A BRIEF SUMMARY OF ENERGY USAGE AT THE CENTRE FOR ALTERNATIVE TECHNOLOGY

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Introduction

This report summarises the results of an energy audit carried out at the Centre for Alternative Technology over the period Nov 1979 - Oct 1980 (1).

It is hoped that by outlining the present situation, highlighting areas of wastage and illustrating ways in which the contribution of renewable energy sources can be increased, steps can be taken to improve the energy supply and usage patterns at the Centre.

The Results

Figure 1 shows the breakdown of Useful Energy by source. It can be seen from this that just over 14% (16588kWh) of the Useful Energy was supplied by ambient sources, 23% (27251kWh) from wood and the rest (63% - 74645kWh) was supplied mainly by coal and LPG (bottled gas). The contribution from ambient sources is greater in the non-domestic sector although renewable sources (ambient and wood) provide over 43% of the domestic sector requirement.

Figure 2 illustrates the analysis by sector. It can be seen that the largest use is for heating and hot water (78% - 92418kWh).

Cooking is the second largest use (14% - 16588kWh) followed by lighting and power (7% - 8294kWh).

It is difficult to make a direct comparison between energy usage at the Centre and the national average. Assuming an average of 24 people resident at the Centre the domestic usage is about 2737kWh/head which is between 1/2 and 2/3 of what might be expected. (National average = 4909kWh per person) (2)(3).

However the population density at the Quarry is high, resulting in a figure of 164 kWh/m^2 of domestic accomodation which is about equal to the national figure.

Figure 3 shows the expenditure on energy bought into the Centre. LPG costs the Centre more than all the other fuels put together. The cost of the 6 tonnes of stovesse (used only domestically in cottage 3 and caravan 1) is more than three times the expenditure one would have expected.

Conclusions

1. The results reveal that the domestic energy usage is not as conservative as it might be.
2. For various reasons the full potential of the ambient sources is not being exploited.
3. The anthracite being used for domestic heating is being burnt inefficiently in an oversized appliance.
4. The cost of using LPG suggests a future strategy should concentrate on reducing the reliance on this fuel.

Strategy for the Future

The tables A-C suggest 13 projects that if undertaken should result in the energy supply situation shown in Figure 4. This shows ambient sources supplying 61% of an increased load of 141112kWh. All the projects are technically feasible, many are continuations of existing projects. If desired it would not be impossible to complete the significant parts of the programme within 2 or 3 years. The priority given to each project is subjective. However it should be pointed out that some (eg 1 and 2) have a pay-back period in the order of months and therefore deserve immediate serious consideration. The costings are crude and can be further investigated as and when the projects are considered in more detail.

References

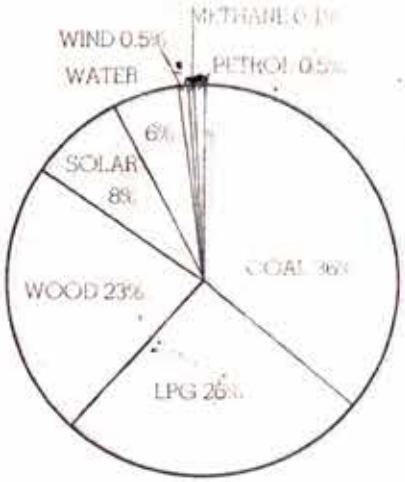
1. J. Willoughby and R.W. Todd — 'Ambient Energy Utilisation at the National Centre for Alternative Technology.' CICC Conference University of Nottingham March 1981.

