



Intermediate Technology Consultants Ltd

Feasibility Report for ENGAGE Project



June 2004

Table of Contents

<i>Acknowledgements</i>	3
<i>Executive summary</i>	4
<i>Introduction</i>	6
<i>Background to project and results of community consultation</i>	7
Questionnaire Results	8
Analysis of Questionnaire	9
Conclusions from Questionnaire	12
Recommendations from Questionnaire	13
<i>Discussion on list of renewable energy projects in Warwick</i>	14
Conclusion	16
<i>Feasibility of selected sites</i>	17
Wind generator at Oakley Woods Crematorium	17
Planning Issues	18
Solar panels at Bath Place Community Venture	20
Planning Issues	23
Solar panels and possibly a ground source heat pump at All Saints Parish church	24
Planning Issues	26
Jephson Gardens hydro turbine	27
Planning Issues	30
<i>Feasibility of a Community Energy Company (CEC)</i>	31
<i>Recommendations and Next Steps</i>	36
<i>Appendix One: Community Questionnaire</i>	38
<i>Appendix Two: Long List of Sites to be ranked by Energy 21</i>	43
<i>Appendix Three: Assumptions for Costs</i>	45
<i>Appendix Four: Layout of Bath Place Community Venture</i>	46
<i>Appendix Five: Poster for Engage Community Energy Scheme</i>	47

Acknowledgements

This report, which is part of the Engage Project, has been possible with funding and support from the Warwick District Action 21 and the Government of the West Midlands.

Thanks must go to the whole Engage team especially Matthew Rhodes (Encraft), Jenny Samson and Bhajan Aulak (Action 21, Warwick District Council) David Julien (Warwickshire Energy Efficiency Advice Centre) Jacky Lawrence (Warwickshire County Council) and all of the Energy 21 Group in Warwick.

The support of the community who filled in the questionnaires and also the people at Bath Place Community Venture, Warwick District Council and All Saints Church is appreciated.

Executive summary

The feasibility study for the Engage project has demonstrated significant community support for a range of energy initiatives. There is potential to deliver approximately 8000 tonnes per year of reductions in CO₂ emissions across the District, through a range of community-led projects. Over 90% of the respondents to a comprehensive public consultation indicated support for such projects.

The total cost of these projects will amount to some £13.6 million over 5-10 years. This can be self-funding, with capital provided through various sources, including manufacturers, central government grant schemes, individual homeowners, and reinvestment of savings achieved. Financial savings to stakeholders and participants amount to some £560 000 per year.

This report analyses four community projects in detail. It demonstrates that they are viable economically and supported by committed champions and the local community, but will not proceed without concerted local leadership, technical, and community marketing expertise. To make this expertise available requires a critical mass of projects, across which costs can be shared.

This feasibility study demonstrates such critical mass exists in Warwick District, and an effective initiative can create a leading exemplar of community-based energy action.

The bulk of the £13.6 million cost comes from projects on domestic properties, which we anticipate will be largely funded by the property owners themselves. We propose a target of engaging 3000 homes in the District in the project over the next 5 years, broadly aligning with national and regional energy strategy objectives. This also creates an easily understood ambition for PR and marketing.

We propose establishing a non-profit community energy company (CEC) to deliver the required leadership and expertise. The company should be jointly owned by local stakeholders, including the community itself, and possibly extend across district

ENGAGE Feasibility Study

boundaries. It will employ approximately 5 full-time staff, and be funded by revenue from savings achieved.

Extensive consultation is proposed to confirm details of the structure of the proposed organisation in the coming months, with a view to commencing operations by January 2005.

Introduction

This report is part of a project looking at the feasibility of specific renewable energy schemes for community sites in Warwick district.

The approach taken was to ask members of the community what they felt about renewable energy and to suggest possible sites. These suggested sites were then considered by the Energy 21 Group and a list of sites worth further analysis was produced. These selected sites were then analysed to produce an indicative technical, economic and social assessment in line with the agreed project terms of reference.

The report is structured as follows:

- ⌘ Background to project and results of community consultation
- ⌘ Discussion on list of sites proposed
- ⌘ Feasibility of selected sites
- ⌘ Next steps and recommendations

Background to project and results of community consultation

Action 21 plans to develop a variety renewable energy schemes in Warwick District, and wants these to have considerable community involvement. The main purpose of this feasibility study was to canvass local views and relate these to specific project proposals. This will enable informed and objective choices to be made with public support.

A householder survey was organised to gauge public opinion on various aspects of renewable energy. This took the form of a written questionnaire where local residents were invited to express their opinions on a range of different renewable energy technologies (the questionnaire is shown in Appendix 1). They were also asked if they would like to see or a specific scheme developed locally and what level of involvement they would like to have.

The survey, which also included a brief outline of 4 examples of community renewable schemes from around the country, was sent to over 2,000 people who formed the District Council's 'resident's panel' and to other local organisations. This resulted in the 340 responses analysed in this report.

Because the resident's panel is selected to achieve a broad cross section of the community it should be considered to be a representative sample of the district as a whole. With the number of responses received, the comments expressed should also be considered reasonably representative of the views of the community.

Questionnaire Results

1- *“Do you think that some form of renewable energy project might make a positive contribution to your community?”*

Answer-

61% agreed strongly and 31% agreed (92% positively in favour)

2% had no opinion, 3% disagreed and 1% disagreed strongly (2% did not respond to the question)

2- *“Having looked at the case studies, how desirable do you think each of the following (technologies) might be in your area?”*

Answer-

Hydro-52% very desirable and 32% desirable (84% in favour),

5% not desirable, 1% very undesirable (10% made no response)

Biomass- 37% very desirable and 43% desirable (81% in favour)

8% not desirable, 2% very undesirable (9% made no response)

CHP-37% very desirable and 36% desirable (73% in favour)

9% not desirable, 2% very undesirable (16% made no response)

Wind 30% very desirable and 30% desirable (60% in favour)

19% not desirable, 9% very undesirable (12% no response)

Solar 64% very desirable and 27% desirable (91% in favour)

3% not desirable, 1% very undesirable (5% made no response)

In addition, 6% of respondents suggested other technologies that could be considered.

3- *This question asked for ideas on specific schemes and their location and is discussed fully under ‘Analysis’*

4- *“What level of support would you give to a local community renewable energy scheme?”*

Answer-

1% would sponsor the scheme (make some sort of financial contribution)

46% would give their support to the scheme

26% would like to participate in the scheme

23% did not want to be involved in any way

4% did not respond to the question

5- *“Would you buy your own energy from a local renewable scheme?”*

Answer-

71% would buy from a local scheme

In addition to the above, 61% of respondents wanted to be kept informed as to the progress of any local schemes and 18% requested further information on the work of Action 21.

Analysis of Questionnaire

There is clearly an overwhelming level of commitment from the local community for renewable energy projects of various types with 92% considering it to be of benefit to the local area. Only 4% considered it to be of no value or a waste of time and money.

Of the renewable technologies proposed, 91% considered solar thermal or solar electric schemes to be the most desirable. From the additional comments made, this appears to be because it's the only technology that could be fitted in most domestic households. Many people expressed the wish to have solar panels on their own roofs if the cost was made more reasonable through grants. Some also commented that they had already had planning applications for this turned down by the local planning department.

