2010. Just enter the corresponding amount in the tool.

Example II: You receive monthly or bi-monthly bills. Just sum up all the invoices related to the academic year 2009-2010 (September - May) and fill in the total.

For the **competition year**, you are required to provide consumption data on a monthly basis.

Ideally, you should monitor your energy counters every month and report your findings in the tool. If you do not have access to counters, you can use your energy bills instead. The tool will automatically translate heating consumption into kwh (kilowatt hour).

Energy units

The units used depend on the energy system you have selected:

- kwh (kilowatt hour) for electricity
- Litres for fuel oil
- m³ (cubic meters) for natural gas
- GJ (Giga Joule) for all other heating system



Estimation

Once you have submitted your data, the tool will provide estimations of savings on the basis of internal calculations, using official statistical data.



NB: If you selected 'Other' in the Heating system menu, you will notice that the tool does not calculate heating costs and CO₂ emissions. These fields will be displayed as #NA (Not Applicable), because the tool does not have the required data to make estimations for heating systems that do not use natural gas or fuel oil. Nevertheless, the energy consumption comparison and savings remain applicable.

EXAMPLE

This sheet provides an example to illustrate an input sheet that has been properly filled in.



| | | | | | | | |
|------------------------|--------------------|-----------|--------------------------------|---------------------------|---------------|-------------|--------------------------------|
| School name: | my school | | | | | | |
| Teacher: | myself | | | | | | |
| Class: | my class | | | | | | |
| Country: | Austria | 0,147 | 0,202 | 9,87 | 0,07242 | 0,26674 | |
| Heating: | Fuel Oil | (€/kwh) | (kgCO2/kwh) | (kwh/unit) | (€/kwh) | (kgCO2/kwh) | |
| 2009-2010 | Electricity | | | Heating (Fuel Oil) | | | |
| unit | Consumption kwh | Cost € | Emissions KgCO ₂ | Consumed liters | Energy kwh | Cost € | Emissions KgCO ₂ |
| Reference year total | 12.345 | 1.814,72 | 2.494 | 1.234 | 12.180 | 882,01 | 3.249 |
| 2010-2011 | Electricity | | | Heating (Fuel Oil) | | | |
| unit | Consumed kwh | Cost € | Emissions KgCO ₂ | Consumed liters | Energy kwh | Cost € | Emissions KgCO ₂ |
| September | 800 | 117,60 | 162 | 25 | 247 | 17,87 | 66 |
| October | 1.000 | 147,00 | 202 | 50 | 494 | 35,74 | 132 |
| November | 1.200 | 176,40 | 242 | 100 | 987 | 71,48 | 263 |
| December | 1.250 | 183,75 | 253 | 200 | 1.974 | 142,95 | 527 |
| January | 1.250 | 183,75 | 253 | 287 | 2.833 | 205,13 | 756 |
| February | 1.200 | 176,40 | 242 | 200 | 1.974 | 142,95 | 527 |
| March | 1.100 | 161,70 | 222 | 100 | 987 | 71,48 | 263 |
| April | 1.000 | 147,00 | 202 | 50 | 494 | 35,74 | 132 |
| May | 800 | 117,60 | 162 | 50 | 494 | 35,74 | 132 |
| Competition year total | 9.600 | 1.411,20 | 1.939 | 1.062 | 10.482 | 759,07 | 2.796 |



GRAPHS

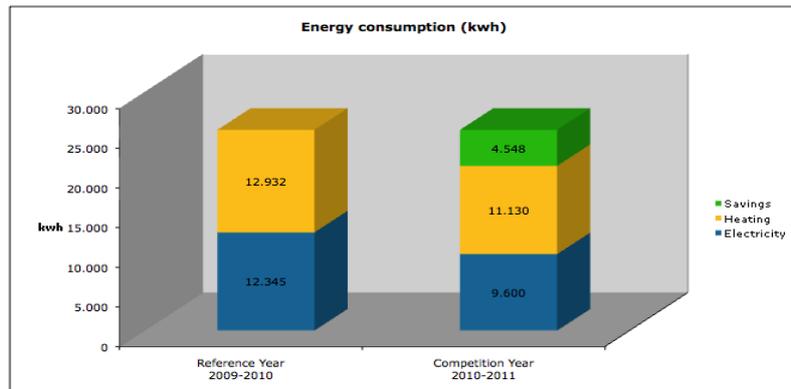
This sheet shows graphical comparisons of your school's consumption of electricity and heating for the reference and competition years.