2. M. Barrett — 'A dynamic Physical Energy Model of the UK' PhD Thesis in preparation.D.U. Energy Research Group.

3. G. Leach et al. — 'A Low Energy Strategy for the UK' IIED 1979.

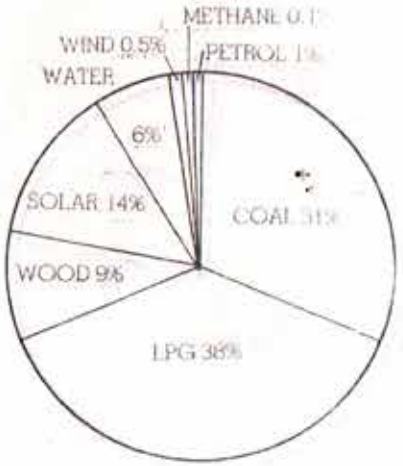
Figure 1 ANALYSIS OF USEFUL ENERGY

By Source



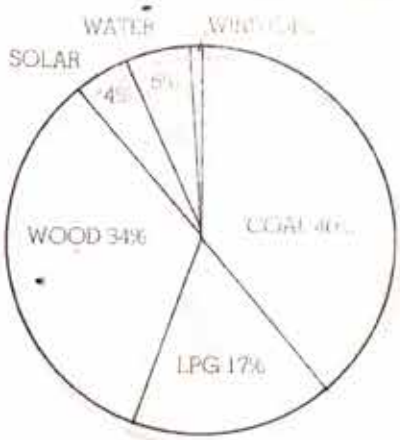
total

118 484



non-domestic

52 792

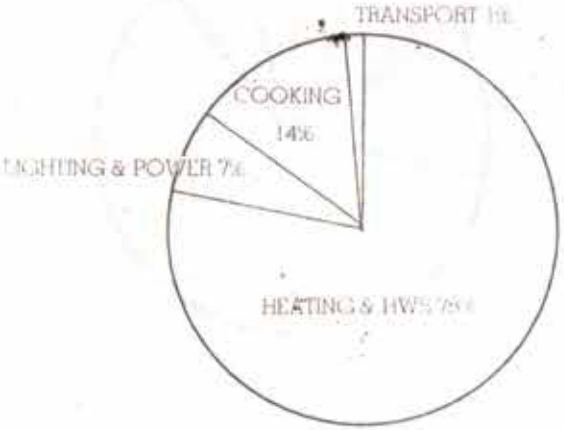


domestic

65 692 kWh

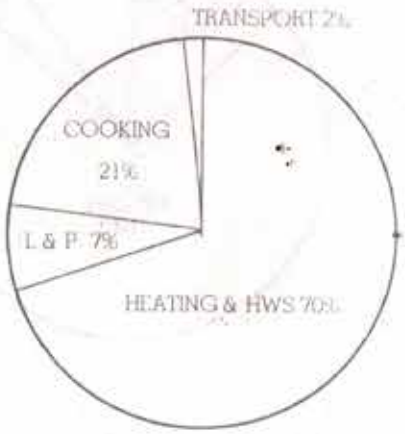
Figure 2 ANALYSIS OF USEFUL ENERGY

By Sector



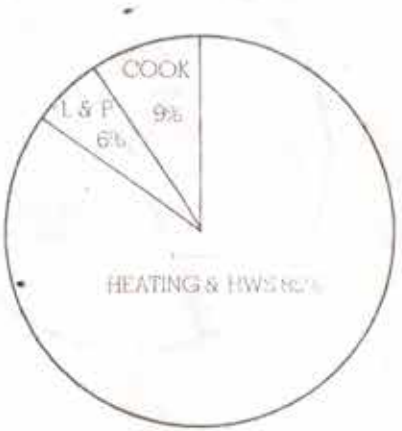
total

118 484



non-domestic

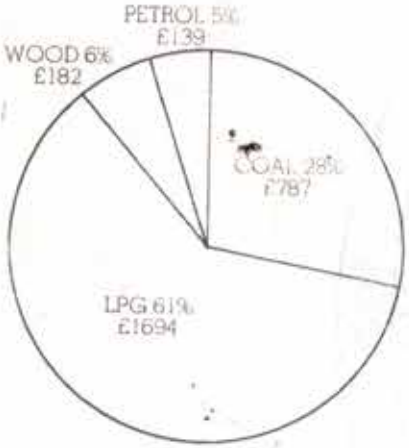
52 792



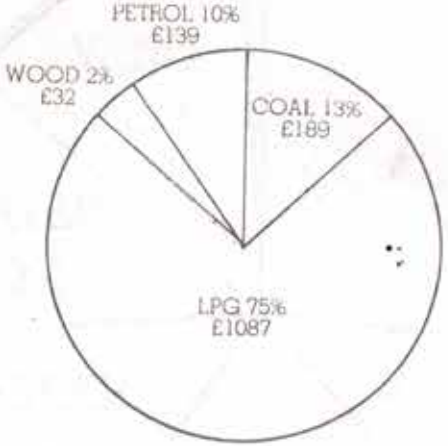
domestic

65 692 kWh

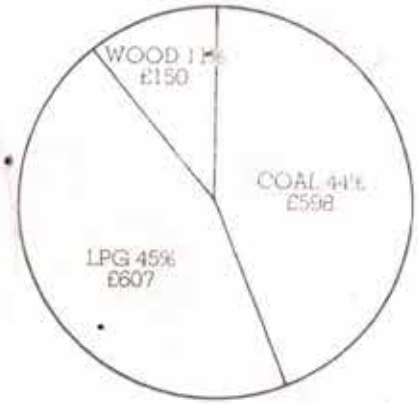
Figure 3 EXPENDITURE ON IMPORTED FUELS



total
£2802

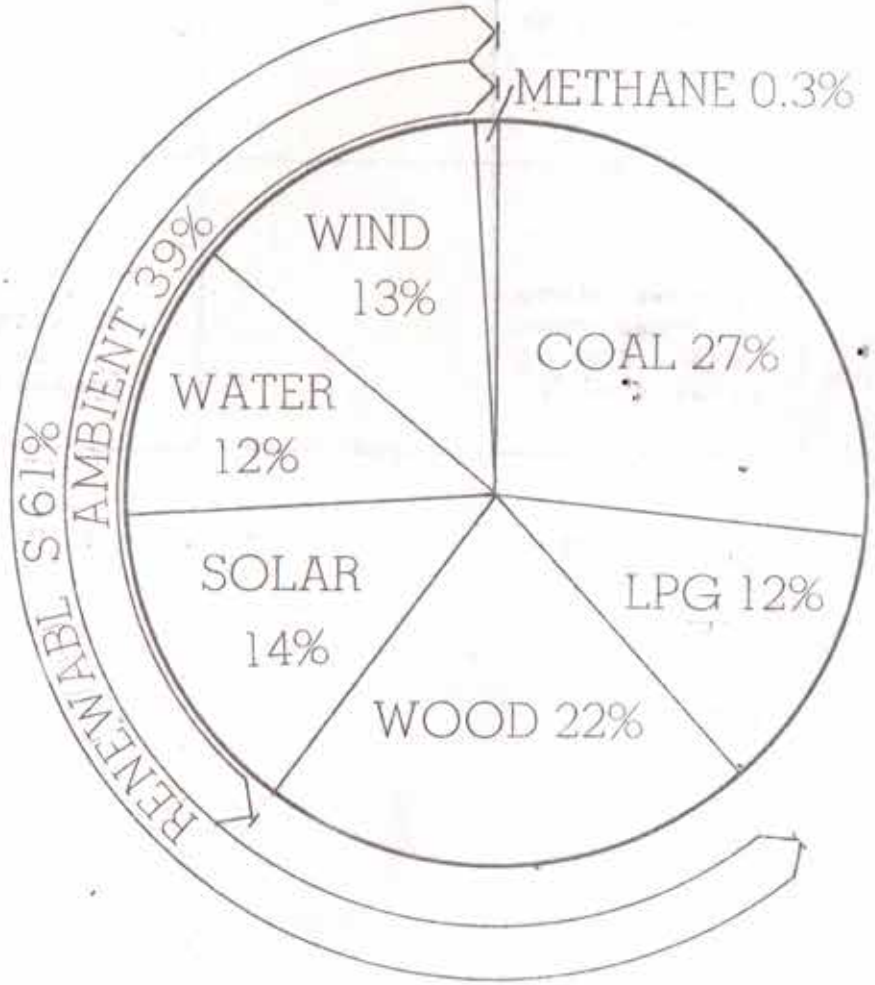


non-domestic
£1447



domestic
£1355

Figure 4 FUTURE STRATEGY (Useful Energy)



total 141 112 kWh

A. AVOID WASTE

ACTION	CONTRIBUTION	SAVING	COST	COMMENTS	PRIORITY
1. COTTAGE 3 Substitute high efficiency wood burning stove for anthracite stove.	17500 kWh/a (delivered)	55421 £482 -17500 £ 75 37921 £407 on anthracite	Medium (£200-£300)	Huge wastage of expensive fuel. Change to wood allows larger storage of anthracite grains for pither stores.	V. High