The second most desired scheme involved small-scale hydro with 84% in favour of the scheme already proposed in this feasibility study. Some people questioned the amount of energy that would be available from the local rivers since they were

relatively small and slow running. However, many people thought that all of the weirs along the river and some considered canal locks as having some potential.

80% of people thought that using biomass was a good idea, citing the local farming community as a potential source. Surprisingly, two farms that responded were not so positive, indicating their belief that the material would not be sourced locally enough.

Not surprisingly, the least favoured technology was wind with 60% in favour. Those against it tended to be very much against the whole idea, mainly on grounds of noise and visual impact. However, many of those in favour considered it to be the most practical proposition because it could potentially provide the most energy was likely to be the most cost effective of the renewable technologies.

Of those against everything, most were concerned that this would not be cost effective and place an additional burden on the local Council Tax payers. Most of those expressing this view stated that they were pensioners. Just 4 responses, representing around 1%, thought the whole idea was a waste of everyone's time.

Several potential schemes were identified and some of these would be suitable for further investigation. However, some of the suggestions included more awareness raising, educating the community and energy efficiency improvements. This supports the overall Action 21 objective of combining renewable energy schemes with energy efficiency measures and community involvement. Also, from many of the comments, it is clear that there is a lack of understanding that renewable energy can be supplied to everyone. There is definitely a need to provide more education on the way potential schemes can supply energy to the community.

Grouping the suggested schemes by technology, there were 31 suggestions involving small scale hydro although most either reiterated the current feasibility study or were not specific in location. Those that were specific included the River Avon at Warwick Castle, and St Nicholas Park, The Saxon Mill and Pottertons Site and the River Leam at the Pump Rooms. Several also suggested linking with other technologies and that this should be in the form of a public 'exhibit' to promote renewable energy rather than a realistic attempt to generate a useful amount of energy.

There were 25 suggestions for biomass schemes including burning non-recyclable household waste, methane from landfill sites and human waste and crops for bio-diesel. The largest number thought something should be located at the Princes Drive waste site. Newbold Comyn and Longbridge were also specified as possible locations.

13 people suggested CHP schemes mostly for public buildings although Warwick Hospital was mentioned in several of these. Schools in general were also suggested. The most surprising suggestions concerned wind schemes. Considering that this technology produced the most adverse comments, there were 41 suggested schemes. 11 of these specified Newbold Comyn as a possible site and 5 suggested Campion Hills. Others included wind turbines sited on school playing fields in conjunction with solar as a combined energy source linked to educational activity and involving local communities.

There were 81 suggestions that included solar. 35 of these specified schools as being the most appropriate location with Claverdon, North Leamington, Briar Hill, Campion and Kenilworth being specifically mentioned. Many people thought that this would also be useful for Kenilworth, Warwick and Leamington swimming pools specially if linked to a public display showing the energy generated. There were also a significant number of people who would like to have solar systems themselves but were put off by the cost. Some of these suggested that all new developments should be required to have solar systems installed at construction stage as part of planning agreement.

People were given the opportunity to identify other technologies and this resulted in bio-diesel, energy from waste, geothermal and heat pumps being mentioned as possible schemes. There were also 9 suggestions that education should be a scheme in it's own right including an 'Eco Centre' or other demonstration schemes open to the public and one suggesting that the local colleges should run renewable energy courses.

71% of respondents may be prepared to purchase their own energy from a local renewable scheme although many with the proviso that it should be no more expensive than their existing supplier. Several did not think that this was not an

option for them as ordinary householders, indicating a general lack of understanding of how the energy supply market works.

Conclusions from Questionnaire

The survey has been very useful in that it shows a significant level of support for local renewable energy schemes with relatively few strong objections. This is borne out by 61% of people wanting to be kept informed of the progress of the scheme and 18% wanting to know more or to be involved in Action 21.

From the diversity of the suggestions, it is likely that almost any scheme that proved cost effective would be favourably received, even wind turbines.

Perhaps the most difficult area will be in persuading the planning authorities to be more sympathetic when considering renewable schemes to reflect what is clearly the majority of local public opinion.

Funding is still a major issue and anything that would lead to a rise in local taxation would receive little support.

Some of the comments made, indicated that there is some misunderstanding of how renewable energy can be of direct benefit to all householders. There is also a general lack of awareness of the grants and schemes already available to support these technologies. Although both national and local promotions have been regularly taking place, many people have failed to take heed of them or link them to this process. Much more awareness raising is needed and this will be a long and ongoing process.

Schemes that include a very visible demonstration of the principles involved and the benefits to the local community would seem to satisfy most of the respondents to the survey. Local community involvement in any type of scheme was repeated throughout the responses.

Recommendations from Questionnaire

The survey confirms Action 21's view that renewable energy schemes are desirable and should be linked to energy efficiency and community involvement and this formula should receive majority public support.

From the suggestions made in the survey, Action 21 should initially identify one potential pilot scheme from each technology and seek funding to carry out the necessary feasibility studies.

The local community should be kept informed through regular media releases and be involved as much as possible.

Action 21 should produce a newsletter to distribute to all residents informing them of the results of the survey and outlining the process that will be used to develop future schemes.

The number of people requesting to be kept informed is so large that a public event may now be well received, even though past experience has resulted in disappointing attendances. This would only work with widespread promotion and the support and sponsorship of significant local organisations.

Discussion on list of renewable energy projects in Warwick

Following the results of the survey a list was compiled of possible projects that could be looked at in Warwick- these are in Appendix 2- and amounted to about 20 possible projects. These were then discussed at a meeting of the Energy 21 group in Leamington. The projects were given a score out of ten to the various proposals taking into account the following criteria:

- ⊘ One of each technology was to be selected
- ⊘ Social criteria, i.e. include various target groups
- ⊘ Energy efficiency
- ⊘ Educational value
- ⊘ Practicality in the political sense
- ⊘ Ensure at least one project of sufficient size to generate saleable energy
- ⊘ Visibility as a demonstration of renewable energy generation

The number of projects chosen for initial evaluation was constrained by the resources available to this feasibility study. There are a number of projects in the list (e.g., solar powered hydrotherapy for one of the old people's homes, and other wind projects). These may well be attractive and viable, but we chose not to evaluate them at this stage in the interests of maintaining diversity and getting maximum value from the resources available. The projects evaluated enable the team and public to compare alternative options and technologies locally, and thus provide maximum momentum and minimum diversion for the next stages of the project.

The projects that were chosen were:

1. The possible use of a biomass-powered combined heat and power system to heat one or more of the district swimming pools (Abbey Fields, Newbold Comyn or St Nicholas Park), making the electricity and possibly spare heat generated available to the local community at lower cost than existing systems.

2. The potential for installing renewable energy systems (such as solar electricity, solar water heating and heat pumps) on All Saints Parish Church who expressed interest, where this can be done without visual impact.
3. The potential for installing solar systems on Bath Place Community centre.
4. The potential for a wind turbine on a number of the sites suggested by survey respondents.
5. The potential for integrated solar, combined heat and power and wind systems on the planned new school development in Warwick Gates
6. The potential for hydro-electric power from the River Leam, for community use.

