Report on

Fuel Cost Analysis

plus Sensitivity Analysis

for the

Western Development Commission

by Enercomm International Consultants Ltd



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1. Introduction And Background

1.1 Introduction

This report, commissioned by the Western Development Commission, is to examine the relative fuel costs for space heating, hot water and cooking as they apply to domestic households and commercial enterprises. In addition, the study examines relative fuel costs for process heating, space heating, hot water and cooking for an industrial enterprise.

A sensitivity analysis, detailed in Section 10, has been included for three price scenarios. These examine the impact of changes in the prices of natural gas, oil and LPG relative to those applying on 1st July 2007 (termed the basecase); these are (S1) prices applying or expected to apply on 1st Nov 2007, (S2) increases of 15% relative to the basecase and (S3) decreases of 15% on the basecase. The new electricity tariffs come into operation of 1st Nov 2007 and are used in the sensitivity analysis S1. The gas tariffs used in the sensitivity analysis S1 are those that came into operation on 1st Oct 2007, i.e. the beginning of the new gas year.

1.2 Energy Users Studied

The study considered four typical energy users that would be broadly representative of those in Irish towns; these energy users are described as:

- 1. A Factory/Production Facility using process heat
- 2. A Medium Commercial/Service Enterprise
- 3. A Small Commercial/Service Enterprise
- 4. A Domestic Household

1.3 Energy Sources Considered

Six energy sources are considered in the study, on a fuel-only basis and also taking account of capital costs together with annual operating & maintenance costs. The energy sources are electricity, LPG, oil/kerosene, natural gas, biomass and solar panels. CHP fired on natural gas was also considered for the Factory/Production Facility.

In the case of biomass, costs relating to wood pellets have been modelled for the Small Commercial/Service Enterprise and the Domestic Household, while both wood pellets and wood chips have been modelled for the Factory/Production



Facility and the Medium Commercial/Service Enterprise.

The cost of electricity for electrical applications such as motors, lighting, office equipment, household appliances etc has not been considered in this study. Rather the focus has been on comparing the relative costs of providing space heating, hot water (plus process heat for the industrial enterprise) and cooking from a number of different fuel sources.

2. Interpretation of Results & Typical Figures Used

It is important to understand that while typical figures were employed throughout these should not be taken as specifically representative of individual cases. For example, the capital cost of installing a pellet-fired biomass boiler and its associated storage facility can vary considerably depending on the physical layout, topography and access to the particular site. Another example is where many boiler manufacturers claim their products have thermal efficiencies considerably in excess of 90%; nevertheless a more global figure of 85% for all boilers whether biomass, oil or gas has been adopted for this study.

3. Results

A cost comparison, based on the total annual cost excluding annual capital and O&M costs is shown in Table 1 (BC) below. Essentially this is a fuel only comparison and as expected solar power providing hot water and space heating only is the cheapest – electric cooking is assumed. In each case this is the annual cost (excluding capital and O&M costs) for providing space heating, hot water and cooking from different fuel sources. In the cases of oil, biomass and solar, electric cooking is assumed. This Table 1 (BC) is the basecase for the sensitivity analysis where the details and results are set out in Section 10.

Table 1 (BC): Total Annual Cost exclud. Annual Capital + O&M Cost (Space Heating + Hot Water + Cooking)						
Note: Gas, electricity, LPG, oil and biomass prices on 1st July 2007 as Basecase						
All Costs in Euro	Domestic Household					
Electricity	220,757	7,914	5,237	1,405		
LPG	218,222	8,150	4,976	1,463		
Oil/Kerosene	151,602	5,597	3,516	994		
Natural Gas	104,003	4,807	3,133	884		
Biomass (wood pellets)	91,433	3,503	2,288	654		
Biomass (wood chips)*	74,183	2,871	-	-		
Solar Power	5,207	342	311	106		
CHP with Natural Gas**	49,929	-	-	-		
Assumes wood chips are 20% cheaper than wood pellets with equivalent heat value						
Depends on load profile of Factory/Production Facility + matching energy costs						



The 'fuel costs only' results show that:

- Electricity and LPG are highest, but the gap between them is not consistent. This arises due to the fact that each of the four energy users is on a different electricity tariff and load profile. However, as they are relatively close their average provides a broad reference against which to measure the other fuel costs
- Oil is about 30% lower than electricity/LPG
- Natural gas is next to oil and is about 40% lower than electricity/LPG. The gas connection costs in the model at €5,000, €2,000, €1,000 and €132 are reasonable but even trebling the connection cost for the Factory/Production Facility has little impact due to the economy of scale.
- Biomass (pellets) is about 55% cheaper than electricity/LPG, and the saving with wood chips is even greater at about 65%
- As expected, solar power on a fuel only basis comes in the cheapest. However, the application of solar power for a large or medium-sized facility might not be practical immediately

Table 2 below shows the results with capital and annual O&M costs included. As would be expected solar drops to the bottom of the merit order and biomass drops down well; this is due to the high cost of solar panels and the relatively high cost of the biomass boiler, bin storage and installation costs. With regard to solar power, the number of years over which these are depreciated has a significant impact on its competitiveness.

Table 2 (BC): Total Annu	Vater + Cooking)					
Note: Gas, electricity, LPG	Note: Gas, electricity, LPG, oil and biomass prices on 1st July 2007 as Basecase					
All Costs in Euro	Domestic Household					
Electricity	220,757	7,914	5,237	1,405		
LPG	219,455	8,434	5,210	1,586		
Oil/Kerosene	153,452	6,023	3,867	1,179		
Natural Gas	105,853	5,338	3,491	1,023		
Biomass (wood pellets)	103,686	5,790	3,964	1,402		
Biomass (wood chips)*	86,435	5,158	-	-		
Solar Power	381,384	13,846	8,229	2,300		
CHP with Natural Gas**	85,579	-	-	-		
* Assumes wood chips ar						
** Depends on load profi						



The fuel plus capital and O&M results show that:

- Electricity and LPG are again the highest, and their average provides a broad reference against which to measure the costs relating to the other fuel sources
- Oil is about 25% lower than electricity/LPG
- Natural gas is next to oil and is about 40% lower than electricity/LPG.
- The savings arising from using biomass (pellets or chips) varies enormously across the four energy users modelled, i.e. from 6% to 60%. Biomass is approx 50% to 60% cheaper for the largest energy user, depending on whether pellets or chips are burned. The domestic household lies at the lower end of savings achieved with only a 6% saving relative to electricity and LPG. It is considerably higher than either natural gas or oil, even with the SEI boiler grant included. However, the biomass savings are dependent on the turnkey cost of boilers/bins/installation/commissioning. As it was difficult to get 'firm' prices from suppliers for this study the relevant costs modelled would need to be modified for individual situations.
- As expected, solar power comes in the most expensive.
- CHP with natural gas, for the Factory/Production Facility, is marginally better than biomass fired on wood chips. Because of the significant capital cost involved in CHP and the greater number of variables, the results are highly dependent on the assumptions in regard to number of years over which the plant is depreciated, the heat and electricity load profiles and also the varying price of electricity. For example, electricity surpluses (exports) may occur only at times of low electricity prices while electricity shortfalls (imports) may occur only at times of high electricity prices. The pattern of each specific case will significantly impact on the result.

4. Purpose of this Study

The purpose of this study is to examine the energy costs of businesses and households, particularly in relation to those areas that can be supplied by natural gas. These are space heating, hot water and cooking. In the case of industrial energy users this would also include hot water for process heat.

5. Methodology Employed

The study modelled the annual energy costs relating to four typical energy users



on both a fuel only basis and then on a fuel plus annual capital and O&M costs. The four energy users are as follows:

- 1. A Factory/Production Facility using process heat
- 2. A Medium Commercial/Service Enterprise
- 3. A Small Commercial/Service Enterprise
- 4. A Domestic Household

6. Prices Used

The prices used in the basecase are those obtaining on 1st July 2007 and are shown in Table 3 below. These prices include the gas and electricity tariffs in operation on that date and which are approved and published by the Commission for Energy Regulation (CER) in its documents CER/06/251 and CER/06/252 respectively. Also, prices for LPG, oil/kerosene and wood pellets are those quoted on 1st July 2007. As the market for wood chips is still in its development stage there is no single market price for wood chips and so a 20% discount on the price of wood pellets was seen as reasonable for the purposes of this study. VAT has been omitted from all capital and fuel calculations to ensure there is consistency across the comparative results.

The prices used in the sensitivity analysis are detailed in Section 10 of this report. The gas prices for 1st Nov 2007 represent a reduction of approx 10.6% on those applying on 1st July as indicated by the CER

6.1 Electricity Tariffs

It is assumed the four energy users are supplied by ESB PES (Public Electricity Supplier) and are therefore on the appropriate electricity tariffs. These are the current electricity tariffs have been approved by the CER (Commission for Energy Regulation) in its document CER/06/252; these are:

- 1. Factory/Production Facility Medium Voltage Seasonal & Time of Day Tariff
- 2. Medium Commercial/Service Enterprise Low Voltage Max Demand Tariff
- 3. Small Commercial/Service Enterprise General Purpose Nightsaver Tariff with Storage Heating
- 4. Domestic Household Urban Domestic Tariff with Storage Heating



6.2 Natural Gas

Following on from the four typical energy users referred to above, four BGE gas tariffs were selected for the basecase as appropriate. These are the gas tariffs applying on 1st July 2007, which were approved by the CER (Commission for Energy Regulation) in its document CER/06/251. These are:

- 1. Factory/Production Facility Demand & Commodity 2, I&C Tariff
- 2. Medium Commercial/Service Enterprise Standard I&C Tariff
- 3. Small Commercial/Service Enterprise Standard I&C Tariff
- 4. Domestic Household Residential Standard Tariff

To ensure consistency, the residential tariff was adjusted to VAT exclusive, in line with the I&C (Industrial & Commercial) tariffs.

6.3 LPG and Oil

While there is some variation in these prices across the country, this is quite a competitive sector; large energy users normally enjoy a discount relative to smaller users. The LPG prices are those quoted by Flogas Ireland while Fourways Oil Company quoted the oil prices.

6.4 Biomass

Balcas Ltd in Northern Ireland quoted the price for wood pellets, and as stated earlier the price of wood chips is taken as 20% less than wood pellets

6.4 Solar Panels

The pricing information on solar panels was received from Ecologics. While the solar panel prices have been scaled up proportionally to meet the space heating and hot water requirements of all four energy users in the study, this may not be strictly correct. The ability of solar panels to deliver large quantities of hot water in an industrial setting in Ireland and any economies of scale arising are not fully proven.



1. Factory/Production Facility	kWh/unit	Unit	€/Unit	€/kWh	Info Source
Cost of Wood Pellets	4.80	kg	0.15000	0.03125	Balcas
Cost of LPG	7.22	Ī	0.56000	0.07756	Flogas
Cost of Natural Gas	1.00	kWh	0.03389	0.03389	BGE Tariffs
Cost of Kerosene	9.43	I	0.50000	0.05305	*Fourways Oil Co
Cost of Solar	1.00	kWh	0.00001	0.00001	*Ecologics
Heating per m2 (kWh/annum)	100				_
Quantity of water heated by 1 kWh	10				
Additional Electrical Heating % Cost	8.00				
2. Medium Commercial/Service Enterprise	kWh/unit	Unit	€/Unit	€/kWh	Info Source
Cost of Wood Pellets	4.70	kg	0.15000	0.03191	Balcas
Cost of LPG	7.22	ĭ	0.56000	0.07756	Flogas
Cost of Natural Gas	1.00	kWh	0.04548	0.04548	BGE Tariffs
Cost of Kerosene	9.43	I	0.50000	0.05305	*Fourways Oil Co
Cost of Solar	1.00	kWh	0.00001	0.00001	*Ecologics
Heating per m2 (kWh/annum)	100				
Quantity of water heated by 1 kWh	14				
Additional Electrical Heating % Cost	8.00				
3. Small Commercial/Service Enterprise	kWh/unit	Unit	€/Unit	€/kWh	Info Source
Cost of Wood Pellets	4.70	kg	0.16000	0.03404	Balcas
Cost of LPG	7.22	Ĭ	0.58000	0.08033	Flogas
Cost of Natural Gas	1.00	kWh	0.04963	0.04963	BGE Tariffs
Cost of Kerosene	9.43	I	0.52000	0.05517	*Fourways Oil Co
Cost of Solar	1.00	kWh	0.00001	0.00001	*Ecologics
Heating per m2 (kWh/annum)	110				
Quantity of water heated by 1 kWh	14				
Additional Electrical Heating % Cost	8.00				
4. Domestic Household	kWh/unit	Unit	€/Unit	€/kWh	Info Source
Cost of Wood Pellets	4.70		0.16000	0.03404	Balcas
Cost of LPG	7.22	kg	0.58000	0.03404	
Cost of Natural Gas	1.00	kWh	0.03604	0.00033	Flogas BGE Tariffs
Cost of Natural Gas Cost of Kerosene	9.43	KVVII	0.52000	0.05517	
Cost of Kerosene Cost of Solar	1.00	kWh	0.52000	0.0001	*Ecologics
Heating per m2 (kWh/annum)	125	KVVII	0.00001	0.00001	Ecologics
neaung per mz (KVVII/amium)					
Quantity of water heated by 1 kWh	14				

7. Energy Assumptions & Conversion Efficiencies

The breakout of energy consumption by the four 'typical' energy users is set out in the Table 4 below. The total energy for each user is deemed to be measured 'at the front gate'. The actual consumed energy for space heating, hot water, process heat and cooking are all adjusted by a factor of 0.85 to take account of the energy conversion process. However, in contrast to this, the conversion of electrical energy is taken as unity (100% efficient).

7.1 Factory/Production Facility

The Factory/Production Facility is assumed to consume 4 GWh (4 million units) annually and is comprised of:

- 30% on electrical power for lighting, motors, office equipment etc
- 33% on space heating



- 36% on process heat and hot water
- 1% on cooking in staff canteen

While it is difficult to say that this is a typical industrial energy user in Ireland it is nevertheless a reasonable energy breakdown.

