

Energy Solutions for Sustainable Development


Energy Management for SME's

#2 – Calculating Efficiency

Shannon Region

June 2007


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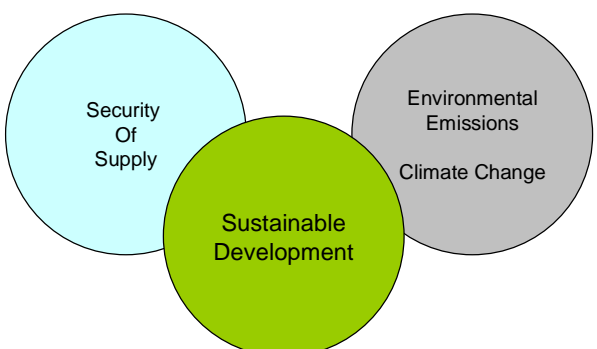
Contents

- Sustainability
- Energy Calculations
- Energy Benchmarking
- Environmental Benchmarking

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Sustainable Development



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Sustainable Development

- In order to survive every organism and organisation needs energy.
- This is true from the most basic biological cell to the largest multinational company.
- Inability to secure energy at an economic cost threatens the economic environment to survive.
- Expensive energy has been identified as a concern for many companies of all sizes.
- Inefficient use of energy, contributes to the phenomena of Climate Change (global warming)
- Global warming threatens the physical environment we need to survive.



SME's & Energy Management

- SME's are particularly vulnerable to increases in the cost base
- Energy inflation in Ireland has been running at 10 – 20 % per annum for the past 5 years
- SME's typically do not have dedicated staff to address their energy costs
- After staff, high energy costs are now being cited as deterrents for investment by large multi national companies
- SME's employ more people than large multinational companies
- Difficulties for SME's are less visible but have the potential to effect far more people in our economy



Energy Calculations

- It can be very difficult for companies to determine the full extent of their energy use
- Invoices are often filed in a manner that makes retrieval and analysis difficult
- The energy invoice itself is not always clear
- Most invoices contain elements of
 - fixed (standing) charges
 - Variable consumption charges
 - Variable demand charges
 - Variable time of use charges
 - Time of use charges
 - Environmental levies
- The cost of energy itself may vary considerably from fuel to fuel
- Different fuels are invoices in different units.

Energy Standard Units

Energy is sold in many different units.

To make sense of your energy you need to convert all forms to a standard unit – kWh.

Natural gas	Therms	x	29.31	=	kWh
	Cubic feet	x	0.303	=	kWh
	kWh	x	1	=	kWh
Liquid petroleum gas (LPG)	Litres	x	7	=	kWh
	Tonnes	x	13900	=	kWh
Gas oil (35 sec)	Litres	x	10.6	=	kWh
Light fuel oil (290 sec)	Litres	x	11.2	=	kWh
Medium fuel oil (950 sec)	Litres	x	11.3	=	kWh
Heavy fuel oil (3500 sec)	Litres	x	11.4	=	kWh
Coal	Tonnes	x	7600	=	kWh
Anthracite	Tonnes	x	9200	=	kWh
Wood chip (Moisture content 35%-50%)	Tonnes	x	3500	=	kWh
Wood chip (Moisture content >50%)	Tonnes	x	2800	=	kWh
Wood pellets	Tonnes	x	4800	=	kWh
Electricity	kWh	x	1	=	kWh
Total energy use for the year					= kWh

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Energy Standard Unit

Identify for Space Heating Load

2. Find your space-heating energy use. Apply (A) OR (B)

(A) If you can identify any of the fuels above used **only** for space heating, enter the total energy use in kWh

Description	kWh
1. <input type="text"/>	<input type="text"/>
2. <input type="text"/>	<input type="text"/>
3. <input type="text"/>	<input type="text"/>
Total = <input type="text"/> kWh B	

(B) For fuels used for space heating and hot water, where they not separately metered, use 60% of thermal energy used. This figure may also be used for all electrically heated buildings

Enter total thermal energy by fuel type:-

a. <input type="text"/>	kWh
b. <input type="text"/>	kWh
c. <input type="text"/>	kWh
Total = <input type="text"/> kWh x 0.60 = <input type="text"/> kWh C	
Annual space heating energy (B or C) = <input type="text"/> kWh D	
Annual non-space heating energy (A-D) = <input type="text"/> kWh E	

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Energy Standard Unit

Your heating energy use is “normalised” to Shannon Region, Degree Days - 2100

3. Space heating energy adjusted for Shannon Region weather

Adjust the space-heating energy to standard conditions (D x G) = kWh **F**

4. Normalised annual energy use

Your annual energy use normalised for weather is = kWh **G**

Degree days are a technical method of calculating the duration that outside air temperature falls below a “base level”. For dwellings and hotels this base level is taken as 15.5 °C. For hospitals and nursing homes the base level is 17 °C.