Preliminary investigation into these sites and contact with key people produced the following results:

1. All of the three leisure centres in Warwick use gas driven CHP units which have run for a number of years but are not due to be replaced. The Energy manager for Warwick District Council, George Elkington, said that the thermal demand in the council buildings is too low to justify more CHP plants and the current low electricity and high gas prices make this economically unattractive as well. He also made the point that all of the District offices currently buy green electricity. A feasibility assessment of a biomass-powered combined heat and power system to heat one or more of the district swimming pools was therefore not done
2. An assessment of seven possible wind sites was done using the BWEA website and one of the most attractive wind sites was Oakley wood crematorium so it was decided to do a feasibility assessment there.
3. The school suggested from the community questionnaire results has not actually been built and was someone's wish to build a school there! Other schools were contacted but was unable to find a teacher to allow access to a school and take this further. It may be able to do this at a later date.

Conclusion

The four sites that were assessed for their feasibility were:

- ⌘ Wind turbine at Oakley Woods Crematorium
- ⌘ Solar PV and solar thermal at Bath Place Community Venture
- ⌘ Solar thermal and ground source heat pump at All Saints Church
- ⌘ Jephson Gardens hydro power scheme

The results are shown in the next section and some of the technical assumptions for the technologies are given in Appendix 3.

Planning issues are discussed for each specific site and while there are concerns for each site none are insurmountable. The Community Plan for Warwick District which sets out the key priorities for the district for the next 5-10 years contains a general statement of support for renewable energy schemes with two specific objectives:

- ⌘ “To reduce the consumption of scarce resources....”
- ⌘ “The development of infrastructure powered by renewable energy resources can support this and other objectives of the core strategy. We recognise the importance of this issue and will support such proposals provided that they do not harm the surrounding environment”

Feasibility of selected sites

Wind generator at Oakley Woods Crematorium

The crematorium situated at Oakley woods has a good wind regime of between 6.3-6.4 m/s with a mast height of 50 metres. This information was derived from the BWEA website model.

The site consists of a small building with two chapels and a waiting room, and three cremators. Each cremator is 81 kW and electrical heating is 150 kW (off peak)

Electricity demand is:

	Day (kWh)	Night (kWh)	Yearly Total (kWh)	Cost (£)
Total (year)	212,033	152,245	364,278	16,186
Average (month)	17,699	12,687	30,357	1,349

Estimated costs for a 50kW wind turbine with a rotor blade of 15m and a tower height of 50m are shown below. The turbine would be capable of delivering about a third of the annual output, roughly 115000 kWh. The costs include an estimated tower cost of £10,000 and foundation costs are estimated to be 30% of the installation costs. However, as foundation costs are site specific a full site feasibility study would need to be done.

The payback is shown with the assumption that a community grant of 50% would be available.

Costs	£
Fully installed	76,200
Potential grants	38,100

ENGAGE Feasibility Study

Net total cost	38,100
Maintenance costs per annum	1,200
Fuel cost savings from wind turbine per year	5,773
Net savings per year	4,573
Carbon savings	45.54 tonnes CO ₂ ¹
Financial payback	8.3 years
Carbon payback	0.4 months

This is an attractive payback and is for one turbine. At the time of the full feasibility study it may be worth thinking about having three turbines of 50 kW (maximum Clear Skies grant would be £100, 000). A 50 kW turbine is the biggest one that could go for a community grant and it is unlikely that a bigger turbine would operate with the low wind speeds.

Planning Issues

The site is an ancient woodland and contains a scheduled ancient monument.

DP 4 of the local plan says that 'development will not be permitted which harms scheduled monuments', so the wind turbine would need to be built away from the monument itself.

In terms of visual and physical impact there would need to be a noise and visual impact assessment to make sure that the ancient woodland and the community were not too adversely affected.

Two other points on the plan that would need to be considered are:

DP1 Development will only be permitted which positively contributes to the character and quality of its environment through good layout and design"

¹ Note that at this particular site, as it is owned by Warwick District Council who buy all the electricity for their properties from green electricity suppliers there would not actually be any carbon savings attached to this particular project.

ENGAGE Feasibility Study

"DP2 Development will not be permitted which has an unacceptable adverse impact on the amenity of nearby uses and residents and / or does not provide acceptable standards of amenity for future users / occupiers of the development. "

There would need to be a planning application and an argument that the turbine would enhance rather than detract from the landscape. Good local consultation would also be necessary, although there are no residential houses in the vicinity so objections would hopefully be limited.

English Nature would need to be consulted at the stage of a full feasibility study.

Solar panels at Bath Place Community Venture

Bath Community Centre in Leamington Spa is an old school building that is used as a community centre for different groups and activities. It uses gas, oil, diesel and electricity. An average of 320 meals are served a month and over 900 people use the centre. Water is heated in the kitchen by an under-counter electric immersion heater, there is a boiler for the nursery and art room. Heating is by gas fired storage heaters, there are 2 fridges and freezers and lights plus computer equipment and a photo-copier.

A plan of the building is shown in Appendix A. The rough roof area that could be used in the South West facing roof either where the nursery roof or the youth room roof.

1. Nursery roof is two parts: the top half as at an angle of 40 degrees with an area of 6 metres times 2.5 metres which gives 15 square metres. The bottom half is at an angle of 50 degrees with an area of 6 metres times 1.9 metres so has an area of 11.4 square metres. Total available roof space is therefore about 26 metres.

2. Youth room is all at an angle of 60 degrees and has an equivalent roof space of around 26 metres.

Gas and electricity consumption is:

	Quarterly (kWh)	Yearly (kWh)	Cost per kWh (£)	Total cost (£)
Gas	15,509	46,527	0.02	819
Electricity	15,165	45,495	0.08	3,450
Total				4,269

Two options were looked at. These are mutually exclusive, because there is just one roof available. The first option is to provide electricity from solar PV modules. Given the roof space the maximum amount of electricity that could be produced would be

ENGAGE Feasibility Study

2,400 kWh using a 3.28 kWp solar PV module system covering 25.5 square metres and grid connected. A community grant of 50% is assumed.

Costs	£
Fully installed	19,690
Potential grants	9,845
Net total cost	9,845
Savings from solar PV per year	1,337
Carbon savings	1.03 tonnes CO2
Financial payback	51.3 years
Carbon payback	53 months

Even with a 50% grant the option of solar PV electricity is not an economically feasible option.

The other option would be to provide solar thermal water heating for the water. Two types of collector are available – flat plate and evacuated tube. These have different costs. In broad terms evacuated tube collectors are more efficient but take less space.

Financial and environmental benefits will also vary depending on the mix of fuels used to heat water at the moment (and thus displaced by the solar heating). Based on the information provided, it appears that the bulk of water heating is currently supplied by electricity. However, we have done two sets of calculations for each type of collector to show the range of savings available. This generates four scenarios, summarised below.