7.2 Medium Commercial/Service Enterprise

The Medium Commercial/Service Enterprise (large garage or supermarket) is assumed to consume approx 146,000 units annually comprising of:

- 30% on electrical power for lighting, motors, office equipment etc
- 56% on space heating
- 12% on hot water
- 2% on cooking in staff canteen

7.3 Small Commercial/Service Enterprise

The Small Commercial/Service Enterprise (ladies hair-dressing salon with accommodation overhead) is assumed to consume approx 89,000 units annually comprising of:

- 33% on electrical power for lighting, motors, office equipment etc
- 40% on space heating
- 25% on hot water
- 2% on cooking in accommodation and staff/customers facilities

7.4 Domestic Household

The Domestic Household consumption is taken directly from the Sustainable Energy Ireland document 'Energy in Ireland 1990 – 2005). This states "in 2005 the "average" dwelling consumed a total of 21,755 kWh of energy based on climate corrected data. This was comprised of 16,865 kWh (78%) in the form of direct fossil fuels and the remainder (4,890 kWh) as electricity." (page 69 Energy in Ireland 1990 – 2005) http://www.sei.ie/index.asp?locID=70&docID=-1

From these figures the breakdown of usage is calculated/assumed to be:



- 22% on electrical power for lighting, motors, office equipment etc
- 54% on space heating
- 20% on hot water
- 4% on cooking

out					
Total %	Elec Only %	Space Heating %	Pro/Hot Water %	Cooking %	
100	30	33	36	1	
100	30	56	12	2	
100	33	40	25	2	
100	22	54	20	4	
Total kWh	Elec Only	Space Heating	Pro/Hot Water	Cooking	Ave kW/h Cooking
4,000,000	1,200,000	1,320,000	1,440,000	40,000	8
145,700	43,710	81,592	17,484	2,914	3
89,379	29,495	35,751	22,345	1,788	2.6
21,755	4,786	11,748	4,351	870	1.9
	Total % 100 100 100 100 100 Total kWh 4,000,000 145,700 89,379	Total % Elec Only % 100 30 100 30 100 33 100 22 Total kWh Elec Only 4,000,000 1,200,000 145,700 43,710 89,379 29,495	Total % Elec Only % Space Heating % 100 30 33 100 30 56 100 33 40 100 22 54 Total kWh Elec Only Space Heating 4,000,000 1,200,000 1,320,000 145,700 43,710 81,592 89,379 29,495 35,751	Total % Elec Only % Space Heating % Pro/Hot Water % 100 30 33 36 100 30 56 12 100 33 40 25 100 22 54 20 Total kWh Elec Only Space Heating Pro/Hot Water 4,000,000 1,200,000 1,320,000 1,440,000 145,700 43,710 81,592 17,484 89,379 29,495 35,751 22,345	Total % Elec Only % Space Heating % Pro/Hot Water % Cooking % 100 30 33 36 1 100 30 56 12 2 100 33 40 25 2 100 22 54 20 4 Total kWh Elec Only Space Heating Pro/Hot Water Cooking 4,000,000 1,200,000 1,320,000 1,440,000 40,000 145,700 43,710 81,592 17,484 2,914 89,379 29,495 35,751 22,345 1,788

7.5 Space Heating Assumptions - Area and Heating Requirement per m2

In the absence of firm recent data on average house sizes, it was assumed here that the "average" house size is 1,200 sq ft, which equates to 111 m2. This assumption was made following discussion with a local planning authority. This is the area of a typical 3-bedroom semi-detached house Taking the annual heating requirement as 125 kWh per m2, this ties in with the SEI "average" energy consumption figure.

7.6 Energy Conversion Efficiencies

The energy conversion efficiencies, based on a net calorific value basis, are taken as 85% for all boilers (LPG, natural gas, oil and biomass) and also for CHP. The energy conversion for electrical heating is taken as 100%.

8. Capital Costs and O&M Costs

8.1 Cost of Biomass Boiler/Bins

The cost of these has been calculated from SEI figures below¹ and have been adjusted to take account of the 30% SEI grants in industrial and commercial settings, and the \in 4,200 grant for domestic situations. For the purposes of this study it is assumed that the cost of industrial and commercial biomass boilers/bins

¹SEI Application Guide, http://www.sei.ie/index.asp?docID=1003



employed is the same whether operating with wood pellets or wood chips.

Maximum Capacity Costs for Biomass Boilers					
Plant scale ranges Maximum Capacity Co					
kW	€/kW				
≤20 kW	€1,500 / kW				
>20 kW and ≤ 50 kW €650 / kW					
>50 kW and ≤ 250 kW	€500 / kW				
>250 kW and ≤ 500 kW €350 / kW					
>500 kW and ≤ 1000 kW €250 / kW					
>1000 kW	See Below (€150 / kW)				

8.2 Capital Costs and Annual O&M %

The capital costs relating to each of the fuel sources modelled fort he four energy users, together with annual percentages for O&M, are set out in Table 5 below. These costs only relate to the energy supply side, i.e. they include boiler and auxiliary equipment, installation and commissioning costs but do not include any costs on the energy demand side such as storage heaters, radiators or water systems.

Table 5: Capital Costs and O&M %					
Customer Type>	*		Small Commercial	Domestic	Annual O&M (%)
customer Type	Facility	/Service Enterprise	/Service Enterprise	Household	Annual Odivi (20)
Boiler Size (kW)	618	44	33	24	
Biomass-fired Boiler/Bin (€)	108,112	20,181	14,792	6,600	3
LPG Gas-fired Boiler (€)	10,000	2,300	1,900	1,000	4
* Natural Gas-fired Boiler (€)	15,000	4,300	2,900	1,132	4
Oil-fired Boiler/Tank (€)	15,000	3,450	2,850	1,500	4
Solar Panels/Systems (€)	4,906,667	176,135	103,282	28,620	1
* CHP 280 kWe Plant (€)	345,000				2
* Connection Cost Contribution added (€)	5,000	2,000	1,000	132	

8.3 Annual Capital and O&M Costs (Table 6)

These are crucial in comparing the relative costs of supplying energy from different energy sources in that they enable a more complete picture to be presented and can radically alter the merit order based on fuel cost only. For example, the annual cost of biomass (wood pellets) for a domestic household is the cheapest source of energy (excluding solar power) on a fuel only basis, i.e. €654



versus the dearest at $\in 1,463$ (LPG). However, when annual capital and O&M costs are included the cost of biomass moves to the other end of the scale where it is quite expensive, i.e. $\in 1,402$ versus the cheapest at $\in 1.023$ (natural gas).

Table 6: Annual Capital and O&M Costs (€)					
Customer Type	Factory/Production Facility	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household	Straight Line Depreciation over no. of years
Biomass (€)	12,253	2,287	1,676	748	12
LPG (€)	1,233	284	234	123	12
Natural Gas (€)	1,850	530	358	140	12
Oil (€)	1,850	426	352	185	12
Solar (€)	376,178	13,504	7,918	2,194	15
CHP Fired on Natural Gas (€)	35,650				12

9. Treatment of Other Charges

9.1 Electricity Supply Charge

For the Factory/Production Facility the electricity supply charge will be reduced by approx 30% if the space heating/hot water/cooking are provided by energy sources other than electricity. Even though the majority of this load is provided at night a higher contracted MIC (Maximum Import Capacity) is required to accommodate this. Therefore, 30% of the annual standing charge (with electrical heating) is included as an annual supply charge when comparing the relative costs for space heating/hot water/cooking; the remaining 70% annual charge will exist irrespective of how space heating/hot water/cooking is provided.

Similarly, where the Medium Commercial/Service Enterprise uses electricity to provide space heating/hot water/cooking only 30% of the annual standing charge (with electrical heating) is included as an annual supply charge.

If the Small Commercial/Service Enterprise has electrical storage heating then the annual storage heating standing charge is included as an annual supply charge

Similarly, where the Domestic Household has electrical storage heating then the annual storage heating standing charge is included as an annual supply charge

9.2 Gas Tariff Standing Charge

In the case of natural gas the appropriate annual charge is included as an annual supply charge. Where the gas tariff standing charge is a set on a monthly basis, this is multiplied by 12 (or by 6 for domestic households on the bi-monthly tariff) to give an annual figure.



9.3 Lease of LPG Tank

This is accounted for as an annual supply charge (standing charge) varying in amounts from €100 for a Domestic Household to €500 for a Factory/Production Facility.

10. Sensitivity Analysis for Three Scenarios

The basecase, termed (BC), refers to the prices that obtained on 1st July 2007. This sensitivity analysis covers three different scenarios in order to examine the impact of fuel prices change. In some instances the figures are rounded and so slight variances occur, but these not significant.

The scenarios studies were as follows:

- Oil, LPG and Natural Gas and Electricity Prices Applying on 1st November 2007 (in practice the oil and LPG prices were acquired in mid-October)
- Oil, LPG and Natural Gas prices 15% higher than in the Basecase for this Study
- Oil, LPG and Natural Gas prices 15% lower than in the Basecase for this Study

10.1 Scenario 1 Prices (excluding VAT):

- Kerosene prices quoted by Fourways Oil Company are 54.75 c/litre for domestic and small business customers and 52.75 c/litre for medium and large customers; this is the quoted price for 16th October, and assumed to obtain on 1st Nov 2007 for the purposes of this sensitivity analysis. The reason the date of 1st Nov is chosen is due to the fact that the new electricity tariffs are due to come into operation on that date. The current gas tariffs are in operation since 1st Oct, the beginning of he gas year.
- LPG prices quoted by Flogas Ireland are 56 c/litre for domestic and small business customers and 54 c/litre for medium and large customers; this is the quoted price for 16th October, and assumed to obtain on 1st Nov 2007 for the purposes of this sensitivity analysis. The discount for larger quantities to bigger customers, in both LPG and oil (kerosene) is quoted as



approx 2 cent per litre. Of course this depends on the annual quantities being purchased and may not be the same discount from all LPG and oil suppliers.

• Gas prices are taken from the CER decision documents namely the current gas tariffs for Residential and Smaller Commercial and Industrial (Non-Daily Metered) customers on 3rd Sep 2007 (CER/07/130). There is no fixed gas tariff published for Medium Commercial and Industrial (Non-Daily Metered) customers as the tariffs are treated differently and explained below. For this reason equivalent gas rates are developed for both the Factory/Production Facility and the Medium Commercial/Service Enterprise. This is done by taking the tariffs for the last gas year (1st Oct 2006 to 30th Sep 2007) and applying a 10.6% reduction for each. In September 2007 the Commission approved BGE's allowed revenue for the year 2007/8 which equates to an average decrease of 10.6% in NDM (Non-Daily Metered) tariffs (CER/07/130).

• Gas prices therefore are:

Scenario 1	Standing Charge (€pa)	Unit Rate c/KWh
Factory/Production Facility	8871	3.008
Medium Commercial/Service Enterprise	50	4.146
Small Commercial/Service Enterprise	50	4.509
Domestic	50	4.509

The price of wood pellets, wood chips and solar installations are assumed to be those obtaining on 1st July 2007, i.e. the basecase prices.

Electricity prices used in this scenario are those indicative tariffs published by the CER (document CER/07/159) on 27th September 2007. These fixed tariffs for all low voltage customers only (those connected below 10kV/20kV) for the period 1st November 2007 to 30th September 2008, to coincide with the gas year. The electricity tariff structure for Medium and Large customers (those connected at 10kV/20kV and above) is treated differently and no fixed tariffs have been published for these groups, only transitional tariffs for the four winter months and



indicative tariffs for the following seven non-winter months. In these circumstances the same unit rates as that of the Medium Commercial/Service Enterprise is used. The CER will formally approve the new electricity tariffs before 1st Nov 2007.

Comment of the July – November Price Changes

The significant reduction of 10.6% in gas prices used for the basecase (July 2007) and scenario 1 (Nov 2007) arises because of the reduction in the gas tariffs rather than changes in gas prices during that actual period.

LPG prices, while influenced by oil and natural gas prices, generally do not follow the same price patterns. For example, short and medium term oil prices are frequently driven by geopolitical events, while those for natural gas may by driven by gas interconnection constraints. It is not surprising therefore that the July to mid-October LPG price shows a slight reduction whereas the price of oil is increasing.

Explanatory Note on Gas Prices for Scenario 1

The gas year runs from 1st October each year to the following 30th September. The CER approved the current gas tariffs for Residential and Smaller Commercial and Industrial (Non-Daily Metered) customers on 3rd Sep 2007 (CER/07/130). These are in the public domain and readily known. The gas tariff structure for Medium Commercial and Industrial (Non-Daily Metered) customers (termed the FVT - fuel variable tariff) is treated differently and should reflect the varying price of gas from month to month throughout the coming year. Therefore, it is not a fixed tariff and cannot be plugged into a spreadsheet, requiring 'equivalent' tariffs to be calculated. This applies to the two largest customers in this study.

10.2 Scenario 2 Prices (excluding VAT):

In this scenario it is assumed that the prices of LPG, oil and gas increase by 15%. However, in order to maintain consistency the price of electricity should also be proportionally increased. In his address to the Joint Oireachtas Committee on 7th March 2007 Mr Tom Reeves, Chairman of the Commission for Energy Regulation, stated that "fuel costs make up about one third of the final price of electricity". Therefore a 15% increase in the price of oil and gas should translate roughly into a 5% increase in the price of electricity.



It is recognised here that fuel costs make up a different proportion of the final price of electricity, depending on the type of customer; nevertheless it is assumed that a 15% increase translates into a 5% for all customers in this study.

The following prices therefore are used:

- Kerosene prices of 59.8 c/litre for domestic and small business customers and 57.5 c/litre for medium and large customers; these represent a 15% increase on the basecase prices
- LPG prices of 66.7 c/litre for domestic and small business customers and 64.4 c/litre for medium and large customers; these represent a 15% increase on the basecase prices
- Gas prices with a 15% increase in both the standing charge and unit rate correctly reflect an 15% increase in gas prices
- Because the focus of this scenario is on oil and gas prices, no increase in the price of wood pellet and wood chip prices is assumed
- To maintain consistency with the increase in oil and gas prices, as referred to above, all charge elements in each electricity tariff are increased by 5%.

10.3 Scenario 3 Prices (excluding VAT):

In this scenario, oil, natural gas and LPG prices decrease by 15% for all customers and therefore a corresponding decrease of 5% in the price of electricity is assumed. The following prices apply in this scenario:

- Kerosene prices of 44.2 c/litre for domestic and small business customers and 42.5 c/litre for medium and large customers; these represent a 15% decrease on the basecase prices
- LPG prices of 47.6 49.3 c/litre for domestic and small business customers and 47.6 c/litre for medium and large customers; these represent a 15% decrease on the basecase prices
- Gas prices with a 15% decrease in both the standing charge and unit rate correctly reflect an 15% decrease in gas prices
- Because the focus of this scenario is on oil and gas prices, no decrease in the price of wood pellet and wood chip prices is assumed



• To maintain consistency with the increase in oil and gas prices, as referred to above, all charge elements in each electricity tariff are decreased by 5%.

10.4 Sensitivity Analysis Results

The results of the sensitivity analyses are presented below in tabular form. Table 1 (S1) refers to Table 1 Scenario 1 gives the total annual cost (excluding annual capital and O&M costs) for space heating, hot water and cooking.

Table 2 (S1) gives the total annual cost (including annual capital and O&M costs) for space heating, hot water and cooking for Scenario 1.

Table 3 (S1) details the differences between total annual cost (excluding annual capital and O&M costs) for space heating, hot water and cooking for Scenario 1 and those for the 1st July 2007 basecase figures (excluding annual capital and O&M costs).

Because no changes were made to the capital and O&M costs in the sensitivity analysis, a 'differences' table including annual capital and O&M costs would be identical to Table 3, which gives the total annual cost (excluding annual capital and O&M costs).

10.5 Detailed Tables in Appendices 11, 111 and IV

Appendices II, III and IV show the detailed Tables for the three sensitivities.

Appendix II shows the Tables relating to scenario (S1); these are:

Table 7.1 (S1) Electricity only (for large factory)

Table 7.2 (S1) LPG (for large factory)

Table 7.3 (S1) Oil (for large factory)

Table 7.4 (S1) Natural gas (for large factory)

Table 7.7 (S1) CHP fired on natural gas (for large factory)

Tables 8.1 to 8.4, 9.1 to 9.4 and 10.1 to 10.4 are for the medium commercial, small commercial and domestic customers, similar to those above for the large factory, except of course there is no Table corresponding to the CHP Table for the large factory.

Appendix III shows the Tables relating to scenario (S2); the layout is similar to Appendix II except that no Tables are shown for 7.1 (S2), 8.1 (S2), 9.1 (S2) and 10.1 (S3). In these four cases the 'electricity only' figures were calculated by multiplying the corresponding basecase figures by 5%, to represent the electricity increase arising from the 15% increase in oil and gas prices. Appendix IV gives the Tables relating to scenario (S3) and has the same layout and format as Appendix III.