2. NEW BUILDING Finish draught stripping and weather proofing lecture room, restaurant, bookshop		could be as much as 30,000 kWh/a on anthracite	Low - Medium	This building could prove major drain on energy supply.	V. High

B. IMPROVE PERFORMANCE OF EXISTING AMBIENT SOURCES

ACTION	CONTRIBUTION	SAVING	COST	COMMENTS	PRIORITY
3. UPPER PELTON Install new generator and better load control.	6630 kWh/a (useful)	2751 kWh	Medium	Full potential of water power is not being exploited.	Low - Medium
4. LOWER PELTON Continue to improve performance.	11400 kWh (useful)	approx. 3500 kWh improvement over projected full year output.	Low	Ditto	Medium - High.
5. ELEKTRO Fit new blades. Improve load matching.	1450 kWh (delivered)	1000kWh	Low	Now metered. It would be worth seeing how much can be got out of ELEKTRO.	Medium
6. DUNITE Move to new site	2200 kWh (delivered)	1940 kWh on LPG	High	Depends on strategy for Wates House and development of new wind power site.	Low
7. METHANE Improve performance	370 kWh (useful)	213 kWh on LPG	Low	Useful exhibit. Lot of work needed for small return.	Low

C. DEVELOP NEW AMBIENT SOURCES

ACTION	CONTRIBUTION	SAVING	COST	COMMENTS	PRIORITY
8. NEW 10m WIND MACHINE.	18000 kWh		High	Would go a long way to reducing reliance on LPG driven stand-by generator. An important exhibit.	Depends on funding.
9. SOLAR GREENHOUSES Fit greenhouses to cottage 2&3	3400 kWh	3400kWh on wood	MEDIUM	Important to get some passive solar exhibition in the short term. Gives increased growing/ living space.	High
10. TROMBE WALL Fit trombe wall to cottage 1.	1600 kWh	Small (present energy use small)	MEDIUM - High	Good exhibit	Medium
11. SOLAR ASSIST DHW Continue to install solar water heater -Wates, Tea Chest, cottage 3.	2700kWh	2700 kWh on LPG	MEDIUM - High	Should be an ongoing programme	Medium
12. SOLAR ASSIST NON-DHW. Install solar	1870 kWh	1870 kWh on LPG	MEDIUM - High	Good match between supply and demand in summer.	Medium

C. DEVELOP NEW AMBIENT SOURCES (CONTINUED)

ACTION	CONTRIBUTION	SAVING	COST	COMMENTS	PRIORITY
13. REVAMP WATES HOUSE Electricaire warm air heating from Dunlite. Heat recovery ventilation. Solar assist DHW and heat pump.	4210 kWh	6183 kWh	High	Might be possible to get funding to do the whole job.	Low