(a) Install 26 square metres of flat plate solar water system with associated tank, pump and pipework. Savings are shown against existing system, assuming all water is heated electrically. This is the recommended scenario, and we believe most accurately models savings against the existing heating bills.

Costs	£
Fully installed	14,646
Potential grants	7,323

ENGAGE Feasibility Study

Net total cost	7,323
Savings from solar water heaters per year	1,129
Carbon savings	6.39 tonnes CO2
Financial payback	6.5 years
Carbon payback	11 months

(b) This is a smaller system, and reflects lower savings if the existing system uses approximately 50% gas to heat the water, The capital costs are based on installing 17.5 square metres flat plate solar water heating system with appropriate ancillaries.

Costs	£
Fully installed	10,191
Potential grants	5,095
Net total cost	5,095
Savings from solar water heaters per year	439
Carbon savings	3.24 tonnes CO2
Financial payback	11.6 years
Carbon payback	16 months

(c) Evacuated tube systems take less roof space to deliver the same amount of heat. This scenario shows the costs and benefits of an evacuated tube system using 24.7 square metres of collector system with associated tank, pump and pipework. Savings assume all hot water is currently heated electrically.

Costs	£
Fully installed	51,160
Potential grants	25,580
Net total cost	25,580
Savings from solar water heaters per year	1,389
Carbon savings	7.86 tonnes CO2
Financial payback	18.4 years
Carbon payback	11 months

(d) The final scenario is a smaller evacuated tube system, with savings assuming the gas boiler makes a significant contribution to water heating. The evacuated tube collector is sized at 14.8 square metres.

Costs	£
Fully installed	31,004
Potential grants	15,502
Net total cost	15,502
Savings from solar water heaters per year	587
Carbon savings	4.10 tonnes CO2
Financial payback	26.4 years
Carbon payback	14 months

Sizing assumptions

The collector sizes above are sized to deliver 55% of annual hot water requirements (flat plate) and 65% of annual hot water requirements (evacuated tube) in line with industry practice. This broadly translates to 90% of water being heated by the sun in summer, and between 10 and 30% in the winter.

The existing water heating systems must be retained to act as backup and in the winter months, although new water storage tanks will be installed, insulated to modern standards. Savings from this additional lagging of hot water tanks are excluded from the analysis above.

Planning Issues

The County Council owns the building and planning permission should not be a problem, although a structural survey would need to be done on the roof. English Heritage would also need to be consulted at the full feasibility stage.

As Bath Place is in a conservation area there would need to be a visual impact assessment but the visual impact should be minimal.

In the local plan DP 12 specifically supports solar panels:

£# “the layout and design of development will be encouraged to promote the conservation of energy by its future occupiers. Development proposals will be expected to demonstrate that they...use sustainable and renewable forms of heating such as the use of solar panels and CHP schemes”

Solar panels and possibly a ground source heat pump at All Saints Parish church

All Saints Parish Church is situated at the bottom of the Parade and at the moment the main church is used for Sunday services, occasional concerts and for some clubs and societies.

It has a café that is open four days a week (Wednesday to Saturday) from 10 to 3.30 and the café has separate heating from the church and vestry. The church is only heated for Sunday services and concerts and can be extremely chilly especially in the winter months. It is a very attractive church and the Reverend is very keen to encourage people to use the church and warmth would be one factor that would help this.

The café is very popular with a large section of the community and has constant hot water and three toilets.

The proposed roof is south facing with a slope of about 50 degrees and cannot be seen from the street. The roof space that could be used is approximately 10.5 metres by 2.4 metres so a total area of approximately 25 metres square.

The possibility of a ground source heat pump was attractive to the vicar, but to be effective would involve installing underfloor heating and probably digging up urban roads, which may be expensive. Moreover, the fundamental heating problem for the building lies in the fabric, not the heat source. The most efficient approach would be to find as many ways as possible of insulating the structure, probably internally, to reduce heat demand and draughts. A smaller and modern condensing boiler (or possibly a mini-CHP system) might well then be the optimum solution.

The electricity and gas demand is:

	Yearly (kWh)	Av monthly (kWh)	Cost per kWh	Total cost (£)
Gas	43,044	3,587	0.018	758
Elec Peak	32,906	2,742	0.076	2,495

ENGAGE Feasibility Study

Elec off peak	18,804	1,567	0.052	978
Total Elec				3,473

Please note that it was only possible to get meter readings from the church so the gas and electricity costs are approximate based on the electricity and gas prices paid by Bath Place Community Venture.

Two options were considered for the church, as for the community centre- electricity from solar PV panels or solar thermal water heaters for the café. The costs and financial payback for the church are virtually the same as for Bath Place Community Venture and for the same reasons is not recommended due to its uneconomic viability.

The table below presents the potential savings and environmental benefits from installing a 28.2 square metre flat plate solar water heating system with tank, pump and pipework (savings assuming water is currently heated electrically)

Costs	£
Fully installed	15,822
Potential grants	7,911
Net total cost	7,911
Savings from solar water heaters per year	1,129
Carbon savings	5.71 tonnes CO2
Financial payback	7 years
Carbon payback	13 months

Solar water heating would thus potentially make a positive contribution to this church. The sizing is based on delivering 55% of annual hot water demand - 90 % in summer and 10% in winter.

Some solar systems have been installed in the UK to supplement space heating systems, but this is always in conjunction with extensive insulation of the property to reduce demand. This building is so old and energy inefficient that such an approach cannot realistically be considered in isolation from radical energy efficiency improvements, which go beyond the scope of this brief.

Planning Issues

The Church is both in a conservation area and is also a Grade 1 listed building so visual impact is a big concern and any scheme would potentially have to be completely out of sight.

The church would need to apply for planning permission through the Faculties process and English Heritage would need to be involved.

The fact that there is a champion for this project within the church would be a big advantage in the negotiation process.

Jephson Gardens hydro turbine

In Jephson Gardens in Leamington Spa at the weir by Mill Bridge there is potential for a small hydro power scheme. The bridge contains two storm culverts at either end of the bridge and there is a boat pass on the North side of the bridge.

There was an original turbine which was opened in February 1904. The turbine was situated in one of the storm culverts and was probably a vertical pit turbine. The turbine was designed to supply 18 HP when there was a flow of 3 inches over the weir but could run with a flow of less than one inch over the weir.

It was designed to pump water for use in watering the streets, sewer flushing, the railways and for supplying the swimming pool (in summer). The pumping of water had previously been performed by a steam engine and the hydro turbine was expected to save running and maintenance costs.

A feasibility study was carried out in July 2000 by ITC, for Warwick District Council, and included a site survey, data collection and discussions with organisations such as the Environment Agency, manufacturers and engineers. At the time of the study it was suggested that the scheme could be used as a stand alone scheme to provide electrical energy to the (not then built) restaurant and lighting for the bridge and there was an option of a heat pump to provide heat energy to the proposed temperate house. Unfortunately lack of funding meant that the feasibility study was not implemented.

However this site is still an attractive possibility and although there is no longer the option to heat and light the temperate house and Jephson Restaurant there are other possibilities such as the All Saints Parish Church (about 100 metres away) or the Sikh Community Centre (5 metres away).