10.6 Scenario 1 Results:

The results of Scenario 1 (termed S1) are as follows:

Table 1 (S1): Total Annual Cost exclud. Annual Capital + O&M Cost (Space Heating + Hot Water + Cooking)

Note: Gas, electricity, LPG						
All Costs in Euro	Factory/Production Facility	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household		
Electricity	199,140	7,423	5,117	1,391		
LPG	210,446	7,867	4,809	1,416		
Oil/Kerosene	158,688	5,852	3,668	1,040		
Natural Gas	93,308	4,300	2,764	815		
Biomass (wood pellets)	90,466	3,469	2,271	653		
Biomass (wood chips)*	73,216	2,837	-	-		
Solar Power	4,240	308	293	105		
CHP with Natural Gas**	33,498	-	-	-		
* Assumes wood chips ar	Assumes wood chips are 20% cheaper than wood pellets with equivalent heat value					
** Depends on load profile of Factory/Production Facility + matching electricity costs						

Table 2 (S1): Total Annual Cost includ. Annual Capital + O&M Cost (Space Heating + Hot Water + Cooking)

Note: Gas, electricity, LPG and oil prices as expected to be on 1st Nov 2007						
All Costs in Euro	Factory/Production Facility	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household		
Electricity	199,140	7,423	5,117	1,391		
LPG	211,680	8,150	5,044	1,539		
Oil/Kerosene	160,538	6,278	4,019	1,225		
Natural Gas	95,158	4,830	3,122	955		
Biomass (wood pellets)	102,719	5,756	3,947	1,401		
Biomass (wood chips)*	85,469	5,124	-	-		
Solar Power	380,418	13,812	8,212	2,299		
CHP with Natural Gas**	69,148	-	-	-		
* Assumes wood chips ar	Assumes wood chips are 20% cheaper than wood pellets with equivalent heat value					
** Depends on load profit	Depends on load profile of Factory/Production Facility + matching electricity costs					

Table 3 (S1): CHANGES v. BASECASE (pos. values indicate increases and neg. values indicate decreases) Same for Total Annual Cost excluding Annual Capital + O&M Cost and Total Annual Cost including Annual Capital + O&M Costs, if 'excluding' compared with 'excluding' and 'including' compared with 'including'

Capital + Oalli Costs, II	excluding compared	a widi excluding and	including compared v	viai including
All Costs in Euro	Factory/Production Facility	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household
Electricity	- 21,617	- 491	- 121	- 14
LPG	- 7,776	- 284	- 167	- 47
Oil/Kerosene	7,086	255	152	45
Natural Gas	- 10,695	- 508	- 369	- 68
Biomass (wood pellets)*	- 967	- 34	- 17	- 1
Biomass (wood chips)*	- 967	- 34		
Solar Power*	- 967	- 34	- 17	- 1
CHP with Natural Gas**	- 16,431	-	-	-
* Cost reduces to to redu	ction in electric cooki	ng costs		
** Depends on load profi	le of Factory/Producti	on Facility + matching	electricity costs	



112

10.7 Scenario 2 Results:

Solar Power

The results of Scenario 2 (termed S2) are as follows:

Table 1 (S2): Total Annual Cost exclud. Annual Capital + O&M Cost (Space Heating + Hot Water + Cooking) Note: 15% increase in price of LPG, Oil and Natural Gas, also resultant 5% increase in electricity price Factory/Production | Medium Commercial | Small Commercial Domestic /Service Enterprise /Service Enterprise Household Facility All Costs in Euro 1,481 Electricity 232,067 8.489 5,516 LPG 250,880 9,343 5,701 1,668 Oil/Kerosene 173,824 6,556 4,012 1,133 **Natural Gas** 119,603 5,528 3,603 1,016 Biomass (wood pellets) 91,692 3,674 2,304 659 Biomass (wood chips)* 74,442 3,042

513

326

CHP with Natural Gas** 73,182 - *

* Assumes wood chips are 20% cheaper than wood pellets with equivalent heat value ** Depends on load profile of Factory/Production Facility + matching electricity costs

5,466

Table 2 (S2): Total Annu	al Cost includ. Annua	I Capital + O&M Cost (Space Heating + Hot W	/ater + Cooking)
Note: 15% increase in price	e of LPG, Oil and Natura	al Gas, also resultant 5%	increase in electricity pr	ice
All Costs in Euro	Factory/Production Facility	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household
Electricity	232,067	8,489	5,516	1,481
LPG	252,114	9,627	5,936	1,791
Oil/Kerosene	175,674	6,982	4,363	1,318
Natural Gas	121,453	6,059	3,961	1,156
Biomass (wood pellets)	103,945	5,961	3,980	1,407
Biomass (wood chips)*	86,695	5,329	-	-
Solar Power	381,644	14,016	8,245	2,306
CHP with Natural Gas**	108,832	-	-	-
* Assumes wood chips ar	e 20% cheaper than w	vood pellets with equiv	valent heat value	
** Depends on load profil	le of Factory/Production	on Facility + matching	electricity costs	

Table 3 (S2): CHANGES v. BASECASE (pos. values indicate increases and neg. values indicate decreases)

Same for Total Annual Cost excluding Annual Capital + O&M Cost and Total Annual Cost including Annual

Capital + O&M Costs, if 'excluding' compared with 'excluding' and 'including' compared with 'including'

		ra man oxoraamig ame		
All Costs in Euro	,	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household
Electricity	11,310	575	278	76
LPG	32,658	1,193	725	204
Oil/Kerosene	22,222	959	496	139
Natural Gas	15,600	721	470	133
Biomass (wood pellets)*	259	171	16	5
Biomass (wood chips)*	259	171		
Solar Power*	259	171	16	5
CHP with Natural Gas**	23,253	-	-	-
* Cost increases correspo	nding to reduction in	electric cooking costs		
** Depends on load profil	e of Factory/Production	on Facility + matching	electricity costs	



10.8 Scenario 3 Results:

The results of Scenario 3 (termed S3) are as follows:

Table 1 (S3): Total Annual Cost exclud. Annual Capital + O&M Cost (Space Heating + Hot Water + Cooking)
Note: 15% decrease in price of LPG, Oil and Natural Gas, also resultant 5% decrease in electricity price

Note. 1370 decrease in pric	e of Li O, Oil and Natur	ai Gas, also resultant 57	o decrease in electricity	once
All Costs in Euro	Factory/Production Facility	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household
Electricity	209,473	7,503	4,961	1,330
LPG	185,564	6,958	4,251	1,259
Oil/Kerosene	129,380	4,792	3,019	856
Natural Gas	88,402	4,086	2,663	751
Biomass (wood pellets)	91,174	3,486	2,273	649
Biomass (wood chips)*	73,924	2,854	-	-
Solar Power	4,948	325	295	101
CHP with Natural Gas**	26,675	-	-	-
* Assumes wood chips ar	e 20% cheaper than v	vood pellets with equiv	valent heat value	
** Depends on load profi	le of Factory/Producti	on Facility + matching	electricity costs	

Table 2 (S3): Total Annual Cost includ. Annual Capital + O&M Cost (Space Heating + Hot Water + Cooking)

Note: 15% decrease in price of LPG, Oil and Natural Gas, also resultant 5% decrease in electricity price

Factory/Production Medium Commercial Small Commercial Domestic /Service Enterprise Facility /Service Enterprise Household All Costs in Euro Electricity 209.473 7.503 4.961 1.330 LPG 4,485 186,797 7,242 1,382 Oil/Kerosene 131,230 5,217 3,371 1,041 Natural Gas 90,252 4,617 3,021 891 Biomass (wood pellets) 103,427 5,773 3,949 1,397 Biomass (wood chips)* 5,141 86,177 Solar Power 381,125 13,829 8,214 2,295 CHP with Natural Gas** 62,325 * Assumes wood chips are 20% cheaper than wood pellets with equivalent heat value

Table 3 (S3): CHANGES v. BASECASE (pos. values indicate increases and neg. values indicate decreases)

Same for Total Annual Cost excluding Annual Capital + O&M Cost and Total Annual Cost including Annual

Capital + O&M Costs, if 'excluding' compared with 'excluding' and 'including' compared with 'including'

** Depends on load profile of Factory/Production Facility + matching electricity costs

Capital + Oalli Costs, i	i excluding compare	tu widi excluding and	i ilicidulily collipared	with including
All Costs in Euro	,	Medium Commercial /Service Enterprise	Small Commercial /Service Enterprise	Domestic Household
Electricity	- 11,284	- 412	- 277	- 75
LPG	- 32,658	- 1,193	- 725	- 204
Oil/Kerosene	- 22,222	- 805	- 496	- 139
Natural Gas	- 15,600	- 721	- 470	- 133
Biomass (wood pellets)*	- 259	- 17	- 16	- 5
Biomass (wood chips)*	- 259	- 17		
Solar Power*	- 259	- 17	- 16	- 5
CHP with Natural Gas**	- 23,253	-	-	-
* Cost reduces correspon	ding to reduction in e	lectric cooking costs		
** Depends on load profi	le of Factory/Production	on Facility + matching	electricity costs	



APPENDIX I (Basecase Tables)



Annual Electric	ity Cost for Space Heating, Hot Water & Cooking	
	Equiv Annual Elec 'Nen Cases heating' (IAMb)	2 690 000
	Equiv Annual Elec 'Non-Space heating' (kWh) Annual Space Heating Usage (kWh)	2,680,000 1,122,000
Space Heating		
	Associated (see 2)	44.000
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Electricity (100% effic)	1,122,000
	Cost per kWh (€)	0.0659
	Additional heating Space heating cost (€)	5,915.18 79,855
Hot Water (Pro	cess Heating & Staff Facilities)	
incertification (i. 10	soot frouting a stain f asimiles,	
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to Electricity (100% effic)	1,224,000
	Cost per kWh (€)	0.1056
	Hot Water heating cost (€)	129,268
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Electricity (100% effic)	40.000
	Cost per kWh (€)	0.1296
	Cooking cost (€)	5,183
Supply Charge		
	Annual Standing Charge	6,451
	Supply charge (€)	6,451
	Annual Capital and O&M Cost (€)	-
Total Annual C	ost exclud. Annual Capital + O&M Cost (€)>	220,757
	. , ,	•



Annual LP	G Cost for Space Heating, Hot Water & Cooking	
Space Hea	ting	
_		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to LPG (Boiler effic)	1,320,000
	Cost per kWh	0.07758
	Space heating cost (€)	102,382
	, , , ,	
Hot Water		
	Overstituste has beested/descriptions	22.527
	Quantity to be heated/day (litres) Water (Its) raised through 90 C by 1 kWh	33,534 10
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to LPG (Boiler effic)	1,440,000
	Cost per kWh	0.07758
	Cost per kvvii	0.07730
	Hot Water heating cost (€)	111,690
Cooking		
cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	
	Annual Heating requirement (kWh)	40,000
	Energy to LPG (Cooker effic 80%)	47,059
	Cost per kWh	0.07758
	Cooking cost (€)	3,650
Supply Cha	arge	
	Annual Standing Charge	500.00
	Supply charge (€)	- 500
	Annual Capital and O&M Cost (€)	1,233
	al Cost exclud. Annual Capital + O&M Cost (€)>	218,222

Annual Oil/Ker	osene Cost for Space Heating, Hot Water & Cooking	1
Space Heating		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Oil/Kerosene (Boiler effic)	1,320,000
	Cost per kWh	0.05305
	Space heating cost (€)	70,027
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	
	Heating per day (kWh)	3,353.42
	Annual Heating requirement (kWh)	1,224,000
	Energy to Oil/Kerosene (Boiler effic)	1,440,000
	Cost per kWh	0.05305
	Hot Water heating cost (€)	76,393
Cooking	(Use Electric)	
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Electricity (100% effic)	40,000
	Cost per kWh (€)	0.1296
	Cooking cost (€)	5,183
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	1,850
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	151,602



Annual Natural (Gas Cost for Space Heating, Hot Water & Cooking	
	Total Gas Consumption (kWh)	2,807,059
Space Heating		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Natural Gas (Boiler effic)	1,320,000
	Cost per kWh	0.03389
	Space heating cost (€)	44,735
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,35
	Annual Heating requirement (kWh)	1,224,000
	Energy to Natural Gas (Boiler effic)	1,440,000
	Cost per kWh	0.03389
	Hot Water heating cost (€)	48,802
Cooking		
	Hours per year cooking	5.000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.03389
	Cooking cost (€)	1,59
Supply Charge		
	Annual Standing Charge	8,87 ⁻
	Supply charge (€)	8,871.47
	Annual Capital and O&M Cost (€)	1,850
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	104,003



Annual Bior	nass Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
opace near	g	
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Biomass (Boiler effic)	1,320,000
	Cost per kWh	0.0312
	Space heating cost (€)	41,250
Hot Water		
	Quantity to be heated/day (litres)	33,53
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,350
	Annual Heating requirement (kWh)	1,224,000
	Energy to Biomass (Boiler effic)	1,440,000
	Cost per kWh	0.0312
	Hot Water heating cost (€)	45,000
Cooking	(Use Electric)	
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Electricity (100% effic)	40,000
	Cost per kWh (€)	0.12957
	Cooking cost (€)	5,183
Supply Cha	где	
	Annual Standing Charge	-
	Supply charge (€)	
	Annual Capital and O&M Cost (€)	12,253
Total Annuz	ıl Cost exclud. Annual Capital + O&M Cost (€)>	91,433
	al Cost includ. Annual Capital + O&M Cost (€)>	103,689
ı vtar Annuz	n Cost meluu, Almuai Capital + OdW COSt (t)>	103,00



Annual Solar Power Cost for Space Heating, Hot Water & Cooking			
Space Heating			
	Area to be heated (m2)	11,220	
	Heating per m2 (kWh/annum)	100	
	Annual Heating requirement (kWh)	1,122,000	
	Solar Energy (100%)	1,122,000	
	Cost per kWh	0.00001	
	Space heating cost (€)	11	
Hot Water			
	0	22.52	
	Quantity to be heated/day (litres)	33,534	
	Water (Its) raised through 90 C by 1 kWh	10	
	Heating per day (kWh)	3,353	
	Annual Heating requirement (kWh)	1,224,000	
	Solar Energy (100%)	1,224,000 0.00001	
	Cost per kWh	0.0000	
	Hot Water heating cost (€)	12	
Cooking	(Use Electric)		
	(555 2.551.15)		
	Hours per year cooking	5,000	
	Cooking requirement (kWh per hour)	8.00	
	Annual Heating requirement (kWh)	40,000	
	Energy to Electricity (100% effic)	40,000	
	Cost per kWh (€)	0.12957	
	Cooking cost (€)	5,183	
Supply Charge			
	Annual Standing Charge		
		-	
	Supply charge (€)	-	
	Annual Capital and O&M Cost (€)	376,178	
Fotal Annual Cos	t exclud. Annual Capital + O&M Cost (€)>	5,206	



Space Heating A H A E C C S Hot Water C C C C C C C C C C C C C C C C C C	Assume €10,000 load-matching cost) Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to CHP Cost per kWh	4,312,513 146,151 105,09 11,220 100 1,122,000 2,040,000 0.03389
Total Gas Cost (€) Electricity Saving (€) (/ Space Heating A H A E C S Hot Water G V H A E C C C C C C C C C C C C	Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to CHP Cost per kWh	11,220 105,09 11,220 100 1,122,000 2,040,000 0.03389
Electricity Saving (€) (// Space Heating AH A E C C S Hot Water C C C C C C C C C C C C C C C C C C	Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to CHP Cost per kWh	11,220 100 1,122,000 2,040,000 0.03389
Space Heating A H A E C S Hot Water C V H A E C C C C C C C C C C C C C C C C C C	Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to CHP Cost per kWh	11,220 100 1,122,000 2,040,000 0.03389
Hot Water GV H	Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to CHP Cost per kWh	100 1,122,000 2,040,000 0.03389
Hot Water GV H	Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to CHP Cost per kWh	100 1,122,000 2,040,000 0.03389
Hot Water GV H	Annual Heating requirement (kWh) Energy to CHP Cost per kWh	1,122,000 2,040,000 0.03389
Hot Water GV H	Annual Heating requirement (kWh) Energy to CHP Cost per kWh	2,040,000 0.03389
Hot Water GV H	Energy to CHP Cost per kWh	2,040,000 0.03389
Hot Water GV H	Cost per kWh	0.03389
Hot Water C V H A	Space heating cost (€)	69,136
G V H A E		
V H A E		
V H A E	Quantity to be heated/day (litres)	33,534
H A E	Vater (lts) raised through 90 C by 1 kWh	33,53
E C	leating per day (kWh)	3,35
E C		
С	Annual Heating requirement (kWh)	1,224,000
	energy to CHP	2,225,45
H	Cost per kWh	0.03389
	lot Water heating cost (€)	75,421
Cooking		
H	lours per year cooking	5,000
C	Cooking requirement (kWh per hour)	8
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.03389
C	Cooking cost (€)	1,59
Supply Charge		
	Annual Standing Charge	8,87
S	Supply charge (€)	8,871
A	Annual Capital and O&M Cost (€)	35,650
Total Annual Cost exclud. A	nnual Capital + O&M Cost (€)>	49,929