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Energy Standard Unit

You will want to express your energy use to a useful performance indicator.

5. Performance Parameter (Treated Floor Area etc.)

Treated Floor area = m² η_j
 Your Performance Parameter = X η_k

6. Find the Normalised Performance Indicator (NPI)

(A) Floor area	$NPI = \frac{L}{M}$		kWh / m ²
(B) 0	$NPI = \frac{L}{N}$		kWh / X

The common Energy Performance Indicators (EPI) are treated floor area, or units of production. You may use both methods on this spread sheet.

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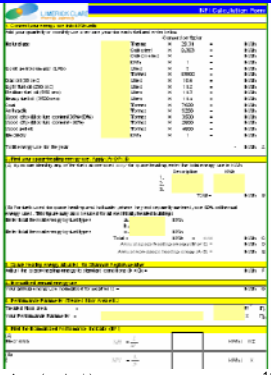
Standard Unit Calculator

Excel Spreadsheet

Prepared by LCEA

Download from Web site

www.lcea.ie



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Energy Costs

- Energy cost is usually your first indicator of energy performance
- Energy cost can be deceiving as an indicator
- Energy costs are sometimes difficult to get (direct debit, filing by period / cost code)
- Important that you have a clear understanding of all energy costs
- Energy will have environmental costs attached in the near future.
- Need at least two years energy bills to begin energy management (three is better)
- Must gather performance indicator data for the same period.

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Energy Selection - Thermal

- The decision on the type of energy you use for space heating was most likely made for you by the person that designed the heating system originally.
- The original decision may have been the correct one, but things do change, does it still make sense.
- Do you need a specific fuel for any process (catering, medical equipment, table ware etc.)
- Can your space heating and / or hot water needs be met by any fuel.
- Can you switch fuels reasonably easily in the event of one particular fuel not being available / expensive.
- What space do you have in plant rooms and outside to modify your heating systems / fuel storage.

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Energy Selection - Electricity

Start Here >>>

Is your total electricity load less than 30 kW and /or your annual usage less than 100,000 kWh(Units)

Yes → Do you use more than 12% of your electricity at night
Yes → You should look at **General Purpose NightSaver Tariff**
No → You should look at **General Purpose Standard Tariff**

No → Your total electricity load is between 30kW and 500kW
Yes → You should look at **Low Voltage Maximum Demand Tariff**

No → Your electricity load exceed 500kW
 You should look at leaflet: **Electricity Prices for Supplies at Medium & High Voltage**

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Energy Benchmarking

- Petrol Consumption - MPG of a car at 56 mph
- Electricity / Gas - kWh / bedroom / M² / annum
- Electricity / Gas - kWh / M² / annum
- Water - Litres / guest / day
- Electricity / Gas - kWh / units of production / annum

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Benefits of Benchmarking

- Assess your performance against other similar businesses
- Compare like with like
- Benchmarks look to the future not the past
- Assess potential savings for Gas / Electricity and water
- Set realistic targets for energy reduction (not a % reduction)
- Avoids over-investment
- Targets Poor performance and identifies areas for investment / staff training

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Benchmarking Comparison

- Having determined your own energy efficiency benchmark the next thing you will want to know is how does it compare.
- First you will have to make sure you are comparing like with like.
- Offices and hotels come in several classes and types.
- Leisure centres have different size of pools, with or without gyms or outdoor courts.
- Production processes differ greatly

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Benchmarking Hotel Example

- Small Hotel Benchmarks

	Annual Gas Consumption kWh per sq. meter	Annual Electricity Consumption kWh per sq. meter
Good	95 - 230	50 - 80
Fair	230 - 360	80 - 140
Poor	360 - 540	140 - 205