The options looked at were:

1. A Turbine in the bridge abutment
2. A waterwheel in the boat pass

ENGAGE Feasibility Study

The feasibility report gives considerable technical detail of these two options (and is available from ITC). The table below summarises the estimated annual energy output of the options. These figures are calculated from the flow duration curve, and the efficiencies of the different system components. The annual amount of energy produced is strongly influenced by both the minimum residual flow that should be left for the main weir.

Option	Max Flow (l/s)	Max electrical power output (kW)	Max heat power output (kW), for direct drive heat pump	Minimum Residual Flow	Average electrical annual energy output (kWh)	Average annual heat energy output (kWh), if direct drive heat pump used
Turbine	800	8.25	32.32	0	31,661	124,037
	800	8.25	32.32	541l/s (2" over main weir)	24,509	96,017
	800	8.25	32.32	210l/s (1" over main weir)	28,208	110,510
	800	8.25	32.32	541 (0 at night)	27,513	107,785
	800	8.25	32.32	210 (0 at night)	29,658	116,191
Waterwheel	500	5.12	21.58	0	33,746	142,341
	500	5.12	21.58	541l/s (2" over main weir)	18,866	79,576
	500	5.12	21.58	210l/s (1" over main weir)	28,948	122,101
	500	5.12	21.58	541 (0 at night)	25,116	105,937
	500	5.12	21.58	210 (0 at night)	30,963	130,602

* Nighttime operation assumes dawn to dusk, when park is shut. So 6p.m. to 7am in winter and 10-6 in summer. Average is 10 hours.

The table on the next page presents the potential costs and savings for a 8kW turbine or 5 kW waterwheel with heat pump and including automatic trash rack cleaner, automatic operation and shutdown, based on the scenarios given above.

In summary the best option would be the waterwheel or turbine with nighttime operation and a heat pump providing heat energy. Up to 130, 000 kWh could be produced which could be utilised by the church. The total cost (excluding changes needed to the church foundations) would be about £50,000, and give a payback of between nine to ten years, if a community grant of 50% was available.

Table for Turbine and Waterwheel financial scenarios

Option	Minimum Residual Flow	Average electrical annual energy output (kWh)	Gross annual value	Average annual heat energy output (kWh), if direct drive heat pump used	Gross annual value	
					electricity @3.6p/kWh	gas at 1.3p/kWh
Turbine	0	31,661	£1,140	124,037	£1,612	£1,116
	541/s (2" over main weir)	24,509	£882	96,017	£1,248	£864
	210/s (1" over main weir)	28,208	£1,015	110,510	£1,437	£995
with night-time operation	541 (0 at night)	27,513	£990	107,785	£1,401	£970
	210 (0 at night)	29,658	£1,068	116,191	£1,510	£1,046
Waterwheel	0	33,746	£1,215	142,341	£1,850	£1,281
	541/s (2" over main weir)	18,866	£679	79,576	£1,034	£716
	210/s (1" over main weir)	28,948	£1,042	122,101	£1,587	£1,099
with night-time operation	541 (0 at night)	25,116	£904	105,937	£1,377	£953
	210 (0 at night)	30,963	£1,115	130,602	£1,698	£1,175

*The electricity price given is the average of peak and off peak prices

Planning Issues

Such a site would require comprehensive discussions with the Environmental Agency to try and avoid constraints, and monitoring requirements on the scheme. There may be a need for an abstraction licence (even though the water is only being diverted for a couple of metres). This is standard procedure for hydropower schemes, even ones as small as this. There will also need to be a screen for the turbine to stop fish being drawn in.

However, the primary impact of this scheme, especially given its location, is that it will reduce the amount of water flowing over the main weir, as it will go through the turbine instead. In the energy output estimates, it has been assumed that a flow of 260 l/s is always left to go over the weir. This flow is exceeded for 95% of the year, and equates to about 1-2" over weir.

The council planners will need to decide what level of flow is acceptable on visual grounds. The EA may also require a minimum flow over the weir, also for visual reasons. Also, as the bridge is a listed building, any modifications to this would need to be cleared - it is not clear whether the boat pass also has this status.

Feasibility of a Community Energy Company (CEC)

The previous section shows how individual projects are well-supported by the community and economically viable in isolation (particularly the wind and hydro projects). However, the “catch-22” is that no single project generates sufficient benefits in isolation to cover the cost of the project leadership, community support and technical expertise required to get it off the ground.

To make anything happen, therefore, will require a grouping together of multiple projects and a sharing of the specialist skills necessary.

We have carried out a preliminary evaluation of the total community-led project potential in the District, extending the budget costs and benefits for the sample projects across the total potential, as established by the questionnaire. The results of this analysis are shown in the table on page 35².

The table shows that a community energy company, employing approximately 5 staff, could leverage funding from a variety of sources to deliver substantial environmental and economic benefit across the District over a realistic timescale (5-10 years). The costs of the company could be covered many times over by the savings, the balance of which will accrue to the property owners, including the Council, individual homeowners, and community groups.

There are a number of alternative ways to structure such an organisation. We outline three below, with a view to consulting on the optimal structure with local stakeholders as the next step.

In all options we are assuming the company will be non-profit-making and community-owned.

² In this table, additional estimates for domestic project costs are provided by encraft, using a simulation model and databases of UK prices and grants for small-scale renewables projects. Newbuild estimates are based on a DTI-funded report into the BedZed zero energy housing development for the Peabody Trust in South London.

Option 1 Wholly owned by a single existing stakeholder (e.g., the District Council or Action 21)

This option has the advantage of simplicity. The disadvantages are that it exposes the community energy company to the risks of being diverted by the agenda and short-term concerns of the single stakeholder, and it may be harder to secure external funding and broad community support without diverse partners already on board. Some owners will constrain funding options because of their own legal status (e.g., if they are charities or public bodies).

There may also be opportunities for the Community Company to operate across District boundaries, which it may be harder to take advantage of in this structure.

Option 2 A new organisation, owned in partnership by local stakeholders and the community

This option has the advantages of broad engagement and clear identity. The disadvantage is exposure to financial risk if the organisation is seen as peripheral to all the partners and fails to secure its own income streams. However, a distinct identity should make it easier to raise funding and carry out effective marketing activities. Ownership by stakeholders and the community minimises risk, creates flexibility and shares the benefits fairly. The objectives of the organisation are set out, governed and agreed clearly and there is no day-to-day distraction from these.

Option 3 A project structure, without legal status and run by a board consisting of representatives from stakeholders

This is effectively option 1, with a project board to bring in additional stakeholders. While increasing engagement, the disadvantage of this structure is lack of a clear identity externally, combined with diverse interests exercising a degree of control without responsibility. Lack of a legal status is likely to limit funding options (e.g., in establishing energy service contracts to recover some of the running costs of the company – see below).

From this discussion, we believe option 2 is the best way forward, but this is an area where more detailed consultation with the interested parties is necessary to agree an optimal structure.

Funding options

As far as funding is concerned, we believe the right way to fund any community energy organisation should be from revenue, applying grant funding to reduce capital costs for individual projects. There are excellent examples of this model working very well, for example in Woking. The table above shows how this is possible in terms of total numbers over a 5-10 year horizon. The immediate issue is short-term funding to get the project off the ground.