Annual Electric	ity Cost for Space Heating, Hot Water & Cooking	
	Equiv Annual Elec 'Non-Space heating' (kWh)	64,108
	Annual Space Heating Usage (kWh)	69,353
Space Heating		
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,353
	Energy to Electricity (100% effic)	69,353
	Cost per kWh (€)	0.0680
	Additional heating	377.28
	Space heating cost (€)	5,093
Hot Water (Prod	cess Heating & Staff Facilities)	
-		
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	40.72
	Annual Heating requirement (kWh)	14,861
	Energy to Electricity (100% effic)	14,861
	Cost per kWh (€)	0.1008
	Hot Water heating cost (€)	1,498
Cooking		
	Hours per year cooking	971
	Cooking requirement (kWh per hour)	3.00
	Annual Heating requirement (kWh)	2,914
	Energy to Electricity (100% effic)	2,914
	Cost per kWh (€)	0.1171
	Cooking cost (€)	341
Supply Charge		
	Annual Standing Charge	982
	Supply charge (€)	982
	Annual Capital and O&M Cost (€)	-
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	7,914



Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,353
	Energy to LPG (Boiler effic)	81,592
	Cost per kWh	0.07756
	Cost per kvvii	0.07730
	Space heating cost (€)	6,328
Hot Water		
	Quantity to be heated/day /litros	בדר
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	40.72
	Annual Heating requirement (kWh)	14,861
	Energy to LPG (Boiler effic)	17,484
	Cost per kWh	0.07758
	Hot Water heating cost (€)	1,356
Cooking		
	Hours per year cooking	971
	Cooking requirement (kWh per hour)	3.00
	Annual Heating requirement (kWh)	2,914
	Energy to LPG (Cooker effic 80%)	3,428
	Cost per kWh	0.07758
	Cooking cost (€)	266
Punnk Ct -		
Supply Cha	ige	
	Annual Standing Charge	200.00
	Supply charge (€)	200.00
	Annual Capital and O&M Cost (€)	284
	al Cost exclud. Annual Capital + O&M Cost (€)>	8,150



Annual Oil/Kero	sene Cost for Space Heating, Hot Water & Cooking	
Space Heating		
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,353
	Energy to Oil/Kerosene (Boiler effic)	81,592
	Cost per kWh	0.05305
	0 1 1 1 10	1.000
	Space heating cost (€)	4,328
Hot Water		
nut water		
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	40.72
	Annual Heating requirement (kWh)	14,861
	Energy to Oil/Kerosene (Boiler effic)	17,484
	Cost per kWh	0.05305
	Cost per kvvii	0.05500
	Hot Water heating cost (€)	928
	not water heating cost (c)	320
Cooking	(Use Electric)	
Cooking	(000 2,001,10)	
	Hours per year cooking	971
	Cooking requirement (kWh per hour)	3.00
	Annual Heating requirement (kWh)	2,914
	Energy to Electricity (100% effic)	2,914
	Cost per kWh (€)	0.1172
	, , , , , , , , , , , , , , , , , , ,	
	Cooking cost (€)	341
	, , , , , , , , , , , , , , , , , , ,	
Supply Charge		
	Annual Standing Charge	-
		-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	426
Fotal Annual Ca		£ £0.
rotal Annual Co	st exclud. Annual Capital + O&M Cost (€)>	5,597

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Table 8.4: Natural Gas (Medium Commercial/Service Enterprise)				
Annual Natural Gas Cost for Space Heating, Hot Water & Cooking				
	T. 10 0 1: 4144	100 50		
	Total Gas Consumption (kWh)	102,504		
Space Heating				
	Area to be heated (m2)	694		
	Area to be heated (m2)			
	Heating per m2 (kWh/annum)	100		
	Annual Heating requirement (kWh)	69,353		
	Energy to Natural Gas (Boiler effic)	81,592		
	Cost per kWh	0.0455		
	Space heating cost (€)	3,711		
Hot Water				
	Quantity to be heated/day (litres)	570		
	Water (Its) raised through 60 C by 1 kWh	14		
	Heating per day (kWh)	40.72		
	Annual Heating requirement (kWh)	14,861		
	Energy to Natural Gas (Boiler effic)	17,484		
	Cost per kWh	0.0455		
	Hot Water heating cost (€)	795		
Cooking				
	House per uper cooking	971		
	Hours per year cooking	3.00		
	Cooking requirement (kWh per hour)			
	Annual Heating requirement (kWh)	2,914		
	Energy to Natural Gas (Cooker effic)	3,428		
	Cost per kWh	0.0455		
	Cooking cost (€)	156		
Supply Charge				
	Annual Standing Charge	145.44		
	Supply charge (€)	145.44		
	Annual Capital and O&M Cost (€)	530		
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	4,807		
Total Annual Ca	st includ. Annual Capital + O&M Cost (€)>	5,338		

Table 8.5: Biomass (Medium Commercial/Service Enterprise) Annual Biomass Cost for Space Heating, Hot Water & Cooking Space Heating Area to be heated (m2) 694 Heating per m2 (kWh/annum) 100 Annual Heating requirement (kWh) 69,353 Energy to Biomass (Boiler effic) 81,592 Cost per kWh 0.0319 Space heating cost (€) 2,604 Hot Water Quantity to be heated/day (litres) 570 Water (Its) raised through 60 C by 1 kWh 14 Heating per day (kWh) 40.72 Annual Heating requirement (kWh) 14,861 Energy to Biomass (Boiler effic) 17,484 Cost per kWh 0.0319 Hot Water heating cost (€) 558 Cooking (Use Electric) Hours per year cooking 971 3.00 Cooking requirement (kWh per hour) Annual Heating requirement (kWh) 2,914 Energy to Electricity (100% effic) 2,914 Cost per kWh (€) 0.11717 Cooking cost (€) 341 Supply Charge Annual Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) 2,287 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 3,503 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 5,791



Annual Solar Power Cost for Space Heating, Hot Water & Cooking				
Enaca Haating				
Space Heating				
	Area to be heated (m2)	694		
	Heating per m2 (kWh/annum)	100		
	Annual Heating requirement (kWh)	69,353		
	Solar Energy (100%)	69,353		
	Cost per kWh	0.00001		
	Cool per Kirii	0.0000		
	Space heating cost (€)	1		
Hot Water				
	Quantity to be heated/day (litres)	570		
	Water (Its) raised through 60 C by 1 kWh	14		
	Heating per day (kWh)	40.72		
	Annual Heating requirement (kWh)	14,861		
	Solar Energy (100%)	14,861		
	Cost per kWh	0.00001		
	Hot Water heating cost (€)	0		
Cooking	(Use Electric)			
Cooking	(OSE Electric)			
	Hours per year cooking	971		
	Cooking requirement (kWh per hour)	3.00		
	Annual Heating requirement (kWh)	2,914		
	Energy to Electricity (100% effic)	2,914		
	Cost per kWh (€)	0.11717		
	Cooking cost (€)	341		
Supply Charge				
Supply Charge				
	Annual Standing Charge			
	Allifual Standing Charge			
	Supply charge (€)	-		
		40.50		
	Annual Capital and O&M Cost (€)	13,504		
Fotal Annual Cos	st exclud. Annual Capital + O&M Cost (€)>	342		



Annual Electric	city Cost for Space Heating, Hot Water & Cooking	
	5 : 4 : 15: 11: 0 : 1 : 14:14:1	50.00
	Equiv Annual Elec 'Non-Space heating' (kWh)	53,627
	Annual Space Heating Usage (kWh)	30,389
Space Heating		
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to Electricity (100% effic)	30,389
		0.0695
	Cost per kWh (€)	
	Additional heating Space heating cost (€)	168.96 2,281
Hot Water (Pro	cess Heating & Staff Facilities)	
(, , ,		
	Quantity to be heated/day (litres)	728
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	18,993
	Energy to Electricity (100% effic)	18,993
	Cost per kWh (€)	0.1389
	Hot Water heating cost (€)	2,638
Cooking		
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	2.60
	Annual Heating requirement (kWh)	1,788
	Energy to Electricity (100% effic)	1,788
	Cost per kWh (€)	0.1736
	Cooking cost (€)	310
Supply Charge		
	Appual Standing Chargo	
	Annual Standing Charge Annual Storage Heating Standing Charge	8.03
	Supply charge (€)	8.03
	Annual Capital and O&M Cost (€)	-
Total Annual C	cost exclud. Annual Capital + O&M Cost (€)>	5,237

Table J.Z. 1	LPG (Small Commercial/Service Enterprise)	
Annual LPG	Cost for Space Heating, Hot Water & Cooking	
	<u> </u>	
Space Heat	ing	
	Area to be heated (m2)	27
	Heating per m2 (kWh/annum)	111
	Annual Heating requirement (kWh)	30,38
	Energy to LPG (Boiler effic)	35,75
	Cost per kWh	0.080
	Space heating cost (€)	2,87
lot Water		
	Quantity to be heated/day (litres)	72
	Water (Its) raised through 60 C by 1 kWh	1
	Heating per day (kWh)	52.0
	Annual Heating requirement (kWh)	18,99
	Energy to LPG (Boiler effic)	22,34
	Cost per kWh	0.080
	Cool per Kyyn	0.000
	Hot Water heating cost (€)	1,79
Cooking		
	Hours per year cooking	68
	Cooking requirement (kWh per hour)	
	Annual Heating requirement (kWh)	1,78
	Energy to LPG (Cooker effic 80%)	2,10
	Cost per kWh	0.080
	Cooking cost (€)	16
Supply Cha	rge	
	Annual Standing Charge	140.0
	Supply charge (€)	140.0
	Annual Capital and O&M Cost (€)	23
Fatal A		
otal Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	4,97
ntal Annua	al Cost includ. Annual Capital + O&M Cost (€)>	5,21



Annual Ull/Kei	osene Cost for Space Heating, Hot Water & Cooking	
Space Heating		
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to Oil/Kerosene (Boiler effic)	35,751
	Cost per kWh	0.0552
	Space heating cost (€)	1,972
Hot Water		
	0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	700
	Quantity to be heated/day (litres)	728
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	18,993
	Energy to Oil/Kerosene (Boiler effic)	22,345
	Cost per kWh	0.0552
	11-438-4	4 222
	Hot Water heating cost (€)	1,233
Cooking	(Use Electric)	
Cooking	(Ose Liectric)	
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	2.60
	Annual Heating requirement (kWh)	1,788
	Energy to Electricity (100% effic)	1,788
	Cost per kWh (€)	0.1738
	out for min (g	
	Cooking cost (€)	310
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	
	Annual Capital and O&M Cost (€)	352
Total August 1		
i otai Annual (Cost exclud. Annual Capital + O&M Cost (€)>	3,510
Total Annual (Cost includ. Annual Capital + O&M Cost (€)>	3,86



Annual Natural Gas Cost for Space Heating, Hot Water & Cooking			
	Total Gas Consumption (IdMIh)	60.100	
	Total Gas Consumption (kWh)	60,199	
Space Heating			
	Area to be heated (m2)	276	
	Heating per m2 (kWh/annum)	110	
	Annual Heating requirement (kWh)	30,389	
	Energy to Natural Gas (Boiler effic)	35,75	
	Cost per kWh	0.04963	
	Space heating cost (€)	1,774	
Hot Water			
	Quantity to be heated/day (litres)	728	
	Water (Its) raised through 60 C by 1 kWh	14	
	Heating per day (kWh)	52.04	
	Annual Heating requirement (kWh)	18,99	
	Energy to Natural Gas (Boiler effic)	22,34	
	Cost per kWh	0.04963	
	Hot Water heating cost (€)	1,109	
Cooking			
	Hours per year cooking	688	
	Cooking requirement (kWh per hour)	2.60	
	Annual Heating requirement (kWh)	1,788	
	Energy to Natural Gas (Cooker effic)	2,103	
	Cost per kWh	0.04963	
	Cooking cost (€)	104	
Supply Charge			
	Annual Standing Charge	145.44	
	Supply charge (€)	145.44	
	Annual Capital and O&M Cost (€)	350	
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	3,133	
Total Annual Co	ost includ. Annual Capital + O&M Cost (€)>	3,49	



Annual Bio	mass Cost for Space Heating, Hot Water & Cooking	
Space Hea	ting	
	Area to be heated (m2)	278
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to Biomass (Boiler effic)	35,751
	Cost per kWh	0.03404
	Space heating cost (€)	1,217
Hot Water		
	Quantity to be heated/day (litres)	728
	Water (Its) raised through 60 C by 1 kWh	1
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	18,993
	Energy to Biomass (Boiler effic)	22,345
	Cost per kWh	0.03404
	Hot Water heating cost (€)	761
Cooking	(Use Electric)	
	Harris non room cooking	coc
	Hours per year cooking	688 2.60
	Cooking requirement (kWh per hour)	
	Annual Heating requirement (kWh)	1,788
	Energy to Electricity (100% effic) Cost per kWh (€)	1,788 0.17360
	Cooking cost (€)	310
Supply Cha	irge	
	Annual Standing Charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	1,676
	al Cost exclud. Annual Capital + O&M Cost (€)>	2,288



Annual Solar Power Cost for Space Heating, Hot Water & Cooking		
Allinaar Solai i o	Not cooking space meaning, not mater at cooking	
Space Heating		
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Solar Energy (100%)	30,389
	Cost per kWh	0.0000
	Space heating cost (€)	(
Hot Water		
	Quantity to be heated/day (litres)	72
	Water (Its) raised through 60 C by 1 kWh	1,
	Heating per day (kWh)	52.0
	Annual Heating requirement (kWh)	18,99:
	Solar Energy (100%)	18,993
	Cost per kWh	0.0000
	Cost per kyvn	0.0000
	Hot Water heating cost (€)	l
Cooking	(Use Electric)	
	House nor year appling	688
	Hours per year cooking Cooking requirement (kWh per hour)	2.60
	Annual Heating requirement (kWh)	1,788
	Energy to Electricity (100% effic)	1,78
	Cost per kWh (€)	0.17360
	Cost per kyvii (e)	0.17300
	Cooking cost (€)	310
Supply Charge		
	Annual Standing Charge	
	r amost oranging charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	7,918
Total Annual Cos	t exclud. Annual Capital + O&M Cost (€)>	31