The first graph is a global year-to-year comparison based on annual energy consumption:



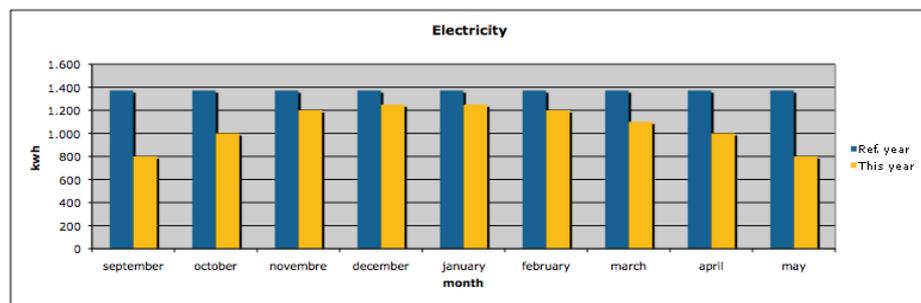
Energy Saving Tool

| Energy unit | Electricity kwh | Heating kwh | Savings kwh |
|----------------------------|-----------------|-------------|-------------|
| Reference Year 2009-2010 | 12.345 | 12.932 | |
| Competition Year 2010-2011 | 9.600 | 11.130 | 4.548 |

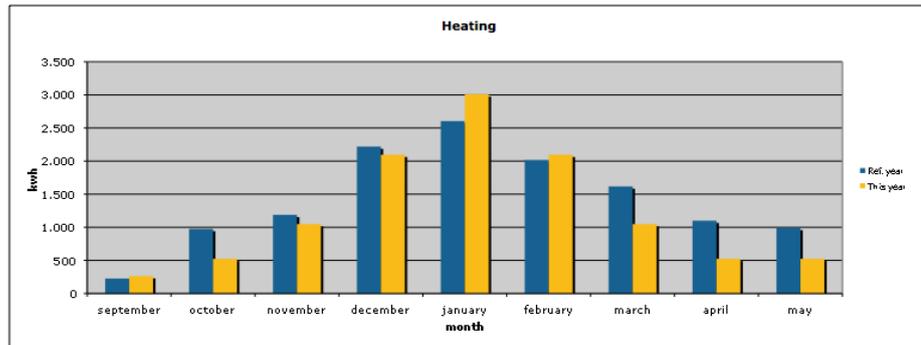


The second and third graphs display monthly consumption levels for electricity and heating throughout the academic year, from September to May:

| Electricity | Ref. year | This year |
|--------------|---------------|--------------|
| september | 1.372 | 800 |
| october | 1.372 | 1.000 |
| novembre | 1.372 | 1.200 |
| december | 1.372 | 1.250 |
| january | 1.372 | 1.250 |
| february | 1.372 | 1.200 |
| march | 1.372 | 1.100 |
| april | 1.372 | 1.000 |
| may | 1.372 | 800 |
| Total | 12.345 | 9.600 |



| Heating | Ref. year | This year |
|--------------|---------------|---------------|
| september | 226 | 262 |
| october | 975 | 524 |
| novembre | 1.187 | 1.048 |
| december | 2.219 | 2.096 |
| january | 2.604 | 3.008 |
| february | 2.014 | 2.096 |
| march | 1.617 | 1.048 |
| april | 1.099 | 524 |
| may | 991 | 524 |
| Total | 12.932 | 11.130 |



RESULTS

The Results sheet gives a detailed comparison of energy use, costs and CO₂ emissions.