There appear to be broadly three options for initial funding:

- a. One or more partners advancing a loan to be offset against future savings
- b. One or more organisations making a grant to support costs until breakeven is reached (perhaps 2-3 years)
- c. One or more organisations supplying the resources necessary from their existing staff and budgets, until such time as the company becomes self-sustaining.

We rule out option c as a complete solution, because it is unlikely to result in the necessary focus and creates transitional problems at the point self-sustenance is reached. However, it may be an option for some initial support in some specialist areas.

Option a is straightforward, and would create sensible incentives and levels of commitment among stakeholders. The risks are limited given the captive market among local stakeholders, the established potential, and the likelihood of energy price rises in the immediate future.

Option b is attractive, but it is not clear where such funding might come from, and significant effort is likely to be required to secure any such grants in the short term. It is not clear whether any partners have the capacity and skills to commit such effort at

this time, and grant providers might reasonably ask why they are being asked to fund a scheme which is in principle self-supporting within a relatively short timescale.

Longer-term, we could adopt a variety of models for funding. For example, the simplest option could be the CEC operating as an Energy Services Company (ESCO). This model is one where the company acts as an energy services supplier to stakeholders and homes, charging customers directly for their energy via contracts at a reduced rate reflecting the savings made through energy efficiency and renewables investments. The ESCO essentially takes the management fee out of the savings made from energy efficiency measures.

Alternatively, we could consider variants on this such as homeowners acquiring rights to invest in the CEC through energy efficiency savings made, or even public subscription, where individuals or organisations can contribute a fixed fee (say £100) per household to become part owners of the CEC and obtain a share of the savings.

The precise model requires detailed consultation with stakeholders and probably some legal evaluation. However, the table provided in this section illustrates the viability of the concept and demonstrates that further work is justified.

ENGAGE Feasibility Study

Warwick District Engage Project Potential

Potential project	Budget estimates (inc grants) per project			Potential number of projects in the District****	Total cost (£)	Overall potential	
	Capital costs net of govt grants (£)***	Annual savings (£ p.a.)	Annual savings (t CO2)			Total potential savings (£ p.a.)	Total potential savings (t CO2 p.a.)
Community solar water heating	7500	1200	6	9	67500	10800	54
Community PV	10000	1400	1	9	90000	12600	9
Community wind (50kW)	38000	4500	45	6	228000	27000	270
Community biomass (30kW)	6000	560	5	9	54000	5040	45
Community hydro-electric	42000	1250	11	3	126000	3750	33
Domestic energy efficiency/microgeneration	8000	300	2.5	1000	8000000	300000	2500
Domestic energy efficiency/solar water heating	5000	200	2	1000	5000000	200000	2000
Newbuild microgeneration/solar systems*	0	250	2	500	0	125000	1000
Newbuild eco-standards*	0	400	4	500	0	200000	2000
Project delivery, marketing and management**						(328000)	
					Total project potential	£13,565,500	7911 t CO2 p.a.

Potential funding

Homeowners	£7,800,000	60% of net retrofit costs after grants
Installer/manufacturers	£5,608,000	40% of net retrofit costs in reduced prices due to scale
Developers	£0	Additional cost offset by additional revenue
Other	£157,500	to include public subscription, for example
Total	£13,565,500	

* Newbuild based on achieving 70% of Bedzed cost/benefit analysis. Their experience shows how additional capital costs (£100k per unit for full eco, £5-10k per unit for solar) can be recouped by developers from sales value through careful design, additional rentals/sale value, higher densities and planning gain.

** This covers the costs of marketing, administrative and technical project management support across all the projects. The main roles are: promoting the project to the community and households working with partners and stakeholders to develop project proposals and funding bids developing the local installer base, and working with skills development organisations negotiating with suppliers, developers and other relevant parties co-ordinating support from specialist partners, such as the energy advice centre building constructive long-term relationships with planners, funding agencies, and regional policy bodies It is likely around 5 FTE individuals will be needed to cover these roles, working on a mix of full, part-time, and secondments. A detailed budget is available separately.

*** Grants assumed are current Clear Skies 50% grants for community projects; or technology-specific support for domestic projects (e.g., £400 per solar water system)

**** Numbers of domestic properties based on 10% of homes in the district participating over 6 years.

***** Savings assume wood chips can be sourced locally as waste byproduct (no cost)

Recommendations and Next Steps

1. There is a great deal of interest, enthusiasm and commitment from the local community in Warwick District to the idea of renewable energy projects with 92% of the people who returned the questionnaire saying that it would be of benefit to the local area. The majority of the respondents also wanted to be kept informed as to the progress of any schemes. This interest needs to be built on with project updates and perhaps more public meetings if the schemes progress.
2. The social and educational benefits of renewable energy schemes were very clear in the Bath Place Community Venture and in the All Saints Church. The Jephson Gardens scheme and the Church would attract more tourists to both places and show the benefits of renewable energy
3. The study has also shown that there are a lot of innovative ideas around on how to use renewable energy and also that these need to be linked to energy efficiency, especially in the case of old buildings like Bath Place and All Saints Church.
4. The study has shown that electricity from solar PV is still not economically viable on existing buildings (although it may be on new buildings)
5. Solar thermal water heating is potentially viable, especially if the solar heaters are displacing water currently heated by electricity and if flat plate technology is used.
6. The wind turbine at Oakley Woods Crematorium is the most attractive economically as it has a fairly good wind regime, a good end-use and appears to have less planning issues than most wind turbines. It may be worth approaching energy supply companies to discuss the option of a bigger turbine and exporting the electricity.

7. The Jephson Garden turbine or waterwheel would be a very visible renewable energy scheme. The end use of the electricity is not clear but it would be worth exploring the possibility of using it to heat the church.

8. A community energy company should be established. This is the best way to take these projects forward. To make any of them viable, a critical mass of projects and expertise need to be established locally, and this requires significant focus. Establishing a critical mass of projects has knock-on benefits in terms of generation of local employment opportunities, creation of a potential industry cluster in a growing market, and broad community engagement.

9. Maintaining momentum and effective marketing across the community is an important element of the project. To build on the excellent work already completed (see for example, the poster attached in appendix 5) we suggest some simple, easily understood targets are adopted and publicised – for example making 3000 homes in the district solar homes by 2010.

10. To get the community energy company off the ground, extensive consultation should take place with stakeholders locally, including with neighbouring District Councils. The objective should be to agree a formal structure and funding basis by October 2004, with a view to the company commencing operations by January 2005.

Appendix One: Community Questionnaire

Renewable Energy

For Warwick District

Global Climate change is the single biggest environmental threat facing the planet and it is mostly caused by burning fossil fuels to generate energy, for example electricity.

Extreme weather conditions, increased flooding, sea level rise and summer droughts will affect us in Warwick District as well not just people in other countries. This will have a huge effect on our quality of life our environment and wildlife and our economy. Think of the cost of repairing infrastructure after storm and flood damage, to say nothing of the effects of drought on farmers! Did you know that many species of wildflowers will not germinate unless the seeds have been through a frost each year? These are just a few examples of what the effects will be (for more on climate change see www.warwickshire.gov.uk).