Table 10.1: Ele	ctricity Only (Domestic Household)	
Annual Electric	ity Cost for Space Heating, Hot Water & Cooking	
Annual Eleculc	try Cost for Space nearing, not water & Cooking	
	Annual Elect. 'Non-Space heating' Usage (kWh)	10,00
	Annual Space Heating Usage (kWh)	9,98
	Annual Electricity Bill (€)	2,14
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	125
	Annual Heating requirement (kWh)	9,986
	Energy to Electricity (100% effic)	9,986
	Cost per kWh (€)	0.0705
	Additional heating	56.32
	Space heating cost (€)	760
	Space heading cost (c)	700
Hot Water (Prod	cess Heating & Staff Facilities)	
•		
	Quantity to be heated/day (litres)	142
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.13
	Annual Heating requirement (kWh)	3,698
	Energy to Electricity (100% effic)	3,698
	Cost per kWh (€)	0.1435
	Hot Water heating cost (€)	531
Cooking		
	Harman and the same and the same	200
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Electricity (100% effic)	740
	Cost per kWh (€)	0.1435
	Cooking cost (€)	106
Supply Charge		
	Annual Standing Charge	
	Annual Storage Heating Standing Charge	8.03
	Supply charge (€)	8.03
	Annual Capital and O&M Cost (€)	-
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	1,405
Total Annual Co	ost includ. Annual Capital + O&M Cost (€)>	1,405

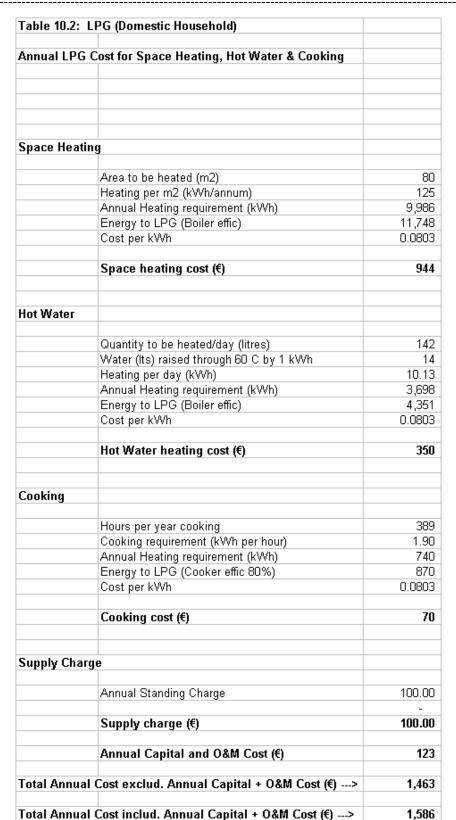




Table 10.3: Oil	(Domestic Household)	
Annual Oil/Kero	osene Cost for Space Heating, Hot Water & Cooking	
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	125
	Annual Heating requirement (kWh)	9,986
	Energy to Oil/Kerosene (Boiler effic)	11,748
	Cost per kWh	0.0552
	Space heating cost (€)	648
Hot Water		
	Quantity to be heated/day (litres)	142
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.13
	Annual Heating requirement (kWh)	3,698
	Energy to Oil/Kerosene (Boiler effic)	4,351
	Cost per kWh	0.0552
	Hot Water heating cost (€)	240
Cooking	(Use Electric)	
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Electricity (100% effic)	740
	Cost per kWh (€)	0.1435
	Cooking cost (€)	106
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	185
Total Annual C	ost exclud. Annual Capital + O&M Cost (€)>	994
Total Annual C	ost includ. Annual Capital + O&M Cost (€)>	1,179



Annual Natural	Gas Cost for Space Heating, Hot Water & Cooking	
	Total Gas Consumption (kWh)	16,969
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	125
	Annual Heating requirement (kWh)	9,988
	Energy to Natural Gas (Boiler effic)	11,748
	Cost per kWh	0.03604
	Space heating cost (€)	423
Hot Water		
	Overstitute has been didness (films)	4.45
	Quantity to be heated/day (litres)	142
	Water (Its) raised through 60 C by 1 kWh	1/
	Heating per day (kWh)	10.13
	Annual Heating requirement (kWh)	3,698
	Energy to Natural Gas (Boiler effic) Cost per kWh	4,351 0.03604
	Hot Water heating cost (€)	157
Cooking		
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Natural Gas (Cooker effic)	870
	Cost per kWh	0.03604
	Cooking cost (€)	31
Supply Charge		
	Annual Standing Charge	271.88
	Supply charge (€)	271.88
	Annual Capital and O&M Cost (€)	140
Total Annual Ca	st exclud. Annual Capital + O&M Cost (€)>	884



Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge Supply charge (€)	er & Cooking
Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Energy to Biomass (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	1
Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	9,9
Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	11,7
Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	0.034
Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	4
Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Water (its) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Water (its) raised through 60 C by 1 k Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	1
Heating per day (kWh) Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	√h
Annual Heating requirement (kWh) Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	10.
Energy to Biomass (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	3,6
Cost per kWh Hot Water heating cost (€) Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	4,3
Cooking (Use Electric) Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	0.034
Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	1
Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	
Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	_
Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	3
Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	1.
Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge	7
Cooking cost (€) Supply Charge Annual Standing Charge	7
Supply Charge Annual Standing Charge	0.143
Annual Standing Charge	1
Supply charge (€)	-
Annual Capital and O&M Cost (€)	7
Total Annual Cost exclud. Annual Capital + O&M	Cost (€)> 6



Annual Solar Po	wer Cost for Space Heating, Hot Water & Cooking	<u> </u>
ai oolai i o	wer door for opace freating, flot frater at cooking	
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	125
	Annual Heating requirement (kWh)	9,986
	Solar Energy (100%)	9,986
	Cost per kWh	0.00001
	Space heating cost (€)	0
Hot Water		
	Overstitu to be heated(dev /litree)	1.40
	Quantity to be heated/day (litres)	142
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.13
	Annual Heating requirement (kWh)	3,698
	Solar Energy (100%)	3,698
	Cost per kWh	0.00001
	Hot Water heating cost (€)	0
Cooking	(Use Electric)	
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Electricity (100% effic)	740
	Cost per kWh (€)	0.14350
	oost por krym (c)	0.14000
	Cooking cost (€)	106
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	2,194
Fotal Annual Cos	st exclud. Annual Capital + O&M Cost (€)>	106



APPENDIX II (Sensitivity 1 Tables)



Annual Electric	ity Cost for Space Heating, Hot Water & Cooking	
	,	
	Equiv Annual Elec 'Non-Space heating' (kWh)	2,680,000
	Annual Space Heating Usage (kWh)	1,122,00
Space Heating		
	Area to be heated (m2)	11,220
	Area to be heated (m2)	100
	Heating per m2 (kWh/annum)	1,122,000
	Annual Heating requirement (kWh)	
	Energy to Electricity (100% effic)	1,122,000
	Cost per kWh (€)	0.0639
	Additional heating Space heating cost (€)	5,735.66 77,43 1
	opaco neuting cost (c)	11,40
Hot Water (Prod	ess Heating & Staff Facilities)	
	Quantity to be heated/day (litres)	33,534
	Water (lts) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to Electricity (100% effic) Cost per kWh (€)	1,224,000 0.0907
	Hot Water heating cost (€)	111,041
Cooking		
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Electricity (100% effic)	40,000
	Cost per kWh (€)	0.1054
	Cooking cost (€)	4,216
Supply Charge		
	Annual Standing Charge	6,451
	Supply charge (€)	6,451
	Annual Capital and O&M Cost (€)	
T-4-1 A 10		400 444
i otal Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	199,140
	ost includ. Annual Capital + O&M Cost (€)>	199,140



	1): LPG (Factory/Production Facility)	
Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
Space near	mg	
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to LPG (Boiler effic)	1,320,000
	Cost per kWh	0.07479
	out por norm	0.01111
	Space heating cost (€)	98,720
	Space (4)	
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,35
	Annual Heating requirement (kWh)	1,224,000
	Energy to LPG (Boiler effic)	1,440,000
	Cost per kWh	0.07479
	,	
	Hot Water heating cost (€)	107,70
Cooking		
ocoming		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	{
	Annual Heating requirement (kWh)	40,000
	Energy to LPG (Cooker effic 80%)	47,059
	Cost per kWh	0.07479
	Cooking cost (€)	3,520
	Cooking Cost (C)	3,320
Supply Cha	rge	
	Annual Standing Charge	500.00
	Supply charge (€)	500
	Annual Capital and O&M Cost (€)	1,23
Total Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	210,440
		,

Table 7.3 (S1): Oil (Factory/Production Facility) Annual Oil/Kerosene Cost for Space Heating, Hot Water & Cooking Space Heating Area to be heated (m2) 11,220 Heating per m2 (kWh/annum) 100 Annual Heating requirement (kWh) 1,122,000 Energy to Oil/Kerosene (Boiler effic) 1,320,000 Cost per kWh 0.05597 Space heating cost (€) 73,878 Hot Water Quantity to be heated/day (litres) 33,534 Water (Its) raised through 90 C by 1 kWh 10 Heating per day (kWh) 3.353.42 Annual Heating requirement (kWh) 1,224,000 Energy to Oil/Kerosene (Boiler effic) 1,440,000 0.05597 Cost per kWh Hot Water heating cost (€) 80.594 Cooking (Use Electric) 5,000 Hours per year cooking Cooking requirement (kWh per hour) 8.00 Annual Heating requirement (kWh) 40,000 Energy to Electricity (100% effic) 40,000 Cost per kWh (€) 0.1054 Cooking cost (€) 4,216 Supply Charge Annual Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) 1,850 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 158,688 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 160,538

	Natural Gas (Factory/Production Facility)	
Annual Natural (Gas Cost for Space Heating, Hot Water & Cooking	
	Total Gas Consumption (kWh)	2,807,059
Space Heating		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Natural Gas (Boiler effic)	1,320,000
	Cost per kWh	0.03008
	Space heating cost (€)	39,700
11-410/-4		
Hot Water		
	Quantity to be heated/day (litres)	33,53
	Water (Its) raised through 90 C by 1 kWh	1(
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to Natural Gas (Boiler effic)	1,440,000
	Cost per kWh	0.03008
	Hot Water heating cost (€)	43,315
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.03008
	Cooking cost (€)	1,410
Supply Charge		
	Annual Standing Charge	8,87
		-
	Supply charge (€)	8,871.47
	Annual Capital and O&M Cost (€)	1,850
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	93,308
Total Annual Co	st includ. Annual Capital + O&M Cost (€)>	95,15



Annual CHP Cost for Spa	ce Heating, Hot Water & Cooking	
Total Cas Overtity (I/MI)		4 242 542
Total Gas Quantity (kWh)		4,312,513
Total Gas Cost (€)	(F. r. + 1040 0001 1 + 11; 1)	129,720
Electricity Saving (€)	(Estimated €10,000 load-matching cost)	105,09
Space Heating		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to CHP	2,040,000
	Cost per kWh	0.03008
	Cost per KVVII	0.03000
	Space heating cost (€)	61,363
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	1(
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to CHP	2,225,455
	Cost per kWh	0.03008
	Hot Water heating cost (€)	66,942
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.03008
	Cooking cost (€)	1,416
Supply Charge		
	Annual Standing Charge	8,871
	Supply charge (€)	8,871
	Annual Capital and O&M Cost (€)	35,650
Total Annual Cost exclud	. Annual Capital + O&M Cost (€)>	33,498



Annual El	it. Continue Connection II all the Continue Contin	
Annual Electric	ity Cost for Space Heating, Hot Water & Cook	ing
	Equiv Annual Elec 'Non-Space heating' (kWh)	64,10
	Annual Space Heating Usage (kWh)	69,35
	g == g ,,	,
Space Heating		
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,353
	Energy to Electricity (100% effic)	69,353
	Cost per kWh (€)	0.0639
	Additional heating	354.53
	Space heating cost (€)	4,786
		,,,,
Hot Water (Prod	cess Heating & Staff Facilities)	
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	14
		40.72
	Heating per day (kWh)	
	Annual Heating requirement (kWh)	14,861
	Energy to Electricity (100% effic) Cost per kWh (€)	14,861 0.0907
	Cost per Kvvii (e)	0.0307
	Hot Water heating cost (€)	1,348
Cooking		
	Hours per year cooking	971
	Cooking requirement (kWh per hour)	3.00
	Annual Heating requirement (kWh)	2,914
	Energy to Electricity (100% effic)	2,914
	Cost per kWh (€)	0.1054
	Cooking cost (€)	307
Supply Charge		
	Annual Standing Charge	982
	Supply charge (€)	982
	Annual Capital and O&M Cost (€)	-
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	7,423
Lotal Annual Co	ost includ. Annual Capital + O&M Cost (€)>	7,423



Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Allindar Er G	cost for opace freating, flot trater a cooking	
C II4		
Space Heat	ing	
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,353
	Energy to LPG (Boiler effic)	81,592
	Cost per kWh	0.07479
	Oust per KVVII	0.0141
	Space heating cost (€)	6,102
	opuse nearing cost (c)	0,102
Hot Water		
.or mater		
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	40.72
	Annual Heating requirement (kWh)	14,86
	Energy to LPG (Boiler effic)	17,484
	Cost per kWh	0.07479
	Hot Water heating cost (€)	1,308
Cooking		
g		
	Hours per year cooking	971
	Cooking requirement (kWh per hour)	3.00
	Annual Heating requirement (kWh)	2,914
	Energy to LPG (Cooker effic 80%)	3,428
	Cost per kWh	0.07479
	Cooking cost (€)	256
Supply Cha	rge	
.,,	Annual Standing Charge	200.00
	Annual Standing Charge	200.00
	Supply charge (€)	200.00
	Annual Capital and O&M Cost (€)	284
Fotal Annua	Il Cost exclud. Annual Capital + O&M Cost (€)>	7,867

Table 8.3 (S1): Oil (Medium Commercial/Service Enterprise) Annual Oil/Kerosene Cost for Space Heating, Hot Water & Cooking Space Heating Area to be heated (m2) 694 Heating per m2 (kWh/annum) 100 Annual Heating requirement (kWh) 69,353 Energy to Oil/Kerosene (Boiler effic) 81,592 Cost per kWh 0.05597 Space heating cost (€) 4,567 Hot Water Quantity to be heated/day (litres) 570 Water (Its) raised through 60 C by 1 kWh 14 Heating per day (kWh) 40.72 Annual Heating requirement (kWh) 14,861 Energy to Oil/Kerosene (Boiler effic) 17,484 Cost per kWh 0.05597 Hot Water heating cost (€) 979 Cooking (Use Electric) 971 Hours per year cooking Cooking requirement (kWh per hour) 3.00 Annual Heating requirement (kWh) 2,914 Energy to Electricity (100% effic) 2.914 Cost per kWh (€) 0.1054 Cooking cost (€) 307 Supply Charge Annual Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) 426 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 5,852 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 6,278



Annual Natural (Annual Natural Gas Cost for Space Heating, Hot Water & Cooking		
	Total Gas Consumption (kWh)	102,504	
Space Heating			
	Area to be heated (m2)	694	
	Heating per m2 (kWh/annum)	100	
	Annual Heating requirement (kWh)	69,353	
	Energy to Natural Gas (Boiler effic)	81,592	
	Cost per kWh	0.04146	
	Space heating cost (€)	3,383	
Hot Water			
	Quantity to be heated/day (litres)	570	
	Water (Its) raised through 60 C by 1 kWh	14	
	Heating per day (kWh)	40.72	
	Annual Heating requirement (kWh)	14,861	
	Energy to Natural Gas (Boiler effic)	17,484	
	Cost per kWh	0.04146	
	Hot Water heating cost (€)	725	
Cooking			
	Hours per year cooking	971	
	Cooking requirement (kWh per hour)	3.00	
	Annual Heating requirement (kWh)	2.914	
	Energy to Natural Gas (Cooker effic)	3,428	
	Cost per kWh	0.04146	
	Cooking cost (€)	142	
Supply Charge			
	Annual Standing Charge	50.00	
	Supply charge (€)	50.00	
	Annual Capital and O&M Cost (€)	530	
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	4,300	