Annual Gas Costs

Annual Cost - €/bedroom

Performance	Min Cost (€)	Max Cost (€)
Good	~200	~300
Fair	~350	~450
Poor	~500	~650

Annual Electricity Costs

Annual Cost - €/bedroom

Performance	Min Cost (€)	Max Cost (€)
Good	~50	~80
Fair	~80	~140
Poor	~140	~205

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Benchmarking Pool & Gym

- Leisure Centre Benchmarks

Heating Energy Performance Indicators

EPI KWh / m ² / yr.	"Good" EPI KWh / m ² / yr.	"Typical" EPI KWh / m ² / yr.
831	420	960

Electricity 1 – Building Services, Energy Performance Indicators

EPI KWh / m ² / yr.	"Good" EPI KWh / m ² / yr.	"Typical" EPI KWh / m ² / yr.
197	110	170

Electricity 2 – External Services & Equipment, Energy Performance Indicators

EPI KWh / m ² / yr.	"Good" EPI KWh / m ² / yr.	"Typical" EPI KWh / m ² / yr.
49	35	55

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Benchmarking Pool & Gym

- Leisure Centre – Pool Benchmarks

Pool Hall, Electricity Performance


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Benchmarking Pool & Gym

- Leisure Centre – Pool Benchmarks

Pool Hall, Heating Performance

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Benchmarking Pool & Gym

- Summary of Potential Savings

Item	Saving Potential "Good" EPI		Saving Potential "Typical" EPI	
	KWh / Yr.	€ / Yr.	KWh / Yr.	€ / Yr.
Heating	1,093,671	€ 27,990	-	-
Electricity 1 (indoor)	231,500	€ 23,845	71,847	€ 7,400.24
Electricity 2 (outdoor)	37,250	€ 3,837	-	-
Totals	1,362,421	€ 55,672	71,847	€ 7,400.24


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Remember

- Energy is a controllable cost but only if it is managed
- Savings from energy conservation go straight on the bottom line – that means more profit
- A 10-20% saving is generally achievable by simple no or low cost measures
- The longer you wait the more you waste


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Environmental Benchmarking

- Environmental Benchmarking can be a very detailed and complicated process.
- It can incorporate all facets of environmental impact, as part of an ISO 14000 environmental standard.
- For the purpose of this seminar, "environmental impact" is limited to the CO2 emissions associated with energy use.
- Determining these emissions will enable you to take the first steps toward IS 393 Energy Management Standard, and NSAI Certification.


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Environmental Benchmarking

- Earlier you determined your energy use.
- Based on the types of fuel used, the CO₂ emissions can be calculated.
- Standard tables of CO₂ emissions for fuel use have been prepared by the EPA and SEI.

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Environmental Benchmarking

The table below shows the various fuels and the CO₂ emissions associated with them

Fuel	unit	kWh / unit	kg- CO ₂ / kWh
Natural gas	Therms	29.3	0.203
Liquid petroleum gas (LPG)	Litres	7.0	0.232
Gas oil (35 sec)	Litres	10.6	0.272
Light fuel oil (290 sec)	Litres	11.2	0.282
Medium fuel oil (950 sec)	Litres	11.3	0.292
Heavy fuel oil (3500 sec)	Litres	11.4	0.35
Coal	Tonnes	7,600.0	0.361
Anthracite	Tonnes	9,200.0	0.361
Peat Sod	Tonnes	4,002.0	0.375
Peat Briquette	Tonnes	5,363.0	0.377
Peat Briquette	Bale	67.0	0.377
Wood chip (Moisture content 35%-50%)	Tonnes	3,500.0	0.025
Wood chip (Moisture content >50%)	Tonnes	2,800.0	0.025
Wood pellets	Tonnes	4,800.0	0.025
Electricity	kWh	1.0	0.643

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Environmental Benchmarking

- By applying the appropriate emissions factors to the energy consumed an annual emissions of CO₂ is determined.
- Taking the annual emissions in CO₂ and expressing this over the performance indicator will give an environmental indicator
- Kg-CO₂ / Performance Indicator

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Work Shop

- Take some time to examine your own energy use & determine the energy performance; kWh / P.I.
- From the energy performance indicator determine your environmental performance indicator; kg-CO₂ / P.I.



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RURAL
RESOURCE
DEVELOPMENT

Energy Solutions for Sustainable Development

Energy Management for SME's

#2 – Calculating Efficiency

Thank You