However the good news is that the technology to help put this right exists and it is available now!!

To help address climate change and pollution, Action 21 would like to set up renewable energy schemes in Warwick District. We would especially like to involve local people in identifying and prioritising possible *renewable energy* schemes. We are especially interested in schemes which can be linked to energy saving in the home.

Renewable Energy is:

Energy flows that occur naturally and repeatedly in the environment and can be harnessed for human benefit

To help us find out what may be possible, and what local people would support, we would like you to help us compile a list of specific ideas for renewable energy schemes in Warwick District.

The questionnaire on the back of this sheet is to allow you to have a say and suggest potential projects in Warwick District. We will then look at how practical each of them are from a technical, economic and social point of view, and then let you know what we found if you wish us to do so.

We will be looking at the following renewable energy options for Warwick District (please see attached sheet for detailed examples):

- **Small scale Hydro:** using existing sluices and weirs on rivers or open flowing water that are then used to turn small turbine devices of many different types
- **Biomass:** using forestry, manure and / or agricultural products to supply just heat only, or electricity and heat together, in what are known as **Combined Heat and Power (CHP)** plants.
- **Wind:** either individual wind turbines or wind farms comprising a group of turbines that could be community owned or managed
- **Solar:** both
 - i. **Solar water heating** that involves collecting the sun's heat in highly Absorbent collectors, and transferring the heat to water. This type of technology provides heat only, and does not produce electricity.
 - ii. **Photo-voltaic (PV) panels** that convert sunlight directly into electricity and which can be mounted on roofs or walls of domestic and commercial Buildings.

Thank you for your time in filling in this questionnaire - it is much appreciated and invaluable to our project.

Please return the completed questionnaire by 30th January 2004

Please return your completed questionnaire in the envelope provided to:

WEEAC, FREEPOST MID 17638, WARWICK, CV35 9BR.



Questions

1. Do you think that some form of renewable energy project might make a positive contribution to your Community? (please tick as appropriate)
- agree strongly agree no opinion disagree disagree strongly

2. Have a look at the case studies on the sheet provided - How desirable do you think each of the following might be in your area? (please tick as appropriate)

	Very desirable	desirable	not desirable	very undesirable
Hydro:				
Biomass:				
CHP				
Wind:				
Solar				
Other (Please specify)				

Any Other Comments?

3. Can you think of a specific location, or locations, in Warwick District where you would like to see a community owned renewable energy project (i.e. a school, community buildings, places of worship, parks, etc)

Where will it be?

Describe your idea, what type is it?

“Who should be involved?”

4. Are you or your organisation willing to support in principle, take part in, or even sponsor a community led renewable energy scheme? (please tick as appropriate)
- sponsor support participate neither

5. Would you or your organisation consider buying your energy from a local initiative even if you weren't involved in developing it (i.e. a hydro-electric project on the River Leam or a CHP system powered by local farmer's crops?) (please tick as appropriate)
- Yes No

Comments

If you would like us to keep you informed of our project please tick this box

Name & Telephone No.:

Address:

Action 21 is a voluntary group promoting sustainability.
For more information on Action 21 please tick this box:

Renewable Energy What Can Be Done?

Micro hydro power

In the West Midlands region, energy from water could be derived by using existing sluices and weirs or open flowing water that are then used to turn small turbine devices of many different types. These are typically in the range of 25 kW to 1 MW capacity.

Jephson Garden, Leamington Spa

In Mill Bridge Weir there was an original turbine which was opened in February 1904. It was designed to pump water for use in watering the streets, sewer flushing, the railways and for supplying the swimming pool (in summer). A feasibility study was carried out in 2000 with the original intention of supplying electricity to the restaurant and greenhouse. There is still an option of a waterwheel in old boat pass or a turbine in bridge abutment (site of original turbine) with the electricity being used to supply a community building.

Biomass

The phrase "biomass" covers many different types of renewable energy technologies and sources of fuel. Also, unlike other forms of renewables, such as wind, or PV panels, biomass energy can supply just heat only, or electricity and heat together, in what are known as Combined Heat and Power (CHP) plants.

Animal manures can be anaerobically digested (that is, without air), to produce biogas (methane). This biogas can then be burnt to generate heat alone, or, for larger plants, the biogas is combusted in a diesel engine to produce electricity and heat (CHP). Practically, only manures from animals kept housed can be readily collected, so this means suitable manures are chicken litter, pig manure, and manure from dairy cows.

Forestry residues can also be used- softwood thinnings can be converted to woodchip, which could then be burnt in a biomass boiler, to provide heat (and possibly electricity as well), for an institutional user e.g. school or hospital. An alternative to the above sources is to specifically grow crops that will be combusted in a biomass plant. The most accepted way of doing this is to grow willow or poplar which is coppiced on a short rotation (SRC), every 3 years

Weobley School, Herefordshire (Heat Only)

The Weobley school wood fuel system was installed in 1997. A 350kW boiler meets the base-load heating needs of a new primary school, as well as those of the adjoining secondary school. The school ensured a reliable supply of fuel by entering into a contract with a local co-operative of farmers, labourers and agricultural contractors. They agreed to supply the school with 150-300 tonnes of wood chip per year, derived from woodland thinnings and from willow and poplar SRC.

Solar Energy

Solar water heating involves collecting the sun's heat in highly absorbent collectors, and transferring the heat to water. This type of technology provides heat only, and does not produce electricity. The most common types of uses in the UK are for providing hot water for houses, and for heating swimming pools. However, there is also the possibility of institutional uses, such as providing hot water for hotels, and district heating.

Electricity can be generated directly from the sun using **photo-voltaic (PV) panels**, which can be mounted on roofs or walls of domestic and commercial buildings. PV initiatives in the UK include integration of PV panels into new commercial, industrial and council buildings, and other smaller community needs such as bus shelter lights, traffic warning systems, parking meters, and operation of park fountains. Solar panels are very visible and are good for raising awareness and acceptance through community schemes.

BedZED, the Beddington Zero Energy Development

BedZED, is an environmentally-friendly, energy-efficient mix of housing and work space in Beddington, Sutton. BedZED will only use energy from renewable sources generated on site. It is the first large-scale 'carbon neutral' community - i.e. the first not to add to the amount of carbon dioxide in the atmosphere. It includes a combined heat and power unit and all the houses face south where they can make maximum use of solar energy. All homes will be fitted with photovoltaic solar panels and this electricity will be used to power re-charging points for electric vehicles.

It is estimated that residents might see a 60% reduction in total energy demand and a 90% reduction in heat demand, compared to a typical suburban home.

Wind

Modern wind turbines for use on land can be either individual turbines or wind farms - a group of turbines. Aside from the commercial development of large wind turbines connected to the national grid, there is a small but growing market for micro-wind turbines, ranging in size from 100 W to 10 kW.

Applications are likely to range from off-grid homes, to low power applications for agriculture and wind-pumping. At a community level they could also be used on community buildings, schools, visitor attractions and hospitals.