Annual Electric	ity Cost for Space Heating, Hot Water & Cooking]
	Equiv Annual Elec 'Non-Space heating' (kWh)	53,62
	Annual Space Heating Usage (kWh)	30,38
Space Heating		
<u>-</u>		
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to Electricity (100% effic)	30,389
	Cost per kWh (€)	0.0700
	Additional heating	170.18
	Space heating cost (€)	2,297
Hot Water (Prod	cess Heating & Staff Facilities)	
	Quantity to be heated/day (litres)	728
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	18,993
	Energy to Electricity (100% effic)	18,993
	Cost per kWh (€)	0.1326
	Hot Water heating cost (€)	2,518
Cooking		
	Haura nacycar apaleing	600
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	2.60
	Annual Heating requirement (kWh)	1,788
	Energy to Electricity (100% effic)	1,788
	Cost per kWh (€)	0.1639
	Cooking cost (€)	293
Supply Charge		
	A	
	Annual Standing Charge	-
	Annual Storage Heating Standing Charge	8.03
	Supply charge (€)	8.03
	Annual Capital and O&M Cost (€)	-
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	5,117
Total Annual Co	ost includ. Annual Capital + O&M Cost (€)>	5,117



A L L D.C	Contraction Harding Hat Water & Contraction	
Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to LPG (Boiler effic)	35,751
	Cost per kWh	0.0776
	Space heating cost (€)	2,773
Hot Water		
	Quantity to be heated/day (litres)	728
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	18,993
	Energy to LPG (Boiler effic)	22,345
	Cost per kWh	0.0776
	Hot Water heating cost (€)	1,733
Cooking		
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	
	Annual Heating requirement (kWh)	1,788
	Energy to LPG (Cooker effic 80%)	2,103
	Cost per kWh	0.0776
	0.11	
	Cooking cost (€)	163
Supply Cha	rge	
- 266.) 0110		
	Annual Standing Charge	140.00
	Supply charge (€)	140.00
	Annual Capital and O&M Cost (€)	234
Total Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	4,809



Annual Oil/Kerosene Cost for Space Heating, Hot Water & Cooking			
Alliuai Oli/Reio	Annual On/Nerosene Cost for Space neating, not water & Cooking		
Space Heating			
	Area to be heated (m2)	270	
	Heating per m2 (kWh/annum)	110	
	Annual Heating requirement (kWh)	30,389	
	Energy to Oil/Kerosene (Boiler effic)	35,75	
	Cost per kWh	0.058	
	Space heating cost (f)	2,07	
	Space heating cost (€)	2,011	
Hot Water			
	Quantity to be heated/day (litres)	72	
	Water (Its) raised through 60 C by 1 kWh	14	
	Heating per day (kWh)	52.04	
	Annual Heating requirement (kWh)	18,993	
	Energy to Oil/Kerosene (Boiler effic)	22,34	
	Cost per kWh	0.058	
	Hot Water heating cost (€)	1,298	
Cooking	(Use Electric)		
	Hours per year cooking	688	
	Cooking requirement (kWh per hour)	2.60	
	Annual Heating requirement (kWh)	1,78	
	Energy to Electricity (100% effic)	1,78	
	Cost per kWh (€)	0.163	
	Cooking cost (€)	29:	
Supply Charge			
	Annual Standing Change		
	Annual Standing Charge	-	
	Supply charge (€)	-	
	Annual Capital and O&M Cost (€)	35	
	est exclud. Annual Capital + O&M Cost (€)>	3,668	



Annual Natural	Annual Natural Gas Cost for Space Heating, Hot Water & Cooking		
	Total Gas Consumption (kWh)	60,199	
Space Heating			
	Area to be heated (m2)	276	
	Heating per m2 (kWh/annum)	110	
	Annual Heating requirement (kWh)	30,389	
	Energy to Natural Gas (Boiler effic)	35,751	
	Cost per kWh	0.04509	
	Space heating cost (€)	1,612	
Hot Water			
	Quantity to be heated/day (litres)	728	
	Water (lts) raised through 60 C by 1 kWh	14	
	Heating per day (kWh)	52.04	
	Annual Heating requirement (kWh)	18,993	
	Energy to Natural Gas (Boiler effic)	22,34	
	Cost per kWh	0.04509	
	Hot Water heating cost (€)	1,008	
Cooking			
	Hours per year cooking	688	
	Cooking requirement (kWh per hour)	2.60	
	Annual Heating requirement (kWh)	1,788	
	Energy to Natural Gas (Cooker effic)	2,103	
	Cost per kWh	0.04509	
	Cooking cost (€)	95	
Supply Charge			
	Annual Standing Charge	50.00	
	Supply charge (€)	50.00	
	Annual Capital and O&M Cost (€)	358	
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	2,764	



Hot Water (Process Heating & Staff Facilities) Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh 10.1 Annual Heating per day (kWh) 10.1 Annual Heating requirement (kWh) 2,69 Energy to Electricity (100% effic) 3,69 Cost per kWh (€) 0.141 Hot Water heating cost (€) Cooking Hours per year cooking 20 Cooking requirement (kWh per hour) 1.9 Annual Heating requirement (kWh) 74 Energy to Electricity (100% effic) 74 Cost per kWh (€) Cost per kWh (€) 10 Supply Charge Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) -	Table 10.1 (S1):	Electricity Only (Domestic Household)	
Annual Space Heating Usage (kWh) Annual Electricity Bill (€) Space Heating Area to be heated (m2) Heating per m2 (kWh/annum) 12 Annual Heating requirement (kWh) 9,98 Energy to Electricity (100% effic) 9,98 Cost per kWh (€) 0,070 Additional heating 55.9 Space heating cost (€) Total Annual Heating requirement (kWh) 10.1 Annual Heating per day (kWh) 10.1 Annual Heating per day (kWh) 10.1 Annual Heating requirement (kWh) 10.2 Cost per kWh (€) 10.141 Cooking Annual Heating cost (€) Annual Standing Charge Annual Standing Charge Annual Standing Charge Annual Capital and O&M Cost (€) Annual Capital and O&M Cost (€) Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39	Annual Electric	ity Cost for Space Heating, Hot Water & Cooking	
Annual Space Heating Usage (kWh) Annual Electricity Bill (€) Space Heating Area to be heated (m2) Heating per m2 (kWh/annum) 12 Annual Heating requirement (kWh) 9,98 Energy to Electricity (100% effic) 9,98 Cost per kWh (€) 0,070 Additional heating 55.9 Space heating cost (€) Total Annual Heating requirement (kWh) 10.1 Annual Heating per day (kWh) 10.1 Annual Heating per day (kWh) 10.1 Annual Heating requirement (kWh) 10.2 Cost per kWh (€) 10.141 Cooking Annual Heating cost (€) Annual Standing Charge Annual Standing Charge Annual Standing Charge Annual Capital and O&M Cost (€) Annual Capital and O&M Cost (€) Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			
Annual Electricity Bill (€) Space Heating Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Quantity to Beated (m2) Quantity to be heated/day (litres) Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Hot Water heating cost (€) Cost per kWh (€) Cost per kWh (€) Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) per hour) Annual Heating requirement (kWh) Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Cooking cost (€) Cooking cost (€) 10 Supply Charge Annual Standing Charge Annual Standing Charge Annual Capital and O&M Cost (€) Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			
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Area to be heated (m2) Heating per m2 (kWh/annum) 12 Annual Heating requirement (kWh) 9,98 Energy to Electricity (100% effic) Cost per kWh (€) Additional heating 55.9. Space heating cost (€) 75 Hot Water (Process Heating & Staff Facilities) Quantity to be heated/day (litres) 4 Water (kts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) 5,69 Energy to Electricity (100% effic) Cost per kWh (€) Cost per kWh (€) 4 Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Cooking cost (€) Cooking cost (€) 10 Supply Charge Annual Standing Charge Annual Standing Charge Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Annual Electricity Bill (€)	
Heating per m2 (kWh/annum) 12	Space Heating		
Heating per m2 (kWh/annum) 12		Area to be heated (m2)	0/
Annual Heating requirement (kWh) 9,98 Energy to Electricity (100% effic) 9,98 Cost per kWh (€) 0.070 Additional heating 55.9 Space heating cost (€) 75 Hot Water (Process Heating & Staff Facilities) 14. Quantity to be heated/day (litres) 14. Water (Its) raised through 60 C by 1 kWh 10.1 Annual Heating requirement (kWh) 3,69 Energy to Electricity (100% effic) 3,69 Cost per kWh (€) 0.141 Hot Water heating cost (€) 52 Cooking Hours per year cooking 38 Cooking requirement (kWh) 74 Energy to Electricity (100% effic) 74 Cost per kWh (€) 0.141 Cooking cost (€) 10 Supply Charge 4 Annual Standing Charge 4 Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€)> 1,39		` '	
Energy to Electricity (100% effic) 9,98			
Cost per kWh (€) 0.070 Additional heating 55.9 Space heating cost (€) 75 Hot Water (Process Heating & Staff Facilities) 14 Water (its) raised through 60 C by 1 kWh 1. Heating per day (kWh) 10.1 Annual Heating requirement (kWh) 3,69 Energy to Electricity (100% effic) 3,69 Cost per kWh (€) 0.141 Hot Water heating cost (€) 52 Cooking 38 Cooking requirement (kWh) per hour) 1.9 Annual Heating requirement (kWh) 74 Energy to Electricity (100% effic) 74 Cost per kWh (€) 0.141 Cooking cost (€) 10 Supply Charge - Annual Standing Charge - Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€) -			
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Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Hot Water heating cost (€) Cooking Hours per year cooking Cooking equirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Annual Standing Charge Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Space heating cost (€)	75
Water (its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cost per kWh (€) Cost per kWh (€) Cost per kWh (€) Cooking cost (€) 10 Supply Charge Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39	Hot Water (Proc	ess Heating & Staff Facilities)	
Water (its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cost per kWh (€) Cost per kWh (€) Cost per kWh (€) Cooking cost (€) 10 Supply Charge Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			
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Annual Heating requirement (kWh) 3,69			14
Energy to Electricity (100% effic) 3,69 Cost per kWh (€) 0.141 Hot Water heating cost (€) 52 Cooking		Heating per day (kWh)	10.13
Cost per kWh (€) 0.141 Hot Water heating cost (€) 52 Cooking 38 Cooking requirement (kWh per hour) 1.9 Annual Heating requirement (kWh) 74 Energy to Electricity (100% effic) 74 Cost per kWh (€) 0.141 Cooking cost (€) 10 Supply Charge - Annual Standing Charge - Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€) - 1,39		Annual Heating requirement (kWh)	3,69
Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Energy to Electricity (100% effic)	3,698
Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Cost per kWh (€)	0.141
Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1.39		Hot Water heating cost (€)	523
Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39	Cooking		
Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Hours per year cooking	389
Annual Heating requirement (kWh) Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) - Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			
Energy to Electricity (100% effic) Cost per kWh (€) Cooking cost (€) Supply Charge Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			
Cost per kWh (€) 0.141 Cooking cost (€) 10 Supply Charge Annual Standing Charge - Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			
Supply Charge Annual Standing Charge Annual Storage Heating Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			0.141
Annual Standing Charge - Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Cooking cost (€)	10:
Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39	Supply Charge		
Annual Storage Heating Standing Charge 8.0 Supply charge (€) 8.0 Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39		Annual Standing Charge	_
Supply charge (€) 8.0 Annual Capital and O&M Cost (€)> Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			0.01
Total Annual Cost exclud. Annual Capital + O&M Cost (€)> 1,39			8.03
		Annual Capital and O&M Cost (€)	-
	Total Annual Co		1,391
LOTAL COUNTRY LAST INCHIA CONTROL AND A LANGE LAST CASE OF LAST CASE O			



Table 10.2 (S1): LPG (Domestic Household)	
Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	12
	Annual Heating requirement (kWh)	9,98
	Energy to LPG (Boiler effic)	11,748
	Cost per kWh	0.077
	Space heating cost (€)	911
Hot Water		
	Quantity to be heated/day (litres)	143
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.1
	Annual Heating requirement (kWh)	3,69
	Energy to LPG (Boiler effic)	4,35
	Cost per kWh	0.077
	Hot Water heating cost (€)	33
Cooking		
	Hours per year cooking	38
	Cooking requirement (kWh per hour)	1.9
	Annual Heating requirement (kWh)	74
	Energy to LPG (Cooker effic 80%)	87
	Cost per kWh	0.077
	Cost per Kvvii	0.011
	Cooking cost (€)	6
Supply Cha	rao	
очрріў Спа		
	Annual Standing Charge	100.0
	Supply charge (€)	100.0
	Annual Capital and O&M Cost (€)	12
Total Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	1,41



Table 10.3 (S1):	Oil (Domestic Household)	
Annual Oil/Kerosene Cost for Space Heating, Hot Water & Cooking		
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	12
	Annual Heating requirement (kWh)	9,986
	Energy to Oil/Kerosene (Boiler effic)	11,74
	Cost per kWh	0.058
	oost per kviii	0.000
	Space heating cost (€)	682
Hot Water		
	Quantity to be heated/day (litres)	14:
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.1
	Annual Heating requirement (kWh)	3,69
	Energy to Oil/Kerosene (Boiler effic)	4,35
	Cost per kWh	0.058
	Hot Water heating cost (€)	25
Cooking	(Use Electric)	
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Electricity (100% effic)	740
	Cost per kWh (€)	0.141
	Cooking cost (€)	10:
Supply Charge		
	Annual Standing Chann	
	Annual Standing Charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	18
Total Annual Co	est exclud. Annual Capital + O&M Cost (€)>	1,04



Annual Natural	Gas Cost for Space Heating, Hot Water & Cooking	
	Total Gas Consumption (kWh)	16,96
Space Heating		
	Area to be heated (m2)	8
	Heating per m2 (kWh/annum)	12
	Annual Heating requirement (kWh)	9,98
	Energy to Natural Gas (Boiler effic)	11,74
	Cost per kWh	0.0450
	Space heating cost (€)	53
lot Water		
	Quantity to be heated/day (litres)	14
	Water (Its) raised through 60 C by 1 kWh	1
	Heating per day (kWh)	10.1
	Annual Heating requirement (kWh)	3,69
	Energy to Natural Gas (Boiler effic)	4,35
	Cost per kWh	0.0450
	Hot Water heating cost (€)	19
Cooking		
	Hours per year cooking	38
	Cooking requirement (kWh per hour)	1.9
	Annual Heating requirement (kWh)	74
	Energy to Natural Gas (Cooker effic)	87
	Cost per kWh	0.0450
	Cooking cost (€)	3
Supply Charge		
	Annual Standing Charge	50.0
	Supply charge (€)	50.0
	Annual Capital and O&M Cost (€)	14
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	81



APPENDIX III (Sensitivity 2 Tables)



Table 7.2 (S	2): LPG (Factory/Production Facility)	
Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
_		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to LPG (Boiler effic)	1,320,000
	Cost per kWh	0.08920
	Space heating cost (€)	117,740
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to LPG (Boiler effic)	1,440,000
	Cost per kWh	0.08920
	Hot Water heating cost (€)	128,443
Cooking		
	Have a service a service	5.000
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	3
	Annual Heating requirement (kWh)	40,000
	Energy to LPG (Cooker effic 80%)	47,059
	Cost per kWh	0.08920
	Cooking cost (€)	4,197
Supply Cha	rge	
	Annual Standing Charge	500.00
	Supply charge (€)	500
	Annual Capital and O&M Cost (€)	1,233
Total Annua	Il Cost exclud. Annual Capital + O&M Cost (€)>	250,880
	Il Cost includ. Annual Capital + O&M Cost (€)>	252,114



Annual Oil/Ker	osene Cost for Space Heating, Hot Water & Cooking	g
		_
Space Heating		
		44.00
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Oil/Kerosene (Boiler effic)	1,320,000
	Cost per kWh	0.06101
	Space heating cost (F)	00 E24
	Space heating cost (€)	80,531
Hot Water		
iot water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,353.42
	Annual Heating requirement (kWh)	1,224,000
	Energy to Oil/Kerosene (Boiler effic)	1,440,000
	Cost per kWh	0.0610
	oost per kvvii	0.0010
	Hot Water heating cost (€)	87,851
	(-)	,
Cooking	(Use Electric)	
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Electricity (100% effic)	40,000
	Cost per kWh (€)	0.1361
	Cooking cost (€)	5,442
C C1		
Supply Charge		
	Assurat Otera disas Observa	
	Annual Standing Charge	-
	Cumply shares (6)	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	1,850
	ramaa ouphar and out took to	1,030
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	173,82