| School name: | | | | | | | Your savings: | # N/A kwh # N/A € # N/A kgCO ₂ | | |
|---------------------|-------------|----------------------------|-------------------|-------------|-----------------------|-------------------|----------------------|---|-------------------|--|
| Address: | | | | | | | (circa) | | | |
| Country: | | | | | | | (circa) | | | |
| Heating: | 0 | | | | | | | | | |
| Electricity | | Reference year (2009-2010) | | | This year (2010-2011) | | | Savings | | |
| | Energy | Costs | Emissions | Energy | Costs | Emissions | Energy | Costs | Emissions | |
| Unit | kwh | € | kgCO ₂ | kwh | € | kgCO ₂ | % | € | kgCO ₂ | |
| September | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| October | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| November | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| December | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| January | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| February | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| March | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| April | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| May | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| Total | 0 | #N/A | #N/A | 0 | #N/A | #N/A | 0,00% | #N/A | #N/A | |
| Heating | | Reference year (2009-2010) | | | This year (2010-2011) | | | Savings | | |
| | Energy | Costs | Emissions | Energy | Costs | Emissions | Energy | Costs | Emissions | |
| Unit | kwh | € | kgCO ₂ | kwh | € | kgCO ₂ | % | € | kgCO ₂ | |
| September | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| October | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| November | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| December | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| January | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| February | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| March | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| April | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| May | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |
| Total | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | |



In the green box of the top right corner, you will see the **actual savings** you have achieved in Energy, Costs and CO₂ emissions.

Numbers in white refer to an actual reduction of energy used, whereas numbers in red highlight an increase.

With regard to electricity, the annual consumption for the reference year is equally spread over each month of the academic year.

In terms of heating, climatic factors are very important. Therefore, the tool provides a consumption estimate by using heating degrees-days data, assuming that the energy spent is correlated to the average monthly temperatures recorded for the reference year.

Costs are estimated on the basis of average retail prices per country, and may not reflect the exact prices paid by your school.



NB: Carbon dioxide (CO₂) is the only greenhouse gas taken into consideration when estimating the climate impact of your school (based on the energy consumed for heating and electricity).



CALCULATIONS

The five factors found in the green area of the input sheet govern the whole calculation process of the tool. These factors depend on your country and heating system. But what are these factors and where are they coming from?

1. The first one is the **price of the electricity** in your country. It is expressed in €/kwh.
2. The second one is the **emission factor of the electricity** produced in your country. In other words, it tells you how many kg of CO₂ are emitted to produce one kwh.
3. The third one is the **energetic value** per volume of the fossil fuel you are using (natural gas or fuel oil). This is the amount of energy (kwh) per volume unit (liter or m³)
4. The fourth one is the **price of the heating energy** (natural gas or fuel oil) in your country. It is expressed in €/kwh.
5. The last one is the **emission factor of the heating energy**. This shows how many kilograms of CO₂ are emitted by the burning of fossil fuels to heat your school.

Energy Prices

Energy prices vary greatly from country to country. The average energy prices are publically available. The average price for your country is used to calculate an estimate of your energy costs and savings. All prices are in Euros (€). If you use another currency, you might want to use a currency converter.

Data stem from [Europe's Energy Portal](#) (Gas and Electricity End-user prices for EU Domestic Consumers) and from the [International Energy Agency](#) (Fuel Oil Prices).

Degree days

Consumption of energy depends strongly on weather conditions. If the temperature decreases below a certain value, known as the "heating threshold", then more energy is required due to the need for increased heating.

Taking this into account, Eurostat, the statistical office of the European Union, launched a project aiming to provide a coherent and harmonised system. This system takes into account climatic corrections of final energy consumption for space heating purposes in the 27 Member States of the European Union. On the basis of



corrected temperature, energy consumption data helps interpret energy consumption trends.

- ▶ See <http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/introduction>

CO₂ Emissions

CO₂ emissions due to electricity greatly depend on the primary energy source used to produce electricity: nuclear, fossil, hydro-electrical, solar, etc.

Every country has a different 'mix' of these energy sources and thus 1 kwh of electricity emits a different amount of CO₂ depending on the country where the electricity is produced.

- ▶ see CO₂ Emissions from Fuel Combustion ([IEA](#)) 2009 for more details.

Conversions

Energy can be expressed in different units (kwh, GJ, etc.). Furthermore, fossil fuel quantities are expressed in volume (Litre or m³), not directly in energy units. This table holds key conversion factors between these volumetric and energy units.