Community wind farms are growing in number in the UK- they normally involve a single wind turbine or a cluster of several smaller wind turbines. The electricity produced by the turbines would be sold to the grid. The community would have a financial stake in the project and also may be involved in the management of it.

Baywind Energy Co-operative

In early 1997, the UK's first co-operatively-owned wind cluster started producing electricity at Harlock Hill near Ulverston in South Cumbria. Five 500kW turbines give a site installed capacity of 2.5MW

Appendix Two: Long List of Sites to be ranked by Energy 21

	Project Idea	Resource/Beneficiaries	Criteria ranking
	Solar Thermal/PV		
1	Council buildings	Solar thermal and PV Employees?	
2	Castel Froma Care Home	Solar water heating for hydrotherapy pool	
3	Abbey Fields or Newbold Comyn or St Nicholas Park swimming pool	Hydro/solar thermal or PV with indicator in baths showing savings	
4	New social housing	Solar	
5	Hampton Magna Community Hall roof	Solar PV Cross section	
6	Abbey Fields	Solar PV lighting for park and/or wind	
7	Holy Trinity, All Saints Parish and St Mary Churches	Solar thermal and PV/heat pumps	
8	Regenis offices	Solar PV	
9	Bath Place community centre	Solar	
	Wind Power		
10	Tournament Fields, Longbridge	Wind turbines within industrial development	
11	Playground at Rushmore St.	Wind or PV to power an 'amusement ' for	

ENGAGE Feasibility Study

			kids to think about renewables.	
12	Eagle Rec		Wind for teenage shelter using PV and sensors	
13	Newbold Comyn, River Avon for sports centre?		Wind/biomass from wood trimmings	
14	Campion Hills, near water treatment scheme		Wind	
15	Harbury Lane windmill for ??		Wind	
	Biomass			
16	Warwickshire College, Moreton Morrell		biomass from waste wood and animal waste	
17	Warwick Hospital, Potterton site		CHP from local farms	
18	Town Hall wood boiler			
	Hydro power			
19	Canal boating community		Hydro/solar	
20	Princes Drive weir		Hydro for waste site	
21	Jephson Gardens for community centre/church		Hydro	
	All			
22	School in Kenilworth, Warwick and Leamington and Briar Hill in Whitnash and Aylesford and new school at Warwick Gate		CHP, wind and solar to teach children	
23	St Nicholas Park		Demonstration wind and solar	

Appendix Three: Assumptions for Costs

Technology Assumptions

Wind Turbines

The calculations were based on actual turbine power curves related to the wind speed and it was assumed that the turbines would be mounted 50 metres off the ground.

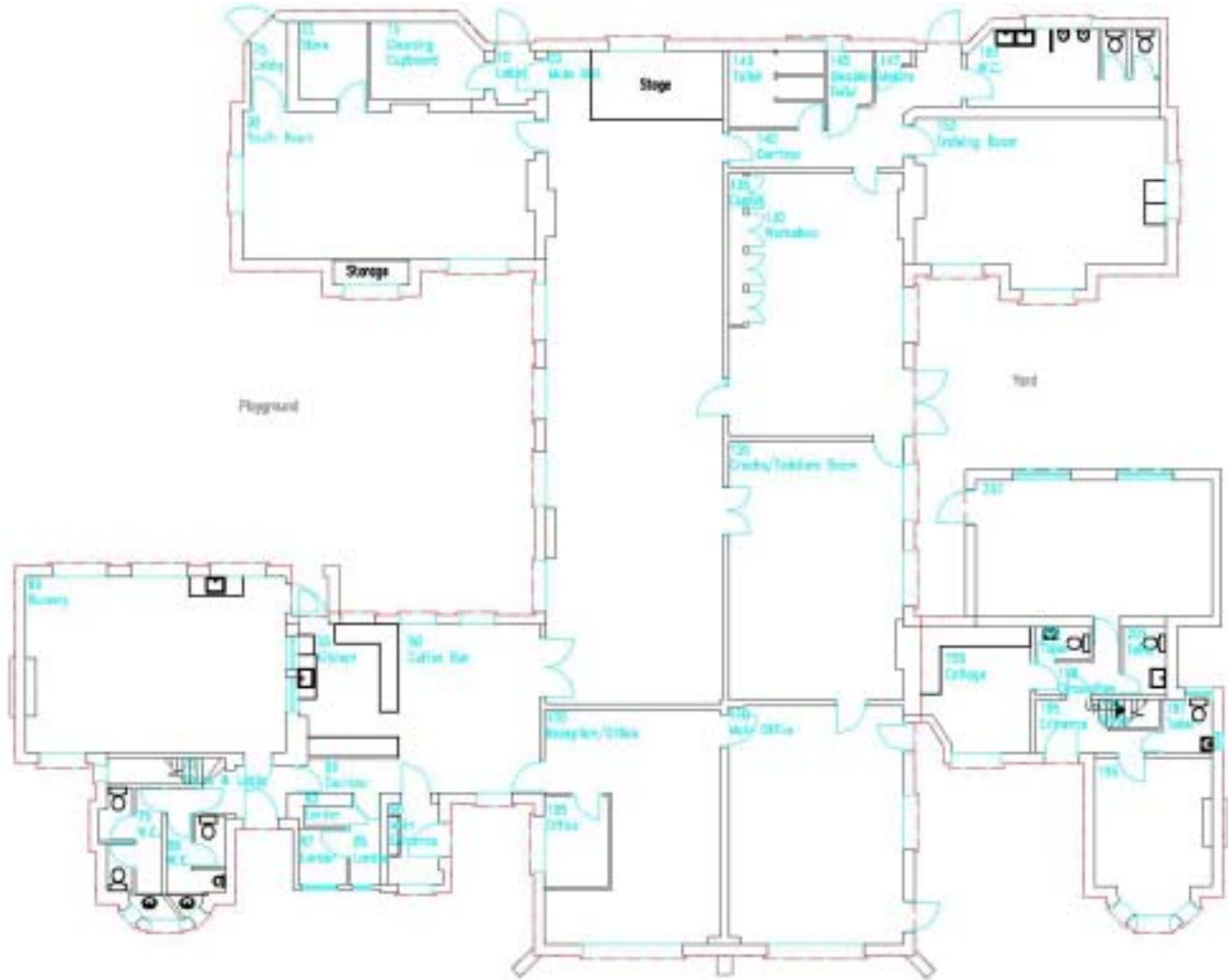
Solar Photovoltaic

The calculations were based on average insolation data for the building over an average year. For the purposes of netting generation off against seasonal demand, our model assumes that 70% of the sunlight is during summer months and 30% in winter months.

Solar Water Heating

The calculations were based on average insolation data for the building over an average year.

Appendix Four: Layout of Bath Place Community Venture



Appendix Five: Poster for *Engage* Community Energy Scheme



Engage

ACTION 21

COMMUNITY ENERGY COMPANY

How the scheme might work - illustrated by a household in Warwick District looking back from 2007



Wind turbine image courtesy of Iskra Windlenraft and solar collector image courtesy of Imagination Solar/enkraft