Annual Natural (Gas Cost for Space Heating, Hot Water & Cooking	
	Total Gas Consumption (kWh)	2,807,059
Space Heating		
	A t- h htd (2)	44.000
	Area to be heated (m2)	11,220 100
	Heating per m2 (kWh/annum) Annual Heating requirement (kWh)	1,122,000
	Energy to Natural Gas (Boiler effic)	1,320,000
		0.03897
	Cost per kWh	0.0369
	Space heating cost (€)	51,445
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,35
	Annual Heating requirement (kWh)	1,224,000
		1,440,000
	Energy to Natural Gas (Boiler effic) Cost per kWh	0.03897
	Hot Water heating cost (€)	56,122
	, ,	•
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.00
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.03897
	Cooking cost (€)	1,834
Supply Charge		
	Annual Standing Charge	10,202
	Supply charge (€)	10,202.19
	Annual Capital and O&M Cost (€)	1,850
	et evelud. Appual Carital + COM Cart (5)	119,603
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	113,00



Annual CHP Cost for Spa	ce Heating, Hot Water & Cooking	
	J.	
Total Gas Quantity (kWh)		4,312,513
Total Gas Cost (€)		168,074
Electricity Saving (€)	(Estimated €10,000 load-matching cost)	105,09
Space Heating		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to CHP	2,040,000
	Cost per kWh	0.03897
	out por KVIII	0.00001
	Space heating cost (€)	79,506
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (lts) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to CHP	2,225,455
	Cost per kWh	0.03897
	Cost per KWII	0.03037
	Hot Water heating cost (€)	86,734
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.03897
	Cooking cost (€)	1,834
Supply Charge		
	Annual Standing Charge	10,202
	Supply charge (€)	10,202
	Annual Capital and O&M Cost (€)	35,650
Total Annual Cost exclud.	Annual Capital + O&M Cost (€)>	73,182
	Annual Capital + O&M Cost (€)>	108,832



Table 8.2 (S	2): LPG (Medium Commercial/Service Enterprise)	
Annual I DG	Cost for Space Heating, Hot Water & Cooking	
Allilual LFG	cost for Space fleating, flot water & Cooking	
C II4		
Space Heat	ing	
	Area to be heated (m2)	69
	Heating per m2 (kWh/annum)	10
	Annual Heating requirement (kWh)	69,35
	Energy to LPG (Boiler effic)	81,59
	Cost per kWh	0.0892
	Space heating cost (f)	7 27
	Space heating cost (€)	7,27
Hot Water		
Trutoi		
	Quantity to be heated/day (litres)	57
	Water (Its) raised through 60 C by 1 kWh	1
	Heating per day (kWh)	40.7
	Annual Heating requirement (kWh)	14,86
	Energy to LPG (Boiler effic)	17,48
	Cost per kWh	0.0892
	Hot Water heating cost (€)	1,56
Cooking		
	Hours per year cooking	97
	Cooking requirement (kWh per hour)	3.0
	Annual Heating requirement (kWh)	2,91
	Energy to LPG (Cooker effic 80%)	3,42
	Cost per kWh	0.0892
	Cooking cost (€)	30
	• • • • • • • • • • • • • • • • • • • •	
Supply Cha	rge	
	Annual Standing Charge	200.0
	Supply charge (€)	200.0
	Annual Capital and O&M Cost (€)	28
Total Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	9,34



Annual Oil/Kero	sene Cost for Space Heating, Hot Water & Cooking	1
Cassa Usatian		
Space Heating		
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,35
	Energy to Oil/Kerosene (Boiler effic)	81,592
	Cost per kWh	0.0610
	OUSE PER KVVII	0.0010
	Space heating cost (€)	4,978
	opus noung soci (c)	1,01
Hot Water		
	Oversity to be been didney (literal)	
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	40.7
	Heating per day (kWh)	
	Annual Heating requirement (kWh)	14,86
	Energy to Oil/Kerosene (Boiler effic)	17,48 0.0610
	Cost per kWh	0.0610
	Hot Water heating cost (€)	1,06
	not water neuting cost (c)	1,00
CL'	(Han Florida)	
Cooking	(Use Electric)	
	Hours per year cooking	97
	Cooking requirement (kWh per hour)	3.0
	Annual Heating requirement (kWh)	2,91
	Energy to Electricity (100% effic)	2,91
	Cost per kWh (€)	0.175
	Cooking cost (€)	513
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	<u> </u>
	Annual Capital and OSM Cast (6)	42
	Annual Cabilal and Cami Cost (#1	
	Annual Capital and O&M Cost (€)	
Total Annual Co	est exclud. Annual Capital + O&M Cost (€)>	6,55



Annual Natural	Annual Natural Gas Cost for Space Heating, Hot Water & Cooking		
	Total Gas Consumption (kWh)	102,504	
Space Heating			
	Area to be heated (m2)	694	
	Area to be heated (m2) Heating per m2 (kWh/annum)	10	
	Annual Heating requirement (kWh)	69,35	
	Energy to Natural Gas (Boiler effic)	81,592	
	Cost per kWh	0.0523	
	Cost per KVVII	0.0323	
	Space heating cost (€)	4,26	
Hot Water			
	Quantity to be heated/day (litres)	57	
	Water (Its) raised through 60 C by 1 kWh	14	
	Heating per day (kWh)	40.7	
	Annual Heating requirement (kWh)	14,86	
	Energy to Natural Gas (Boiler effic)	17,48	
	Cost per kWh	0.0523	
	Hot Water heating cost (€)	914	
Cooking			
	Hours per year cooking	97	
	Cooking requirement (kWh per hour)	3.0	
	Annual Heating requirement (kWh)	2,91	
	Energy to Natural Gas (Cooker effic)	3,42	
	Cost per kWh	0.0523	
	Cooking cost (€)	17	
Supply Charge			
	Annual Standing Charge	167.2	
	Supply charge (€)	167.2	
	Annual Capital and O&M Cost (€)	53	
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	5,52	



Annual LPG Space Heati	Cost for Space Heating, Hot Water & Cooking	
Space Heati	ng	
	Area to be heated (m2)	27
	Heating per m2 (kWh/annum)	11
	Annual Heating requirement (kWh)	30,38
	Energy to LPG (Boiler effic)	35,75
	Cost per kWh	0.092
	Space heating cost (€)	3,30
1-4 W-4		
Hot Water		
	Quantity to be heated/day (litres)	72
	Water (Its) raised through 60 C by 1 kWh	1
	Heating per day (kWh)	52.0
	Annual Heating requirement (kWh)	18,99
	Energy to LPG (Boiler effic)	22,34
	Cost per kWh	0.092
	Hot Water heating cost (€)	2,06
Cooking		
	Hours per year cooking	68
	Hours per year cooking Cooking requirement (kWh per hour)	00
	Annual Heating requirement (kWh)	1,78
	Energy to LPG (Cooker effic 80%)	2,10
	Cost per kWh	0.092
	Cost per KWII	0.032
	Cooking cost (€)	194
Supply Char	ge	
	Annual Standing Charge	140.0
	Supply charge (€)	140.0
	Annual Capital and O&M Cost (€)	23
Total Annua	I Cost exclud. Annual Capital + O&M Cost (€)>	5,70
Total Arress	I Cost includ. Annual Capital + O&M Cost (€)>	5,93



Annual Oil/Koro	sene Cost for Space Heating, Hot Water & Cooking	
Allitual Oli/Kero	selle Cost for Space Heating, not water & Cooking	
Space Heating		
	Area to be heated (m2)	270
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to Oil/Kerosene (Boiler effic)	35,75
	Cost per kWh	0.0634
	Space heating cost (€)	2,26
Hot Water		
TOT WATER		
	Quantity to be heated/day (litres)	72
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	18,99
	Energy to Oil/Kerosene (Boiler effic)	22,34
	Cost per kWh	0.0634
	Hot Water heating cost (€)	1,418
Cooking	(Use Electric)	
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	2.60
	Annual Heating requirement (kWh)	1,78
	Energy to Electricity (100% effic)	1,78
	Cost per kWh (€)	0.1823
	Cooking cost (€)	32
Supply Charge		
	Annual Standing Charge	
	, amoun oranger	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	35
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	4,01



Annual Natural (Gas Cost for Space Heating, Hot Water & Cooking	g
	Total Gas Consumption (kWh)	60,199
	Total Gas Consumption (KVVII)	00,133
Space Heating		
	A to be bested (m2)	07/
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum) Annual Heating requirement (kWh)	30,389
	Energy to Natural Gas (Boiler effic)	35,751
	Cost per kWh	0.05707
	Cost per KVVII	0.05707
	Space heating cost (€)	2,040
Hot Water		
	Overtity to be heated/day/(litros)	700
	Quantity to be heated/day (litres)	728
	Water (Its) raised through 60 C by 1 kWh Heating per day (kWh)	52.04 52.04
	Annual Heating requirement (kWh)	18,993
	Energy to Natural Gas (Boiler effic)	22,345
	Cost per kWh	0.05707
	Hot Water heating cost (€)	1,275
Cooking		
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	2.60
	Annual Heating requirement (kWh)	1,788
	Energy to Natural Gas (Cooker effic)	2,103
	Cost per kWh	0.05707
	Cooking cost (€)	120
Supply Charge		
	Annual Standing Charge	167.26
	Supply charge (€)	167.26
	Annual Capital and O&M Cost (€)	358
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	3,603
Total Annual Ca	st includ. Annual Capital + O&M Cost (€)>	3,96
i otal Alliluai CO	st includ. Allitual Capital + Ootivi Cost (c)>	3,30

Table 10.2 (S2): LPG (Domestic Household) Annual LPG Cost for Space Heating, Hot Water & Cooking Space Heating 80 Area to be heated (m2) Heating per m2 (kWh/annum) 125 Annual Heating requirement (kWh) 9,986 Energy to LPG (Boiler effic) 11,748 Cost per kWh 0.0924 Space heating cost (€) 1,085 Hot Water Quantity to be heated/day (litres) 142 Water (Its) raised through 60 C by 1 kWh 14 Heating per day (kWh) 10.13 Annual Heating requirement (kWh) 3.698 Energy to LPG (Boiler effic) 4,351 Cost per kWh 0.0924 Hot Water heating cost (€) 402 Cooking Hours per year cooking 389 Cooking requirement (kWh per hour) 1.90 Annual Heating requirement (kWh) 740 Energy to LPG (Cooker effic 80%) 870 Cost per kWh 0.0924 Cooking cost (€) 80 Supply Charge Annual Standing Charge 100.00 Supply charge (€) 100.00 Annual Capital and O&M Cost (€) 123 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 1,668 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 1,791



Annual Oil/Kero	sene Cost for Space Heating, Hot Water & Cooking	
	3,	
Cnass Heating		
Space Heating		
	Area to be heated (m2)	8(
	Heating per m2 (kWh/annum)	125
	Annual Heating requirement (kWh)	9,986
	Energy to Oil/Kerosene (Boiler effic)	11,748
	Cost per kWh	0.0634
	out por norm	0.000
	Space heating cost (€)	745
Hot Water		
TOT TOUCH		
	Quantity to be heated/day (litres)	142
	Water (Its) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.13
	Annual Heating requirement (kWh)	3,698
	Energy to Oil/Kerosene (Boiler effic)	4,35
	Cost per kWh	0.0634
	Hot Water heating cost (€)	270
Cooking	(Use Electric)	
Cooking	(Ose Liectric)	
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Electricity (100% effic)	740
	Cost per kWh (€)	0.1507
	Cooking cost (€)	111
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	<u> </u>
	Annual Capital and O&M Cost (€)	185
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	1,133
		•
i otal Annual Co	st includ. Annual Capital + O&M Cost (€)>	1,31

Table 10.4 (S2): Natural Gas (Domestic Household) Annual Natural Gas Cost for Space Heating, Hot Water & Cooking Total Gas Consumption (kWh) 16.969 Space Heating Area to be heated (m2) 80 Heating per m2 (kWh/annum) 125 Annual Heating requirement (kWh) 9,986 Energy to Natural Gas (Boiler effic) 11,748 Cost per kWh 0.04145 Space heating cost (€) 487 Hot Water Quantity to be heated/day (litres) 142 Water (Its) raised through 60 C by 1 kWh 14 Heating per day (kWh) 10.13 Annual Heating requirement (kWh) 3.698 Energy to Natural Gas (Boiler effic) 4,351 Cost per kWh 0.04145 Hot Water heating cost (€) 180 Cooking 389 Hours per year cooking Cooking requirement (kWh per hour) 1.90 Annual Heating requirement (kWh) 740 Energy to Natural Gas (Cooker effic) 870 0.04145 Cost per kWh Cooking cost (€) Supply Charge Annual Standing Charge 312.66 Supply charge (€) 312.66 Annual Capital and O&M Cost (€) 140 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 1,016 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 1,156



APPENDIX IV (Sensitivity 3 Tables)



Table 7.2 (S	3): LPG (Factory/Production Facility)	
Annual LPG	Cost for Space Heating, Hot Water & Cooking	
Space Heat	ing	
	A to be bested (2)	44.000
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to LPG (Boiler effic)	1,320,000
	Cost per kWh	0.06593
	Space heating cost (€)	87,025
Hot Water		
	Quantity to be heated/day (litres)	33,534
	Water (Its) raised through 90 C by 1 kWh	10
	Heating per day (kWh)	3,353
	Annual Heating requirement (kWh)	1,224,000
	Energy to LPG (Boiler effic)	1,440,000
	Cost per kWh	0.06593
	Hot Water heating cost (€)	94,936
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8
	Annual Heating requirement (kWh)	40,000
	Energy to LPG (Cooker effic 80%)	47,059
	Cost per kWh	0.06593
	Cooking cost (€)	3,102
Supply Cha	rge	
	Annual Standing Charge	500.00
	Supply charge (€)	500
	Annual Capital and O&M Cost (€)	1,233
Total Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	185,564
Total Annua	al Cost includ. Annual Capital + O&M Cost (€)>	186,797

Table 7.3 (S3): Oil (Factory/Production Facility) Annual Oil/Kerosene Cost for Space Heating, Hot Water & Cooking Space Heating Area to be heated (m2) 11,220 Heating per m2 (kWh/annum) 100 Annual Heating requirement (kWh) 1,122,000 Energy to Oil/Kerosene (Boiler effic) 1,320,000 Cost per kWh 0.04509 Space heating cost (€) 59,523 Hot Water Quantity to be heated/day (litres) 33,534 Water (Its) raised through 90 C by 1 kWh 10 Heating per day (kWh) 3.353.42 Annual Heating requirement (kWh) 1,224,000 1,440,000 Energy to Oil/Kerosene (Boiler effic) 0.04509 Cost per kWh Hot Water heating cost (€) 64.934 Cooking (Use Electric) 5,000 Hours per year cooking Cooking requirement (kWh per hour) 8.00 Annual Heating requirement (kWh) 40,000 Energy to Electricity (100% effic) 40,000 Cost per kWh (€) 0.1231 Cooking cost (€) 4,924 Supply Charge Annual Standing Charge Supply charge (€) Annual Capital and O&M Cost (€) 1,850 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 129,380 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 131,230



rubio 114 (boji 1	latural Gas (Factory/Production Facility)	
Annual Natural (Gas Cost for Space Heating, Hot Water & Cooking	
		0.007.05
	Total Gas Consumption (kWh)	2,807,059
Space Heating		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to Natural Gas (Boiler effic)	1,320,000
	Cost per kWh	0.0288
	Space heating cost (€)	38,02
Hot Water		
	Quantity to be heated/day/(litros)	22.52
	Quantity to be heated/day (litres)	33,53
	Water (Its) raised through 90 C by 1 kWh	2.25
	Heating per day (kWh)	3,35
	Annual Heating requirement (kWh)	1,224,00
	Energy to Natural Gas (Boiler effic) Cost per kWh	1,440,00 0.0288
	Hot Water heating cost (€)	41,48
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	8.0
	Annual Heating requirement (kWh)	40,00
	Energy to Natural Gas (Cooker effic)	47,059
	Cost per kWh	0.0288
	Cooking cost (€)	1,35
Supply Charge		
	Annual Standing Charge	7,54
	Supply charge (€)	7,540.7
	Annual Capital and O&M Cost (€)	1,850
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	88,402
Total Annual Co	st includ. Annual Capital + O&M Cost (€)>	90,25

Annual CHP Cost for Spa	nce Heating, Hot Water & Cooking	
Total Gas Quantity (kWh)		4,312,513
Total Gas Cost (€)		124,228
Electricity Saving (€)	(Estimated €10,000 load-matching cost)	105,09
Space Heating		
, ,		
	Area to be heated (m2)	11,220
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	1,122,000
	Energy to CHP	2,040,000
	Cost per kWh	0.0288
	Space heating cost (€)	58,765
Hot Water		
	Quantity to be heated/day (litres)	33,53
	Water (Its) raised through 90 C by 1 kWh	1
	Heating per day (kWh)	3,35
	Annual Heating requirement (kWh)	1,224,00
	Energy to CHP Cost per kWh	2,225,45 0.0288
	Hot Water heating cost (€)	64,10
Cooking		
	Hours per year cooking	5,000
	Cooking requirement (kWh per hour)	
	Annual Heating requirement (kWh)	40,000
	Energy to Natural Gas (Cooker effic)	47,05
	Cost per kWh	0.0288
	Cooking cost (€)	1,35
Supply Charge		
Supply Charge	Annual Standing Charge	7,54
Supply Charge	Annual Standing Charge Supply charge (€)	
Supply Charge		7,54 7,54 35,65
	Supply charge (€)	7,54



Table 8.2 (S3): LPG (Medium Commercial/Service Enterprise) Annual LPG Cost for Space Heating, Hot Water & Cooking Space Heating 694 Area to be heated (m2) Heating per m2 (kWh/annum) 100 Annual Heating requirement (kWh) 69,353 Energy to LPG (Boiler effic) 81.592 Cost per kWh 0.06593 Space heating cost (€) 5,379 Hot Water Quantity to be heated/day (litres) 570 Water (Its) raised through 60 C by 1 kWh 14 Heating per day (kWh) 40.72 Annual Heating requirement (kWh) 14.861 Energy to LPG (Boiler effic) 17,484 Cost per kWh 0.06593 Hot Water heating cost (€) 1,153 Cooking Hours per year cooking 971 Cooking requirement (kWh per hour) 3.00 Annual Heating requirement (kWh) 2,914 Energy to LPG (Cooker effic 80%) 3,428 Cost per kWh 0.06593 Cooking cost (€) 226 Supply Charge Annual Standing Charge 200.00 200.00 Supply charge (€) Annual Capital and O&M Cost (€) 284 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 6,958 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 7,242



riiiiidai Oliiitore	sene Cost for Space Heating, Hot Water & Cooking	
Space Heating		
	Area to be heated (m2)	694
	Heating per m2 (kWh/annum)	100
	Annual Heating requirement (kWh)	69,353
	Energy to Oil/Kerosene (Boiler effic)	81,592
	Cost per kWh	0.04509
	Space heating cost (€)	3,679
	, ,,	
Hot Water		
	Quantity to be heated/day (litros)	E7(
	Quantity to be heated/day (litres)	570
	Water (Its) raised through 60 C by 1 kWh	40.72
	Heating per day (kWh) Annual Heating requirement (kWh)	14,86
	Energy to Oil/Kerosene (Boiler effic)	17,484
	Cost per kWh	0.04509
	OOST PET NAVIII	0.04300
	Hot Water heating cost (€)	788
C1:	(III Election)	
Cooking	(Use Electric)	
	Hours per year cooking	97
	Cooking requirement (kWh per hour)	3.00
	Annual Heating requirement (kWh)	2,914
	Energy to Electricity (100% effic)	2,914
	Cost per kWh (€)	0.1113
	Cooking cost (€)	324
C CI		
Supply Charge		
	Annual Standing Charge	-
	Supply charge (€)	-
	Annual Capital and O&M Cost (€)	420

Table 8.4 (S3): Natural Gas (Medium Commercial/Service Enterprise) Annual Natural Gas Cost for Space Heating, Hot Water & Cooking Total Gas Consumption (kWh) 102.504 Space Heating Area to be heated (m2) 694 Heating per m2 (kWh/annum) 100 Annual Heating requirement (kWh) 69,353 Energy to Natural Gas (Boiler effic) 81,592 Cost per kWh 0.03866 Space heating cost (€) 3,154 Hot Water Quantity to be heated/day (litres) 570 Water (Its) raised through 60 C by 1 kWh 14 Heating per day (kWh) 40.72 Annual Heating requirement (kWh) 14,861 Energy to Natural Gas (Boiler effic) 17,484 Cost per kWh 0.03866 Hot Water heating cost (€) 676 Cooking 971 Hours per year cooking Cooking requirement (kWh per hour) 3.00 Annual Heating requirement (kWh) 2,914 Energy to Natural Gas (Cooker effic) 3,428 Cost per kWh 0.03866 Cooking cost (€) 133 Supply Charge Annual Standing Charge 123.62 Supply charge (€) 123.62 Annual Capital and O&M Cost (€) 530 Total Annual Cost exclud. Annual Capital + O&M Cost (€) ---> 4,086 Total Annual Cost includ. Annual Capital + O&M Cost (€) ---> 4,617



Annual I DO	Cost for Space Heating, Hot Water & Cooking	
Allilual LFC	cost for space fleating, flot water & cooking	
Space Heat	ing	
	4	07/
	Area to be heated (m2)	276
	Heating per m2 (kWh/annum)	110
	Annual Heating requirement (kWh)	30,389
	Energy to LPG (Boiler effic)	35,751
	Cost per kWh	0.0683
	0 1 1 10	2.44
	Space heating cost (€)	2,441
Hot Water		
iot water		
	Quantity to be heated/day (litres)	728
	Water (lts) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	52.04
	Annual Heating requirement (kWh)	
	Energy to LPG (Boiler effic)	18,993 22,345
	Cost per kWh	0.0683
	Cost per kvvn	0.000
	Hot Water heating cost (€)	1,526
	not water neating cost (c)	1,320
Cooking		
cooking		
	Hours per year cooking	688
	Cooking requirement (kWh per hour)	3
	Annual Heating requirement (kWh)	1,788
	Energy to LPG (Cooker effic 80%)	2,103
	Cost per kWh	0.0683
	3301 pg. 111111	0.000
	Cooking cost (€)	144
	5 , <i>r</i>	
C		
Supply Cha	rge	
	Annual Standing Charge	140.00
	Supply charge (€)	140.00
	Annual Capital and O&M Cost (€)	234
Total Annua	al Cost exclud. Annual Capital + O&M Cost (€)>	4,25
rotal Allia	, , ,	



Hot Water GOV HARA E C H H H H H H H H H H H H	rea to be heated (m2) eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic)	276 110 30,389 35,751 0.0469 1,677 728 14 52.04 18,993 22,348
A H A E C C H	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04
A H A E C C H	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04
A H A E C C H	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04
A H A E C C H	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04 18,993
A H A E C C H	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04 18,993
Hot Water Q V H A E C T T A T A T C T T A T A T A T A T A T	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04
Hot Water Q V H A E C T T A T A T C T T A T A T A T A T A T	eating per m2 (kWh/annum) nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04
Hot Water Q V H A E	nnual Heating requirement (kWh) nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	30,389 35,75 0.0469 1,67 7 728 14 52.04 18,993
Hot Water Q W H A E	nergy to Oil/Kerosene (Boiler effic) ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 1,677 728 14 52.04
Hot Water Q W H A E	ost per kWh pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04
Hot Water Q W H A E	pace heating cost (€) uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04 18,993
Hot Water Q W H A E	uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04 18,993
Hot Water Q V H A E	uantity to be heated/day (litres) /ater (lts) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	728 14 52.04 18,993
Q W H A E C	/ater (Its) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	14 52.04 18,993
Q W H A E C	/ater (Its) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	14 52.04 18,993
W H A E C	/ater (Its) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	14 52.04 18,993
W H A E C	/ater (Its) raised through 60 C by 1 kWh eating per day (kWh) nnual Heating requirement (kWh)	14 52.04 18,993
H A E C	eating per day (kWh) nnual Heating requirement (kWh)	52.04 18,993
A E C	nnual Heating requirement (kWh)	18,993
E C		
Н	nergy to Oil/Kerosene (Boiler effic)	22 246
Н		
	ost per kWh	0.0469
Cooking (L	ot Water heating cost (€)	1,048
Cooking (L		
cooking	Jse Electric)	
	ose Electric)	
Н	ours per year cooking	688
	ooking requirement (kWh per hour)	2.60
	nnual Heating requirement (kWh)	1.788
	nergy to Electricity (100% effic)	1,788
	ost per kWh (€)	0.1649
	(-)	
С	ooking cost (€)	295
Supply Charge		
Α	nnual Standing Charge	-
S	upply charge (€)	
Α	nnual Capital and O&M Cost (€)	357
Total Annual Cost	exclud. Annual Capital + O&M Cost (€)>	3,019



Table 9.4 (S3): Natural Gas (Small Commercial/Service Enterprise)

Δnnual Natural (Gas Cost for Space Heating, Hot Water & Cooking	
Aimaar Natarar V	sus cost for space fielding, flot water a cooking	
	Total Gas Consumption (kWh)	60,19
Space Heating		
	Area to be heated (m2)	27
	Area to be heated (m2) Heating per m2 (kWh/annum)	11
	Annual Heating requirement (kWh)	30,38
	Energy to Natural Gas (Boiler effic)	35,75
	Cost per kWh	0.0421
	Space heating cost (€)	1,50
lot Water		
	Quantity to be heated/day (litres)	72
	Water (Its) raised through 60 C by 1 kWh	1
	Heating per day (kWh)	52.0
	Annual Heating requirement (kWh)	18,99
	Energy to Natural Gas (Boiler effic)	22,34
	Cost per kWh	0.0421
	Hot Water heating cost (€)	94
Cooking		
	Hours per year cooking	68
	Cooking requirement (kWh per hour)	2.6
	Annual Heating requirement (kWh)	1.78
	Energy to Natural Gas (Cooker effic)	2,10
	Cost per kWh	0.0421
	Cooking cost (€)	8
Supply Charge		
	Annual Standing Charge	123.6
	Supply charge (€)	123.6
	Annual Capital and O&M Cost (€)	35
Fotal Annual Co	st exclud. Annual Capital + O&M Cost (€)>	2,66
Total Annual Co	st includ. Annual Capital + O&M Cost (€)>	3,02



Annual LPG Cost for Space Heating, Hot Water & Cooking Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge Annual Standing Charge	
Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
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Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
Area to be heated (m2) Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
Heating per m2 (kWh/annum) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	8
Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	12
Energy to LPG (Boiler effic) Cost per kWh Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	9,98
Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	11,74
Space heating cost (€) Hot Water Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh) per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	0.068
Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
Quantity to be heated/day (litres) Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	80
Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	
Quantity to be heated/day (litres) Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
Water (Its) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	
Water (lts) raised through 60 C by 1 kWh Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	14
Heating per day (kWh) Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	1
Annual Heating requirement (kWh) Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	10.1
Energy to LPG (Boiler effic) Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	3,69
Cost per kWh Hot Water heating cost (€) Cooking Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	4,35
Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	0.068
Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	29
Hours per year cooking Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€)	
Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	
Cooking requirement (kWh per hour) Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	38
Annual Heating requirement (kWh) Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	1.9
Energy to LPG (Cooker effic 80%) Cost per kWh Cooking cost (€) Supply Charge	74
Cost per kWh Cooking cost (€) Supply Charge	87
Cooking cost (€) Supply Charge	0.068
Supply Charge	
	5
Appual Standing Charge	
Annual Standing Charge	100.0
Supply charge (€)	100.0
Annual Capital and O&M Cost (€)	12
Total Annual Cost exclud. Annual Capital + O&M Cost (€)	> 1,25
Total Annual Cost includ. Annual Capital + O&M Cost (€) -	-> 1,38



Table 10 3 (\$3)	Oil (Domestic Household)	
Table 10.5 (55).	On (Bonnestic Household)	
Annual Oil/Kero	sene Cost for Space Heating, Hot Water & Cooking	
illiaar oliirtoro	one course space reading, not train a coming	
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	125
	Annual Heating requirement (kWh)	9,986
	Energy to Oil/Kerosene (Boiler effic)	11,748
	Cost per kWh	0.0469
	Space heating cost (€)	551
	-pass manning sacretary	
Hot Water		
	Quantity to be heated/day (litres)	142
	Water (lts) raised through 60 C by 1 kWh	14
	Heating per day (kWh)	10.13
	Annual Heating requirement (kWh)	3,698
	Energy to Oil/Kerosene (Boiler effic)	4,351
	Cost per kWh	0.0469
	Hot Water heating cost (€)	204
	<u> </u>	
Cooking	(Use Electric)	
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.90
	Annual Heating requirement (kWh)	740
	Energy to Electricity (100% effic)	740
	Cost per kWh (€)	0.1363
	Cooking cost (€)	101
Supply Charge		
	4 10 5 0	
	Annual Standing Charge	-
	2 1 1 12	-
	Supply charge (€)	-
	Annual Capital and OSM Capt (6)	401
	Annual Capital and O&M Cost (€)	185
Total Annual Ca	est evalued Appual Capital + OSM Capt (6)	05/
Total Annual Co	ost exclud. Annual Capital + O&M Cost (€)>	856
T-4-1 A 1 C	and instead Assessed Control of C	4.044
rotal Annual Co	ost includ. Annual Capital + O&M Cost (€)>	1,041



Table 10.4 (S3): I	Natural Gas (Domestic Household)	
Annual Natural Gas Cost for Space Heating, Hot Water & Cooking		
	Total Can Consumption (IdWh)	16,969
	Total Gas Consumption (kWh)	10,303
Space Heating		
	Area to be heated (m2)	80
	Heating per m2 (kWh/annum)	12:
	Annual Heating requirement (kWh)	9,986
	Energy to Natural Gas (Boiler effic)	11,748
	Cost per kWh	0.03064
	Space heating cost (€)	360
Hot Water		
	Quantity to be heated/day (litres)	142
	Water (Its) raised through 60 C by 1 kWh	14.
	Heating per day (kWh)	10.1
	• • • • • • • • • • • • • • • • • • • •	
	Annual Heating requirement (kWh)	3,69
	Energy to Natural Gas (Boiler effic) Cost per kWh	4,35 0.0306
	Hot Water heating cost (€)	133
Cooking		
	Hours per year cooking	389
	Cooking requirement (kWh per hour)	1.9
	Annual Heating requirement (kWh)	74
	Energy to Natural Gas (Cooker effic)	87
	Cost per kWh	0.0306
	Cooking cost (€)	2
Supply Charge		
	Annual Standing Charge	231.1
	Supply charge (€)	231.10
	Annual Capital and O&M Cost (€)	14
Total Annual Co	st exclud. Annual Capital + O&M Cost (€)>	75
Total Annual Co	st includ. Annual Capital + O&M Cost (€)>	89